

# Classroom Applications of Research on Self-Regulated Learning

Scott G. Paris

*Department of Psychology  
University of Michigan*

Alison H. Paris

*Combined Program in Education and Psychology  
University of Michigan*

This article describes how self-regulated learning (SRL) has become a popular topic in research in educational psychology and how the research has been translated into classroom practices. Research during the past 30 years on students' learning and achievement has progressively included emphases on cognitive strategies, metacognition, motivation, task engagement, and social supports in classrooms. SRL emerged as a construct that encompassed these various aspects of academic learning and provided more holistic views of the skills, knowledge, and motivation that students acquire. The complexity of SRL has been appealing to educational researchers who seek to provide effective interventions in schools that benefit teachers and students directly. Examples of SRL in classrooms are provided for three areas of research: strategies for reading and writing, cognitive engagement in tasks, and self-assessment. The pedagogical principles and underlying research are discussed for each area. Whether SRL is viewed as a set of skills that can be taught explicitly or as developmental processes of self-regulation that emerge from experience, teachers can provide information and opportunities to students of all ages that will help them become strategic, motivated, and independent learners.

A primary purpose of this special issue is to document the contributions of research in educational psychology to classroom practices that promote teaching and learning. Educational psychology, perhaps more than many areas in academic psychology, seeks to bridge theory and practice because the improvement of education is an underlying goal of most researchers. Thus, the question "What has educational psychology done for you lately?" is more than rhetorical. It is a challenge to demonstrate the value and the pragmatic outcomes of research for teachers, policymakers, and others involved in enhancing educational practices. Some may suggest that this endeavor is symptomatic of a new era when political and economic pressures for accountability require academics to justify and publicize their accomplishments. Others may counter that we are "preaching to the choir" with this argument appearing in a specialized scholarly journal. Still others might be proud to illustrate the positive

impact of research on educational practice. We belong to the latter camp of enthusiastic optimists who regard the past 30 years of research in educational psychology as an exciting proliferation of useful ideas for teachers and students.

Our specific focus in this article is self-regulated learning, a topic that has garnered a great deal of interest among academic researchers and practicing educators because it is a worthy objective for students of all ages in all disciplines. Self-regulated learning (SRL), as the three words imply, emphasizes autonomy and control by the individual who monitors, directs, and regulates actions toward goals of information acquisition, expanding expertise, and self-improvement. Zimmerman (2000) said that self-regulation, "... refers to self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals" (p.14). The broad and indefinite scope of SRL appeals to researchers and educators who seek to understand how students become adept and independent in their educational pursuits. For example, students who daydream, forget assignments, and rarely complete their work, display little SRL. In contrast, students who ask questions, take notes, and allocate their time and resources judiciously are in charge of

their own learning. We briefly note some historical and conceptual approaches to SRL and then provide examples of classroom practices that enhance SRL. Specifically, we describe how SRL is manifested in students' strategic reading and writing, task engagement, and self-assessment.

## HISTORICAL TRENDS IN RESEARCH ON SELF-REGULATED LEARNING

The *Educational Psychologist* has promoted attention to SRL with a series of special issues over the years. For example, there were special issues devoted to academic studying (Levin & Pressley, 1986), metacognition (Paris, 1987), SRL theories (Zimmerman, 1990), motivational influences on education (Brophy, 1999), and social influences on school adjustment (Wentzel & Berndt, 1999). In addition, since 1990 there have been more than 30 articles published in the *Educational Psychologist* on topics directly related to SRL. The wide range of topics has included phenomenological aspects of SRL (McCombs & Marzano, 1990), children's social regulation (Patrick, 1997), family influences on self-regulation (Grolnick, Kurowski, & Gurland, 1999), social and cultural influences on SRL (Boekaerts, 1998; Pressley, 1995), monitoring reading (Pressley & Ghatala, 1990), personal cognitive development (Ferrari & Mahalingam, 1998), and specific influences of situation and domain knowledge on SRL (Alexander, 1995). The variety of topics relevant to SRL illustrates how it is interwoven with many aspects of education and development (Paris & Newman, 1990; Pintrich & DeGroot, 1990).

Because SRL is relevant to so many aspects of learning and control, diverse theoretical perspectives have been proposed as useful for examining SRL. These include theories based on Piaget's constructivist theory, Vygotsky's sociocultural theory, social learning theories, and information-processing theories. Zimmerman and Schunk (1989, 2001) highlighted these different approaches by asking authors in their volumes to examine SRL from distinctive theoretical stances (even though a mix of eclecticism is evident in most research). For example, it is commonly accepted now that children construct beliefs, concepts, and naïve theories about the psychological world, especially their own views of epistemology. It is equally accepted that adults and peers shape those emerging theories through sociocognitive processes of guided participation, scaffolded assistance, and apprenticeship. Goals that guide plans and behavior, volition to enact them, and feelings of self-efficacy that follow task completion are also accepted as motivational accompaniments of SRL (Pintrich, 2000; Schunk & Ertmer, 2000). The theoretical lineage of these ideas is less important to teachers than the practical applications of the concepts. We think SRL theories that emphasize how other people can help children learn tactics to regulate their own behavior and learning have had the most direct application to classrooms because they have both theoretical and practical foundations.

Although there are numerous conceptual approaches to research on SRL, there is a need to identify explicitly the practical applications of SRL to classrooms. It seems to us that there are at least two reasons for this. First, there are increasing historical pressures to synthesize findings in educational psychology and link research with practice. Second, there have been historical changes in the practical relevance of research in educational psychology so that the benefits of interventions are made available to more students with methods that teachers can adapt and use in their classrooms. These historical changes are evident in research on cognitive strategies and instruction that led to the popularity of SRL. We briefly trace the historical convergence of these topics on SRL.

### The Nature of Strategies

Consider the changes in research on strategies during the early years of the "cognitive revolution" in educational psychology. First, the grain size has increased. Cognitive research in the 1970s still employed the "magnifying glass" approach of earlier behavioral research whereby aspects of thinking were isolated, examined, and deconstructed into components, perhaps to be reassembled later in models or recommendations. Early studies examined specific strategies such as summarizing text, whereas later research examined the diverse ways that readers respond to text. Research in the 1970s investigated who used which strategies, however, by the 1980s, researchers began experimental implementations of various strategy conditions. In the 1990s, strategy research progressed to studies of classroom programs of strategy intervention.

Second, the variety and relevance of strategies has increased. Weinstein and Mayer (1986) summarized the major categories of general learning strategies as rehearsal strategies, elaboration strategies, organizational strategies, comprehension monitoring strategies, and affective strategies. Research in the 1970s demonstrated that students who were handicapped by youth, inexperience, or lack of understanding failed to use these kinds of strategies as effectively as older and more expert students. Later studies considered a broader range of tactics that students can marshal in school for specific subjects and purposes.

Third, ecological validity has increased. In the last 20 years, research on learning strategies has been conducted in classrooms, with more attention given to ecological and functional orientations. Researchers examined the kinds of strategies that students use as they read and write or as they solve mathematical and scientific problems. There has also been more attention to the methods and materials that teachers use to promote strategic learning.

Fourth, the social collaboration and scaffolding required to use those strategies were implemented in classrooms. In the 1990s, there were detailed studies of the social and motivational conditions that support students' use of effective strategies. Teachers have used pair-share activities, recipro-

cal teaching (Palincsar & Brown, 1984), and collaborative learning to allow children to coach each other to monitor and improve their own learning. Thus, learning strategies have become important cognitive tools for teachers to model, explain, and foster in their students throughout the curriculum.

### The Nature of Instruction

During the past 30 years, the nature of instruction has changed dramatically. Early “training” studies emphasized didactic methods, whereas recent approaches emphasize reflective and scaffolded instruction. Early strategy training studies were conducted in laboratory experiments rather than in classrooms. Ann Brown (1978) characterized these studies as “blind training” and later studies as “informed” because the instructional conditions became more cognitive and explanatory. Research in the 1980s simultaneously increased the grain size of the issues and situated strategy research in classrooms in four distinct ways. First, metacognition was added to the research on strategies so that training included explanations about how strategies operate and why they are useful rather than simple directions to use them. In retrospect, it seems incredibly short-sighted that researchers would not routinely explain how, why, and when strategies are effective. However, the emphasis was on experimental control and rigor, and so children were usually told what to do rather than provided with more explanatory rationales for their actions. Fuller disclosure led to better learning. Explicit instruction on declarative, procedural, and conditional knowledge that underlies effective strategic learning was the hallmark of strategy training in the 1980s (Paris, Wixson, & Palincsar, 1986; Pressley, Harris, & Marks, 1992).

Second, motivation and emotion were added to cognitive dimensions of learning. Consequently, training students to use strategies for learning also entailed making the strategies fun and functional. In fact, the old componential and additive models of learning were threatened by these new classroom interventions that wove fun and information together inextricably. Third, strategies were situated in specific disciplines, beginning with reading in the 1970s and extending to mathematics, science, and social studies as researchers recognized that each discipline afforded different frameworks for organizing knowledge (Alexander, 1995). Fourth, strategy research moved from the laboratory into schools because researchers wanted to test whether students could be taught to use effective strategies in their regular curricula. The interplay of all four factors are evident in the instructional conversations designed to enhance students’ awareness of strategies and problem-solving techniques. Instruction is not telling students what to do or what strategies should be applied. Rather cognitive instruction involves students in reflective discourses about thinking with multiple opportunities to talk about the task and how to solve it. Explanations, guided inquiry, scaffolded support, reciprocal

teaching, and collaborative learning all foster discourse among students and teachers about how to use strategies appropriately and to learn effectively.

The historical convergence of research on strategies, awareness, and control necessary for SRL is evident in this brief review. More generally, the complexity of learning was recognized in the interactions among knowledge, skills, and dispositions for all disciplines. It is especially useful for students to be reflective and metacognitive at three times: during initial learning, while troubleshooting, and while teaching others to use strategies (Paris, Lipson, & Wixson, 1983). SRL depends on motivation and control as well. Students need to be motivated to exert effort, to persist in the face of difficulty, to set attainable yet challenging goals, and to feel self-efficacy with their own accomplishments. They need the volitional control to avoid distractions and stay on track (Corno, 1993). They also benefit from using emotion control, such as reassuring self-speech, to limit anxiety about task difficulty (Kuhl, 1984). It is the fusing of skill and will (and dare we add “thrill?”) to emphasize that cognition, motivation, and affect are all involved in SRL. Similar emphases are apparent in educational movements called “learning to learn,” “higher order thinking,” “mindful learning,” “reflective teaching and learning,” “autonomous learning,” and “flow experiences” that all emphasize the core principles of SRL.

SRL researchers did not discover or invent these processes of learning and SRL holds no privilege or dominion over the study of learning. New terms and emphases will emerge in future studies. What is important to understand, however, are the historical changes that have percolated throughout educational psychology the past 30 years that have made SRL popular as a contemporary topic in research and a focus in classroom practices. Educational psychologists learned quickly that teaching students to use strategies appropriately involved metacognition, motivation, domain-specific knowledge, and features of the classroom tasks. These multiple and interactive forces are the expanded focus of SRL.

The historical changes have moved research from small grain to large grain foci in the study of learning to study how students plan, monitor, and revise their actions as they engage the curriculum. The shift has also been from decontextualized laboratory research to discipline-based applications so that SRL research has illuminated specific strategies and motivations that enhance achievement in specific subject areas. Research has also moved beyond training based on following directions to teaching based on cognitive discussions. Finally, there has been a shift from highly controlled research in artificial settings that might be translated into educational practice to less controlled research that is situated in schools and embodies effective practices within the implementation and research. In the following sections we identify specific examples of SRL in classrooms and the kinds of research on which it is built.

## STRATEGIC READING AND WRITING

Much of the early research on cognitive strategies in the 1960s and 1970s focused on children's memory development and it was a short jump for researchers to study the kinds of strategies children use as they read and write. For example, the literacy strategies used by school-age children can be described according to the time at which they use them (e.g., preliteracy, during literacy, or postliteracy experience). Before children begin to read, it is useful to preview texts and to establish a purpose for reading. It may also be useful to make inferences from the text source, titles, pictures, and skimming of information before one begins to read. However, these strategies are difficult for many children throughout elementary school (Paris, Wasik, & Turner, 1991). Similar kinds of strategies facilitate writing, however 8- to 12-year-olds are often reluctant to use brainstorming, semantic webs, and peer discussions to guide their initial drafts. Instruction in prewriting and prereading strategies has consistently shown positive benefits for elementary school students (Pressley, Johnson, Symons, McGoldrick, & Kurita, 1989).

One of the key strategies that children learn to use as they read is to make inferences and elaborate the meaning from text. However, without explicit instructions, children often focus on the literal meaning of text rather than transforming it into their own words and ideas (Johnston & Afflerbach, 1985). In addition, children in upper elementary grades have difficulty identifying main ideas and difficulty distinguishing important from unimportant information (Baumann, 1984). The focus on literal meaning and the inability to distinguish main ideas may arise from inappropriate comprehension goals or the lack of appropriate strategies employed while reading. In the same vein, children often fail to monitor and repair their writing when they are engaged in the task. They often do not reread for comprehensibility or use topic sentences and main ideas to organize their writing.

After children finish reading a passage, they often do not look back in texts to check their understanding or make good summaries. For example, Brown and Day (1983) found that fifth and seventh graders, when trying to summarize a passage, tended to recall bits of information in the same sequence as the text, and did not plan their summaries effectively. They often ran out of space on the page before they had completed their summaries. Winograd (1984) found a similar pattern among eighth graders when asked to summarize. Again, there is a parallel with writing strategies. Students who are asked to revise frequently make superficial changes and fail to appreciate the audience's perspective or monitor the comprehensibility of their text. Children who use effective strategies for revising may follow the advice of a peer, may reread their own writing from a different perspective, and are more likely to embellish ideas as they revise.

## Literacy Strategies Within an SRL Framework

From these studies of the use of specific strategies, research on strategic reading and writing has changed in two critical ways: (a) by increasing in grain size, and (b) by focusing on the practical applications of strategy instruction in classrooms. First, rather than examining specific strategies such as summarizing or editing, research on reading and writing strategies became embedded in SRL to include a wider variety of strategies as well as broader types of strategies (e.g., executive control strategies). This change was necessitated because of the growing realization that the effective use of literacy strategies depended on awareness of procedural, declarative, and conditional knowledge, as well as motivational attributions and feelings of efficacy. That is, students need to know what actions lead to which outcomes and why it is important to perform and monitor those actions. Feedback is instrumental as well as emotional. Borkowski, Carr, Rellinger, and Pressley (1990) referred to the orchestration of these multiple factors as the "good strategy-user" model. Training children to be more strategic readers and writers thus involved making children aware of potential strategies, helping them to attribute success to good strategies, and helping them to choose and monitor appropriate strategies. As an example of the increased grain size in strategy research, Graham (1997) examined the role of executive control strategies in the revising process of sixth-grade students who struggled with writing. Providing students with support in managing and coordinating their plans and decisions had positive effects on their revising behavior (e.g., increasing the number of nonsurface revisions) and the quality of the text that they produced. Page-Voth and Graham (1999) investigated the role of goal-setting strategies in improving the writing performance of seventh- and eighth-grade students. Students learned strategies that would facilitate goal attainment by helping them to coordinate processes that involved generation, evaluation, and incorporation of target elements into their essays. Students who learned the goal-setting strategy wrote longer papers, included more supporting reasons, and produced qualitatively better essays than students in the control condition.

Second, shifts in the nature of strategy research are evident in the growing number of demonstrations of effective instructional interventions that promote children's strategy use. The more recent classroom-based studies attend to the role of teachers, teaching practices, and materials in mediating children's development of literacy strategies. For example, Palincsar and Brown (1984) taught junior high students to work in pairs as they practiced using reading strategies, a practice called "reciprocal teaching." Paris, Cross, and Lipson (1984) used classroom discussions about strategies to promote understanding among third and fifth graders. Pressley, Almasi, Schuder, Bergman, and Kurita (1994) used



“transactional instruction” to promote the use of reading strategies. Englert et al. (1991) embedded cognitive and metacognitive strategy instruction in a writing program for fourth- and fifth-grade students. Instruction included direct explanation of writing strategies and modeled use, daily writing with topics usually selected by students, use of procedural facilitation in the form of think-sheets, peer review and feedback, frequent writing conferences, and publication of student papers. Harris and Graham (1992) taught children a variety of practical strategies for organizing, planning, and revising their compositions. They taught self-instructional tactics to promote self-regulation such as identifying the problem, focusing on the task, applying the strategies, evaluating performance, coping with anxiety and maintaining self-control, self-reinforcement, goal-setting, self-assessment, and self-monitoring. Harris and Graham (1996) stressed the necessity of incorporating SRL components into classroom instruction, arguing that maintenance and generalization of strategy use will suffer if SRL components are neglected. At the heart of this instruction are the following six recursive stages: (a) activating and developing background knowledge, (b) discussion, (c) cognitive modeling, (d) mnemonic memorization, (e) supported performance, and (f) independent performance.

These programs of strategy instruction exemplify several key features of successful interventions. One key is to provide a rich variety of strategies that children can use on academic tasks. Children must know the types of available strategies that lead to understanding and success before they will be able to implement them. Second, as intervention studies have shown, teachers need to share specific strategy information that is required for students to become aware of how, when, and why to apply strategies. A third important principle is the causal attribution of improved performance to the effective application of effort in using the strategy. If students believe that strategy use is the reason for success rather than attributing success to more stable factors (e.g., ability) or less controllable ones (e.g., luck, the teacher), they are more likely to utilize effective strategies in the future. A fourth key is that effective strategies can be learned from peers by engaging students in situations that make strategy use observable and salient, such as during discussion and tutoring. Fifth, academic literacy strategies are part of larger plans for managing one’s effort, resources, and emotions; therefore, strategy instruction in literacy may set the stage for transfer of strategy use to other domains, as well as perhaps for a more self-regulated approach to learning in general. Sixth, it is important for strategies to be embedded in daily activities so that teachers and students have opportunities to practice the strategies in authentic activities throughout the curriculum. If the nature of activities and their participation structures implicitly require the use of strategies, students will be more likely to develop thoughtful approaches to learning than if they are limited to situations where strategy use is coerced or directed.

## COGNITIVE ENGAGEMENT

Most of the research on SRL has focused on identifying and enhancing the use of effective strategies, mainly as in-the-head features of solo cognition. However, context cannot be ignored. Whether students use self-regulating tactics in school, what kinds of strategies they use, how they are rewarded for their use, and how much effort they expend being regulated and strategic, depends on the tasks and contexts that teachers create for students. Research in the 1990s has used social and ecological perspectives to examine the kinds of instructional activities that support SRL with particular attention on how task demands and constraints of the situation influence students’ learning and motivation. This is the bridge from “situated cognition” to “situated motivation” (Paris & Turner, 1994). For example, Blumenfeld and her colleagues explained that variety, diversity, challenge, control, and meaningfulness, as well as the procedural complexity and social organization of the task, affect the use of deep-level learning strategies (Blumenfeld, 1992; Blumenfeld, Mergendoller, & Swarthout, 1987). Conversely, when teachers structure classroom tasks that emphasize peer competition, rote procedures, and behavioral management, students are likely to perceive classroom tasks as busy work, to focus on completing the task, and to engage in the activities in superficial manners (Blumenfeld, Hamilton, Bossert, Wessels, & Meece, 1983; Doyle, 1983).

Cognitive engagement approaches emphasize how features of academic tasks influence the quality of students’ learning. Definitions of cognitive engagement vary among researchers, but they include meaningful and thoughtful approaches to tasks. When students are deeply engaged, they go beyond the requirements of the assignment, they exhibit preferences for challenge and risk-taking, and they make psychological investments to master the knowledge and skills (Connell & Wellborn, 1991; Newmann, Wehlage, & Lamborn, 1992; Wehlage, 1989). This perspective assumes that students will only be engaged when the context meets their needs and affords the opportunity to become immersed in the task. This requires that tasks elicit the intrinsic interests of students, permit a sense of ownership, relate to life outside of school, allow for collaboration, communicate high expectations, and offer consistent support for students to meet those expectations (Marks, Doane, & Secada, 1996; Newmann et al., 1992; Wehlage, 1989). Conversely, if classroom instruction offers only superficial or low-level tasks (e.g., rote memorization, worksheets), it is doubtful that students will be required to engage in thoughtful and strategic ways.

Research that has focused on classroom tasks sheds light on the challenge of how teachers can design instructional activities that promote independent, strategic, and effortful learning. For example, Turner (1995) found that first-grade teachers were very different in the amount of independence they allowed in their reading curriculum. Whether teachers

regarded themselves as primarily “basal” or “whole language” teachers, some designed classrooms with many open-ended activities. In contrast, Turner (1995) found that other teachers designed their reading tasks with more restrictive opportunities to exercise SRL, tasks that she labeled as “closed,” such as filling in worksheets. In open task structures, students had choices about what, where, and when they read. They were able to choose personally meaningful materials that were appropriately difficult and to work with a partner or with groups on authentic projects and research. In contrast, closed tasks limited the opportunities for decision making, controlled the choice of materials and activities, limited the variation in the types of tasks, and encouraged solitary seatwork. In the open-ended environments, Turner (1995) found that students demonstrated more volitional control, used more strategies, and persisted longer in the face of difficulties. Thus, open-ended tasks that promote thoughtful engagement include opportunities for students to make choices, exercise control, set challenging goals, collaborate with others, construct personal meaning, and derive feelings of self-efficacy as a consequence of their engagement with the task (Paris & Turner, 1994).

Connell and Wellborn (1991) emphasized that engagement depends on the extent to which students’ needs for competence, autonomy, and relatedness are satisfied. Their focus is on specific contextual factors to meet these needs, which include the provision of structure, autonomy support, and involvement. Behavioral, affective, and cognitive engagement will ensue when the appropriate interaction between the classroom context and the child occurs. Such an ecological approach emphasizes the “fit” between the environment and the child, an approach that is similar to “developmentally appropriate practice” in early childhood education. For example, Stipek, Feiler, Daniels, and Milburn (1995) distinguished between young children in child-centered classrooms and children in teacher-directed classrooms and found that the 4- to 6-year-olds in child-centered classes demonstrated more attitudes and behaviors associated with SRL. Child-centered classrooms encouraged peer interaction and gave children choices about a diverse set of activities and materials that were meaningful to students. In contrast, teacher-directed classrooms focused on basic skills that were not embedded in meaningful activities and were controlled by the teachers. They also used external evaluations and rewards, and they emphasized performance goals and social comparisons.

Project-based learning, or problem-based learning (PBL), is a specific task-based approach that teachers can utilize to support the development of SRL. PBL focuses on student-designed inquiries of authentic problems in realistic environments that use many resources and extend over time. Marx, Blumenfeld, Karjck, and Soloway (1997) identified five key features for implementing PBL: (a) Instructional units, which are called “projects,” must be orchestrated around a driving question that is worthwhile, meaningful, and feasible; (b) projects must be in the form of investigations in which students

plan, design, and conduct real-world research that includes asking questions, designing experiments, collecting and analyzing ideas, and drawing inferences; (c) students need to create artifacts that are tangible results of the investigation process and reflect their understanding; (d) projects must include collaboration with their peers as well as teachers and local experts outside of the school environment; and (e) teachers should incorporate the use of technological tools, which allow authentic investigations and support deep understandings.

If PBL activities are designed carefully with teachers who provide appropriate modeling and scaffolding, they promote and necessitate SRL. PBL affords opportunities for self-directed learning by giving students choice and control about what to work on, how to work, and what products to generate. For example, students can select their own project questions, activities, and artifacts; determine how to approach the problem and what resources to use; and how to allocate responsibility among the group (Blumenfeld et al., 1991; Marx et al., 1997). In addition to choice and control, students need to use a variety of strategies to generate and coordinate plans, to formulate and test predictions systematically, to determine solutions, and to monitor progress toward goals. Blumenfeld et al. (1991) explained that “there are at least two types of metacognition that are employed in project-based learning” (p. 379). First, moment-to-moment control and regulation of cognition is required to monitor and fine-tune thoughts while working through the details of particular tasks. Second, students need to be able to engage in strategic, purposeful thought over what may seem to be very disconnected aspects of projects to guide and control their activities. PBL promotes SRL because it places the responsibility on the students to find information, to coordinate actions and people, to reach goals, and to monitor understanding.

Students are cognitively engaged in classrooms that have open-ended tasks, projects, and problems that are based on driving questions. These are student-centered and inquiry-driven contexts in contrast to materials-driven or curriculum-driven classrooms. Tasks, teachers, and classrooms that promote intrinsic motivation, autonomy, and self-determination are likely to promote SRL among students (Deci, Vallerand, Pelletier, & Ryan, 1991). These settings foster a sense of engagement that is sometimes referred to as “flow” (Csikszentmihalyi, 1990). Flow is a satisfied state of consciousness associated with intense concentration, effortless control, and deep enjoyment. For students to be in a state of flow, challenges and skills must be aligned and sufficiently high, immediate and unambiguous feedback must be provided, and the activity must be goal-directed and allow for a sense of control (Csikszentmihalyi & Rathunde, 1993). Flow illustrates how contexts impact learners’ motivational states, where motivation and SRL emerge from situations when the conditions are optimal. This kind of deep engagement elicits SRL and may require little explicit instruction or support because the nature of the activity sustains the learner’s interest and effort.

## SELF-ASSESSMENT

Learning depends on assessment of both product and process to know what is known, what requires additional effort, and what skills are effective. Whether elicited by others or self, assessment fosters planning and regulation of future SRL efforts (Zimmerman, 2000). Assessment of learning can have profound motivational consequences on students' classroom behavior and attitudes. Tests, exams, and grades may lead to negative outcomes for some students, especially if they have a history of poor performance, the evaluations are made public, or the students work only for extrinsic rewards. The desired positive outcomes of assessment on students include greater responsibility, sustained effort, awareness about learning, and personalized mastery goals. These are characteristic of SRL and illustrate how students' views (and theories) of assessment influence their learning. Perhaps the clearest links between SRL and assessment are seen in nonacademic arenas, such as music recitals or sports contests, where children are committed to self-improvement when faced with demonstrations of their abilities. How can academic assessments of learning be infused with the same passion and autonomy? Self-assessment may be the key.

Self-assessment includes all three domains of SRL: cognitive, motivational, and affective. Many kinds of self-assessments are possible in the classroom. Students can evaluate their levels of understanding, their personal interests, and their effort and strategies used on a task. They can assess the perceptions and attributions made by others regarding one's abilities, the improvement from one occasion to the next, the amount of assistance needed to accomplish a task, and their goals and expectations in various situations. As students learn to monitor and interpret their actions, they are able to assess a greater variety of dimensions of their behavior with more insight about possible causes and more accuracy about their progress (Paris & Cunningham, 1996; Rosenholtz & Simpson, 1984). Self-assessment involves the internalization of standards so students can regulate their own learning more effectively. When students are able to interpret their own accomplishments with pride, their perceptions of ability and efficacy increase (Zimmerman, 2000). For example, Schunk and Ertmer (2000) surmised from studies of various goals and feedback conditions that "... providing students with a learning goal and progress feedback led to the highest self-efficacy, motivated strategy use, and achievement" (p. 641). They suggest that periodic, but not too frequent, self-evaluation complements learning goals and helps students to maintain high levels of self-efficacy.

Self-assessment of learning depends on both internal and external factors. Internal factors such as metacognition enable students to reflect on their own accomplishments, to monitor their progress while learning, and to evaluate their understanding against other standards of performance. Paris and Winograd (1990) described two aspects of metacognition as self-appraisal and self-management. The former refers to

review and evaluation of one's abilities, knowledge states, and cognitive strategies, whereas the latter refers to the monitoring and regulation of ongoing behavior through planning, correcting mistakes, and using fix-up strategies. Considerable research has shown that both self-appraisal and self-management of learning improve with age, intelligence, instruction, and academic achievement (e.g., Paris & Cunningham, 1996; Swanson, 1990).

External factors include the kinds of curricula and assessment activities presented to students. Instructional activities that allow little initiative, control, and independence do not allow much SRL. Such closed tasks, as opposed to open-ended tasks, foster routine responses instead of thoughtful engagement. Similarly, assessments that allow little personal responsiveness provide few opportunities for students to practice monitoring, planning, and regulating their own learning. The term *authentic assessment* is intended partly to convey the sense of assessment activities that are thought-provoking and engaging. One of the main purposes of authentic assessment is to encourage students to become involved more actively in monitoring and reviewing their own performance (Calfee, 1991; Paris & Ayres, 1994; Wiggins, 1989). This includes self-assessment of the products as well as the processes of daily learning so that students learn to reflect on their work and evaluate their effort, feelings, and accomplishments, not just their grades. Because self-assessment includes both reflection and evaluation of one's work, it helps to develop feelings of ownership and responsibility for learning. These features of students' learning are crucial in assisting students to become independent learners who develop control over their own learning.

Portfolios provide many opportunities for self-assessment through activities such as reviewing work samples, projects, and artifacts; understanding progress through record keeping; documenting interests and habits; identifying choices and preferences; conducting conferences with teachers; evaluating the processes of collaborative writing; and sharing personal responses to school work (Paris & Ayres, 1994; Tierney, Carter, & Desai, 1991). Each activity requires students to take initiative for assessing their work. Some of these activities can be done independently, whereas others are conducted with peers or teachers. There is, however, a surprising paucity of empirical research on how such activities are related to self-assessment. Van Kraayenoord and Paris (1997) investigated whether self-assessment could be measured in a brief interview. Their Work Samples Interview focused on five basic aspects of students' self-assessment. Students were asked the following: (a) to explain what work was difficult to do and what work made them proud, (b) to identify samples of their work that exhibited their literacy abilities, (c) to show evidence of their academic progress in literacy and other subjects to determine the standards that students use for self-assessment, (d) to report their feelings about self-review and their future academic development, and (e) to explain how they shared their work with parents and how they viewed

feedback from teachers. These questions focus on the development of students' thinking about their learning (e.g., their knowledge, abilities, and strategies), their motivation (e.g., attributions for success, self-perceptions, and affect), their future expectations (e.g., goals, beliefs about their progress and potential improvement), and their perceptions of classroom instruction and assessment (e.g., meaningfulness, engagement, and collaboration).

The results indicated that students are able to assess their own work and provide both cognitive and affective evaluations according to particular features that influence learning (van Kraayenoord & Paris, 1997). The findings indicated that there was developmental improvement in self-assessment among 8- to 12-year-olds; older students were more able to assess their work and progress. The total scores on the Work Samples Interview were also correlated with scores on a task assessing strategic reading. Students who were able to discuss their work samples with awareness of the psychological characteristics that affect performance were more likely to be able to identify reading strategies that would enhance their comprehension and learning. Thus, the ability to assess one's work is linked to the ability to evaluate literacy strategies. This suggests that metacognitive abilities are necessary for both of these tasks. Furthermore, there were modest correlations between the Work Samples Interview and two other tasks that measured attitudes toward school and literacy habits outside school. This suggests that self-evaluation of schoolwork is linked to affective characteristics such as attitudes, interests, feelings of success at school, and enjoyment of reading and writing at home. These are positive motivational characteristics of achievement-striving students and suggest that students who are more effective at self-appraisal have more positive attitudes about school and enjoy reading and writing.

## TWO METAPHORS OF SRL

There are at least two contrasting metaphors of SRL that researchers and teachers can use. One is the metaphor of acquisition, of learning new strategies and skills and then applying them in school. This is the classic view of academic strategies as specialized tools that need to be taught, practiced, and applied in school. In this view, teachers know good strategies and students do not, therefore teachers must describe them and exhort students to use them. A problem with this transmission model is that "having" a strategy does not mean that students will value or use it. Students who comply with teachers and use instructed strategies are regulated by others, not self. The transmission model of SRL raises questions in educational psychology such as, "How do teachers motivate students to use effective learning strategies? Why don't students transfer good techniques to new areas of study? Why is some knowledge inert and not enacted?" Each of these questions presupposes that teachers must change the thinking and motivation of students to make them autonomous learners. This

approach is based on a model of teacher authority and directed instruction rather than a student-centered model of learning through experience and practice.

Transmission models may appear too behavioristic or simplified. There are more subtle variations of this learning model such as the "good strategy user" model (Borkowski et al., 1990) and the social learning model described by Zimmerman (2000). The latter, for example, outlines developmental levels of regulatory skill beginning with a student's observation and vicarious induction of a skill from a model and progressing through levels of emulation, self-control, and finally self-regulation. Social modeling experiences are the heart of this approach and translate into direct instructional models of SRL, or more accurately RL, because the self may not be involved in "compliant cognition." As Zimmerman (2000) noted, "Although social models are advantageous in conveying high quality methods of task skill, they may inhibit learners from assuming self-direction unless these models are phased out as soon as possible" (p. 33).

The second metaphor emphasizes "becoming" more regulated as students develop new competencies. In this view, self-regulation is a description of coherent behaviors exhibited by a person in a situation rather than a set of skills to be taught. The developmental metaphor recognizes the Piagetian tenet that behavior is organized and that self-regulation is an adaptive expression of that organization. Self-regulation in this view is not "acquired" as much as it is shaped and elaborated through participation in "zones of proximal development" according to tenets of sociocultural theories. As children develop, they are better able to coordinate actions with goals, better able to reflect on their own thinking, and better able to plan and monitor complex and abstract sequences (Deci & Ryan, 1985). These features of SRL are linked to maturation as well as the child's increasing agency in shaping psychological activities. What behaviors and thoughts become regulated to which goals, however, depend on specific experiences. These are the features of SRL linked to personal histories and situations (Ferrari & Mahalingam, 1998). In this view, SRL may be regarded not as the goal of students' learning but as the outcome of their pursuits to adapt to their unique environmental demands in a coherent manner.

We have speculated that students' coherent behavior is motivated by their desires to be recognized according to specific identities (Paris, Byrnes, & Paris, 2001). For example, some children want to please their teachers and behave as "good students" so they comply with rules and expend effort to follow teachers' directions. These students are likely to use the strategies that teachers model, discuss, and encourage because they strive for identities as successful students. Thus, the use of SRL is a consequence of the desire to be recognized as a particular identity, a "good student." This view contrasts with a view that purports that students choose goals of self-regulation, mastery, or effort. We believe that those goals are more likely to be superficial and deliberate than underlying identity strivings in which self-regulation is both a



means and an outcome to more fundamental goals but not a goal in itself. Desires to display competence, to gain acceptance, or to be perceived as a particular “possible self” (Markus & Nurius, 1986) are the primary motivational influences. Those strivings may be enacted in various ways.

Desire is not enough, however, because identity strivings must be accompanied by feelings that the identity is possible and valuable to achieve (Bandura, 1997; Higgins, 1991). Students may exhibit regulated actions as they try out various possible selves and the roles associated with them. What motivates action is the desire to be recognized as the smart student, the fast work-finisher, or the quiet-serious intellectual. These possible selves all lead to SRL typically associated with good strategy users and good students. However, students might also strive for identities rejected by teachers such as the practical joker, the bully, or the cheat. Students can be highly regulated in pursuit of these identities as well. Regardless of the particular role that the person is trying to enact, the self-regulated actions are intended to confirm this specific identity for the audience of others as well as for the individual.

Striving to enact an identity, fueled by desires to be recognized and validated as a specific kind of self, provide coherence to a person’s actions. The behaviors that appear planned, regulated, and monitored, are subservient to these underlying motives. Such a view incorporates both intrinsic and extrinsic motivation. Identity strivings can be strengthened by extrinsic rewards, such as getting a high grade on a test, as well as vicarious reinforcement, such as seeing a peer rewarded for the aspired achievements or behavior. However, striving for discrete subgoals and rewards may not be obvious to students who simply want to be viewed in a particular way by valued others. Intrinsic motivation, such as sustained interest and “flow” experiences, may contribute to long-term strivings because of the satisfaction of engaging in activities of the desired self. Participation in practices of the desired self demonstrates both competence and membership, strengthening both the I-self as agent and the Me-self as identity, which provides positive feedback to continue as well as motivation to display the practices. The outward appearance is actions that are highly self-directed and regulated.

Both metaphors of SRL may be useful because they focus on processes of learning, development, and instruction. The transmission view requires teachers to provide explicit information about effective SRL practices and to structure the environment to allow opportunities to practice and generalize the strategies. The developmental view requires teachers to analyze how students regulate their own behavior and to understand students’ aspired identities as precursors to shaping their SRL toward academic goals. The latter view suggests that SRL becomes more meaningful to students when academic goals and strategies are tied to their deeper strivings to display competence as achieving students. Regardless of the perspective one takes, students become more self-regulated with age, experience, opportunity, and desire. For those students who adopt academic goals, SRL involves positive aca-

demical strategies and results in success in school. Teachers need to provide direct explanations about SRL, multiple curriculum opportunities that foster SRL, and positive models of self-regulated learners so that students can aspire to learn and use effective strategies for their own education.

## PRINCIPLES OF SRL TO APPLY IN CLASSROOMS

Paris and Winograd (1999) described 12 principles that teachers can use to design activities in classrooms that promote students’ SRL. They provide a useful summary of the research we discussed and may make the applications of SRL to classrooms more direct, therefore a list follows. We organized them according to four major features of research on SRL with corollaries following each one:

1. Self-appraisal leads to a deeper understanding of learning.
  - a. Analyzing personal styles and strategies of learning, and comparing them with the strategies of others, increases personal awareness of different ways of learning.
  - b. Evaluating what you know and what you do not know, as well as discerning your personal depth of understanding about key points, promotes efficient effort allocation.
  - c. Periodic self-assessment of learning processes and outcomes is a useful habit to develop because it promotes monitoring of progress, stimulates repair strategies, and promotes feelings of self-efficacy.
2. Self-management of thinking, effort, and affect promotes flexible approaches to problem solving that are adaptive, persistent, self-controlled, strategic, and goal-oriented.
  - a. Setting appropriate goals that are attainable yet challenging are most effective when chosen by the individual and when they embody a mastery orientation rather than a performance goal.
  - b. Managing time and resources through effective planning and monitoring is essential to setting priorities, overcoming frustration, and persisting to task completion.
  - c. Reviewing one’s own learning, revising the approach, or even starting anew, may indicate self-monitoring and a personal commitment to high standards of performance.
3. Self-regulation can be taught in diverse ways.
  - a. Self-regulation can be taught with explicit instruction, directed reflection, metacognitive discussions, and participation in practices with experts.
  - b. Self-regulation can be promoted indirectly by modeling and by activities that entail reflective analyses of learning.

- c. Self-regulation can be promoted by assessing, charting, and discussing evidence of personal growth.
4. Self-regulation is woven into the narrative experiences and the identity strivings of each individual.
  - a. How individuals choose to appraise and monitor their own behavior is usually consistent with their preferred or desired identity.
  - b. Gaining an autobiographical perspective on education and learning provides a narrative framework that deepens personal awareness of self-regulation.
  - c. Participation in a reflective community enhances the frequency and depth of examination of one's self-regulation habits.

### ENDURING ISSUES ABOUT SRL AND FUTURE DIRECTIONS FOR RESEARCH

We think SRL is a synthesis of many constructs in learning and motivation and has direct relevance for teachers. We highlighted literacy instruction, cognitive engagement, and self-assessment as three areas in which SRL research has direct applications in classrooms. However, teachers can extend the same principles of SRL to educational technology, to study skills, to scientific reasoning, and many other academic arenas. Our enthusiasm for SRL is based on the functional and pragmatic aspects of this line of inquiry for students of all ages. It is tempered by concerns for abiding issues that invite future research. We identify three broad issues with the following questions.

#### What Does it Mean for Students to be Self-Regulated?

Most important, self-regulated students display motivated actions, that is, goal-directed and controlled behaviors that they apply to specific situations. SRL is the fusion of skill and will (McCombs & Marzano, 1990; Paris & Cross, 1983). It is informed by metacognition from self and others and is fueled by affect and desire. However, we need more research on the "hot cognitions and motivation" that energize students. Are they motivated to display their competence, to impress others, to acquire good grades, to win respect of teachers and parents, or to avoid shame and embarrassment? Of course, all these factors might motivate students, but we need to examine how individuals become motivated to be self-regulated. Research should focus on the developmental characteristics of SRL as well as the individual differences.

How students exhibit SRL is as much of an issue as why they display it. Historically, SRL has been regarded as a set of positive learning strategies that good students apply judiciously. However, such a characterization emphasizes the ac-

quisition of instrumental tactics and the approach of positive goals such as studying text, revising one's writing, or monitoring one's problem solving. Some students can be instrumental in using tactics that lead to less noble outcomes. For example, if a student has failed high-stakes multiple-choice tests for several years, he or she might feel pessimistic, helpless, or angry when given another such test. To avoid another threat to self-esteem or potential confirmation of low ability, the student might pretend to become ill, give a half-hearted effort, or cheat. These actions might be deliberate and goal-oriented, although not in a positive manner, and thus would also be SRL. SRL can involve avoidance of behaviors as well as approach. For example, a student might be highly regulated to avoid distractions while studying or avoid peers who pull them off task. A less aspiring student could be self-regulated in avoiding hard work or studying altogether and spend his time fabricating an excuse. Self-handicapping techniques are clearly the outcome of motivated actions designed to minimize threats to self-esteem (Covington, 1992). Thus, self-regulated actions may be directed to the attainment or avoidance of goals that are held in either high or low regard by teachers.

#### How Do Students Become Self-Regulated?

We believe that every student constructs his or her own theory of SRL. This theory can be naïve and ill-informed or elaborate and appropriate. Indeed, children's theories of SRL, that is, what they must do to achieve specific goals in specific contexts, probably change like their theories of mind, school, and self (Harter, 1999; Paris & Cunningham, 1996). We think that children's understanding of SRL is enhanced in three ways: indirectly through experience, directly through instruction, and elicited through practice. First, SRL can be induced from authentic or repeated experiences in school. For example, students may realize that checking their work does not require much additional time and leads to greater accuracy. For many students, SRL may emerge as tacit knowledge about what is expected by the teacher and what is useful behavior for the student. Second, teachers may provide explicit instruction about SRL. SRL is directly taught, for example, when a teacher describes the need to analyze each term in a story problem in math, place them in the proper location, perform the arithmetic calculation on them, and check the answer (Greeno & Goldman, 1998; Schoenfeld, 1992). SRL instruction could emphasize detailed strategy instruction or it might involve increasing students' awareness about appropriate motivational goals and standards. Explicit instruction designed to avoid distractions and persevere in the face of difficulty is an example of volitional control that promotes SRL (Corno, 1993).

Third, we believe that SRL can be acquired through engagement in practices that require self-regulation, that is, in

situations in which self-regulation is welded to the nature of the task. For example, collaborative learning projects often require each student to contribute one part of the overall project. If a student's contribution is inadequate, the need for further work and the direction of the improvement may become apparent in the process of working on the project. It could also be pointed out explicitly by peers but the self-regulation aspect may be required as part of the activity. This is the intent of creating "communities of learners" that is consistent with learning through participation and practice (Brown & Campione, 1990; Lave, 1991; Rogoff et al., 1995). Rarely would we expect SRL to be acquired neatly in only one of these three manners: indirect induction, direct instruction, and elicited actions. All three probably operate together in classrooms as children create their theories about learning in school and their own abilities as they work with teachers, parents, and peers.

### Are There Individual Differences in SRL?

More attention needs to be given to the differences among children in SRL. Research shows that children in primary grades exhibit less SRL than children in later grades, however, this is a consequence of many factors, including age, cognitive development, explicit instruction, and changing demands in the classroom. It is possible that personality differences in impulsivity, activity levels, patience, resistance to distractions, and internal locus of control might contribute to differences in SRL. Students who have difficulty using strategies and maintaining task focus and engagement may need more explicit instruction and support to promote SRL (Englert, Raphael, Anderson, Anthony, & Stevens, 1991; Graham, 1997). It is not clear why some students are more comfortable than others when it comes to monitoring their behavior, double-checking their answers, talking about their own thinking, or writing reflective journals. Some students simply may have greater capacities than others for monitoring and regulating their behaviors.

There are also intraindividual factors that need additional research. For example, capacity for SRL may vary between students but it almost certainly varies within students during the school day and year. Some students may be more vigilant in the morning than afternoon; some may be more careful in reading than math; and some may be more careful when they are interested in the subject matter. SRL requires effort to be vigilant and strategic and it is reasonable to assume that students cannot be vigilant and focused without periodic rests. Cognitive fatigue must contribute to the lack of SRL just as alertness probably fosters better attention. Teachers understand this and research may help identify how periods of vigilance can be spaced among tasks and time to promote SRL.

Perhaps the greatest source of individual difference lies in the failures to self-regulate thinking and behavior. Lack of knowledge and experience are the usual explanations for students' poor self-regulation. However, when children do not

induce effective monitoring and regulation from academic tasks and direct instruction, teachers might infer that the students have a learning or attention disorder. Indeed, there may be neurological and personality factors that underlie failures in self-control (Baumeister, Heatherton, & Tice, 1994). Mood, affect, impulsivity, impatience, and aggression may also prevent some students from appraising and managing their own behavior. Such factors may be considerably more resistant to change than lack of appropriate goal orientations or knowledge about useful strategies.

## CONCLUSION

We showed how research in educational psychology has studied and promoted SRL in classrooms. Direct explanations about cognitive strategies, metacognitive discussions, and peer tutoring can all help increase students' use of effective learning strategies. SRL is also more likely when teachers create classroom environments in which students have opportunities to seek challenges, to reflect on their progress, and to take responsibility and pride in their accomplishments. SRL then is a combination of knowledge about appropriate actions coupled with motivation to pursue goals supported in environments that allow students to be autonomous. Clearly, SRL is more than a developmental milestone tied to grade levels or an educational achievement tied to specific learning. Both experience and context contribute to SRL.

Teachers can use knowledge about SRL directly in several ways. First, students of all ages can benefit from analyses and discussions of strategies for learning. Young children might discuss how to use pictures as clues to text meaning, whereas college students might discuss alternative ways to take notes, but they are both metacognitive discussions about regulating learning. Teachers need to be able to describe appropriate strategies—what they are, how they operate, and when they should be applied—and be able to lead discussions so that students can explore their understanding about how they learn. Second, teachers can design open-ended instructional activities and scaffold assistance for student inquiry. Less emphasis should be placed on workbook exercises and routine tasks and more emphases should be placed on working together to guide students to more effective approaches to learning. Third, teachers can minimize objective tests (e.g., multiple-choice tests, true-false tests), competitive test scores, and public comparisons of performance which detract from students' sense of efficacy and mastery. Projects, portfolios, and performance assessments can motivate students, provide opportunities for SRL, and enhance creative expression. Linking self-assessment with external standards may help students regulate their actions to desired outcomes. These practical suggestions for helping children take charge of their own learning are direct manifestations of research on SRL. The synergy between practices in classrooms and research on SRL should be useful for many years.

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