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Self-Regulated Learning: The Educational Legacy of Paul R. Pintrich

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Paul R. Pintrich was a leading figure in the field of self-regulated learning. This article discusses some of Paul's major contributions: (a) formulating a conceptual framework for studying self-regulated learning comprising phases (forethought, planning, activation; monitoring; control; reaction, reflection) and areas for self-regulation (cognition, motivation, behavior, context); (b) emphasizing the role of motivation in self-regulation; (c) conducting research linking learning, motivation, and self-regulation; (d) exploring the development of and interventions to enhance self-regulatory processes; (e) investigating how the complexities of classrooms and schools affect self-regulation; and (f) helping to develop the MSLQ to assess self-regulated learning, cognition, and motivation. Paul's writings provide ideas for future research on self-regulated learning. Paul Pintrich left a rich legacy through his theoretical elaboration, exemplary research, dissemination and advocacy, and personal and professional friendships.

Self-regulated learning, or *self-regulation*, is "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (Pintrich, 2000b, p. 453). Research on academic self-regulated learning began as an outgrowth of psychological investigations into self-control among adults and its development in children (Zimmerman, 2001). Much early self-regulation research was therapeutic in nature; researchers taught participants to alter dysfunctional behaviors such as aggression, addictions, and behavioral problems. Researchers now apply self-regulatory principles to academic studying and other forms of learning, such as social and motor skills (Boekaerts, Pintrich, & Zeidner, 2000; Zimmerman & Schunk, 2001).

Part of the impetus for studying academic self-regulated learning came from research showing that learners' skills and abilities did not fully explain student achievement (Zimmerman, 2001), which suggested that factors such as self-regulation and motivation were important. Applying self-regulation to education also broadened its scope beyond the historical emphasis of performance of previously learned actions to actual learning. Self-regulated learning is seen as a mechanism to help explain achievement differences among students and as a means to improve achievement.

For many years Paul R. Pintrich was a leading theorist, researcher, and advocate of self-regulated learning in education. His sudden passing on July 12, 2003, left a deep void in educational psychology and was a severe personal blow for his colleagues and friends. This article discusses some of his major contributions to the field of self-regulated learning: a conceptual framework for studying self-regulation; emphasis on motivational processes; research on learning, motivation, and self-regulation; the development of and interventions to enhance self-regulated learning; the complexity of self-regulation in educational contexts; and the Motivated Strategies for Learning Questionnaire (MSLQ). Within these areas research by Pintrich and colleagues (and by others where appropriate) is described. Pintrich's suggestions for future research on self-regulation are provided, and the article concludes with a summary of his legacy to self-regulated learning and education.

MAJOR CONTRIBUTIONS TO SELF-REGULATED LEARNING

Conceptual Framework

Without question one of the major contributions Paul Pintrich made to the field of self-regulated learning was the conceptual framework he formulated. In developing this

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model he drew from his work and that of other theorists. The model may be thought of as a social-cognitive framework, although it incorporates elements from other theories (e.g., cognitive information processing; see Zimmerman & Schunk, 2001, for a discussion of different theories of self-regulation.) The following is an abbreviated description; more-complete coverage may be found in Pintrich (2000b).

Pintrich believed that self-regulatory activities mediated the relations between learners and their environments and influenced learners' achievements (Pintrich, 2000b; Pintrich & Zusho, 2002). His model comprises four phases of self-regulation and, for each phase, four possible areas for self-regulation (Table 1). This model specifies the possible range of activities; it does not necessitate them. The full range of areas may not be amenable to self-regulation, and within any area some activities may require little if any self-regulation. The model does not presume that the phases are linearly ordered; they may occur at any time during task engagement. There are learning situations in which learners may engage in some but not all of the phases. Phases also are interactive in that individuals may simultaneously engage in more than one.

Forethought, planning, and activation. Cognitions that can be self-regulated during this phase include goals, prior content knowledge, and metacognitive knowledge. Goals involve setting and modifying task-specific goals that serve as criteria against which to gauge progress. Activation of relevant content knowledge may occur without conscious awareness, but self-regulated learners often activate knowledge in a planful way through prompting and self-questioning (e.g., "What do I know about this?"). Activation of metacognitive knowledge, which also can occur automatically or through deliberate conscious control, includes declarative knowledge (e.g., of learning strategies such as rehearsal and note taking), procedural knowledge (how to implement these strategies), and conditional knowledge (when and why to use different strategies).

Motivational processes subject to self-regulation during this phase include goal orientations, self-efficacy, perceptions of difficulty and ease of learning, task value, and interest. *Goal orientations*—a central construct in the model—are the reasons learners engage in tasks; for example, why they want to earn a high grade in a course or perform their best during a concert. *Self-efficacy* refers to individuals' beliefs about their capabilities to learn or perform actions at designated levels (Bandura, 1986, 1997). Learners' *ease of learning/task difficulty* judgments concern how easy or hard they believe the material will be to learn. *Task value* beliefs include perceptions of the relevance, importance, and usefulness of the learning. *Interest* denotes the degree of liking students have for the content area or topic being learned.

TABLE 1
Conceptual Framework for Studying Self-Regulation

Phases of Self-Regulation	*Areas for Self-Regulation*
Forethought, planning, activation	Cognition
Monitoring	Motivation
Control	Behavior
Reaction, reflection	Context

Behaviors that can be self-regulated are time and effort planning and planning for self-observation of behavior. Time and effort planning (time management) involves creating study schedules and allotting time for different activities. Planning for self-observation involves determining what methods one will use to assess progress and regulate behaviors; for example, counting pages of written text produced and keeping records.

Contextual regulation factors include students' perceptions of the task and context. Pintrich (2000b) noted that, although these perceptions are cognitions, their focus is on the context and not on the individual's self-perceptions. These might include perceptions about classroom features that may help or hinder learning, types of tasks to be completed, grading practices, and classroom climate factors (e.g., helpfulness of the teacher).

Monitoring. The second phase is *monitoring*, or attention and awareness of one's actions and their outcomes. Pintrich (2000b) viewed cognitive monitoring as including dynamic metacognitive judgments of learning and metacognitive awareness (feeling of knowing). Judgments of learning involve beliefs about what one knows and what one does not understand. Feeling of knowing occurs when students believe they have some understanding of material, perhaps because they previously studied it. They may not be able to recall the information (e.g., the "tip-of-the-tongue" phenomenon) but it seems familiar.

Motivational monitoring refers to being aware of one's self-efficacy, values, attributions (perceived causes of outcomes), interests, and anxieties. Monitoring of behaviors includes time and effort management and adjusting based on assessments of their effects (e.g., redoubling effort when material is judged as difficult). Contextual monitoring refers to monitoring task conditions to determine whether they are changing.

Control. During this phase learners attempt to control their cognitions, motivation, behaviors, and contextual factors based on their monitoring with the goal to enhance learning. Cognitive control and regulation include cognitive and metacognitive activities that learners use to adapt and change their cognitions (Pintrich, 2000b). Through cognitive monitoring learners assess their goal progress. They continue to use strategies that are deemed effective or alter or replace them if they believe better strategies are needed. Various cognitive and learning strategies (e.g., outlining, summarizing, note taking) may be involved (Weinstein & Mayer, 1986; Zimmerman, 2000).

Motivational control and regulation processes include self-efficacy through positive self-talk (e.g., "I can do this"). Learners also may make positive outcomes contingent on academic performance (e.g., rewarding oneself with a movie after studying), and they may attempt to control their anxiety, such as by not ruminating on test questions that they cannot answer.

Behavioral control includes persisting, expending effort, and seeking help when needed. Good self-regulators do not seek help indiscriminately but rather selectively to understand a particular point and from a source they believe will be helpful. Contextual control includes strategies to make the context more conducive to learning. These may include efforts to eliminate or reduce distractions as well as attempts to renegotiate task requirements. For example, students may ask a teacher whether they can work fewer problems or read fewer pages when assignments seem lengthy. Students exert contextual control by choosing peers to work with and settings in which to work and by departing a situation if it appears antithetical to learning.

Reaction and reflection. Learners' reactions and reflections include judgments, attributions, and self-evaluations of performance (Pintrich, 2000b). Learners' assess their performances, and these assessments form the basis for other efforts to regulate motivation, behavior, and context. Motivational reactions include efforts to enhance motivation when learners judge that their motivation has slackened. These may include attributing low performance to insufficient effort rather than low ability. Motivational reactions also can involve emotions, as when learners feel pride after succeeding or anger when they fail. Consequences of emotions have been studied extensively by attribution researchers (Weiner, 1986).

Behavioral reaction and reflection include cognitions about one's behaviors, such as whether one has used time effectively or exerted sufficient effort. Contextual reaction and reflection refer to evaluations of task demands and contextual factors. Good self-regulation requires that learners evaluate whether they will able to accomplish the task, whether the environment is conducive to learning, and what changes are needed for better learning.

This model shares some assumptions that are common to other models of self-regulation (Pintrich, 2000b; Zimmerman & Schunk, 2001). First, learners are active and constructive participants in learning rather than passive recipients. A second assumption is that learners have some choices or the potential for control over key activities. Third, many models of self-regulation assume that learners have a goal or criterion level of performance against which they can assess progress. Finally, most models assume that self-regulatory processes mediate the relation between personal factors and performance outcomes.

Pintrich (2000b) stated that this framework was intended to serve as a heuristic to help researchers think about self-regulation and investigate the operation of component processes. Pintrich and his colleagues have conducted much research on self-regulated learning—primarily on cognitive and motivational processes—and some of this research is summarized in sections that follow. The framework is ideal for investigating self-regulated learning in educational settings because it includes factors associated with schooling and addresses the complexities of self-regulation outside of laboratory settings. It has served to stimulate much educational research on self-regulated learning.

Motivational Processes

A second major way that Paul Pintrich contributed to self-regulated learning is through his emphasis on the importance of motivational processes to self-regulation. He made motivation a key factor that, notwithstanding its position as a separate area of self-regulation, is infused throughout all phases. Motivational variables interact with cognitive, behavioral, and contextual factors to affect self-regulation (and conceptual change; Pintrich, Marx, and Boyle, 1993). This decidedly motivational flavor stands in contrast to many other self-regulation models, which tend to stress cognitive or behavioral factors (Zimmerman & Schunk, 2001).

Research on motivation and on the interaction of cognitive and motivational processes formed the focus of self-regulated learning research by Pintrich and his colleagues. In general, the motivational variables highlighted by Pintrich have been shown to be critical for self-regulation. Studies comparing good with poor self-regulators have found that they differ in several motivational processes (Pintrich, 2000b; Pintrich & Zusho, 2002). Self-regulated learners set hierarchical goals, and may simultaneously hold process (e.g., understanding content and strategies for solving problems) and product goals (e.g., scoring well on tests and making good grades; Zimmerman, 2000).

Self-regulated learners are more self-efficacious for learning than are students with poorer self-regulatory skills; the former believe that they can use their self-regulatory skills to help them learn (Zimmerman, 2000). Self-regulated learners engage in self-evaluation when they compare progress against goals. These self-evaluative judgments substantiate their self-efficacy for learning and motivate them to persist. Better self-regulators also form positive attributions during periods of self-reflection by attributing success to ability and effort and difficulty to use of ineffective strategies (Pintrich, 2000b; Schunk, 2001).

Research also shows that interest and value relate to self-regulation. Students with greater personal interest in a topic and those who view the activity as important or useful are more likely to use adaptive self-regulatory strategies (Pintrich & Zusho, 2002). Research is needed to explore the process whereby these effects occur. We might expect that because interest and value relate positively to perceptions of competence that these students are more likely to set goals and assess their learning progress, which builds self-efficacy and furthers learning.

Students' goal orientations play a key role in Pintrich's model of self-regulation (Pintrich, 2000a). In the literature on goal orientations, a general distinction is drawn between mastery and performance goals. Mastery goals reflect a focus on the acquisition of knowledge, skill, and competence relative to one's prior performance; performance goals involve a striving to demonstrate competence by outperforming peers (Elliot & Harackiewicz, 1996; Pintrich, 2000a).

Pintrich (2000a, 2000b, 2003; Linnenbrink & Pintrich, 2002) adopted a multiple goals perspective on motivation by crossing this mastery-performance dimension with an approach-avoid dimension according to whether students were attempting to approach or avoid the goals. Mastery-approach goals concern working on tasks to develop skills. Mastery-avoid goals might involve avoiding the possibility of not meeting high standards. Performance-approach goals include a focus on outperforming others. Performance-avoid goals entail a concern with avoiding the demonstration of low ability. This journal issue provides further discussion of Pintrich's contributions to the work on goal orientations.

Research has identified self-regulatory benefits of mastery-approach goals. Students with a mastery orientation demonstrate better cognitive monitoring and use of learning strategies (Pintrich, 2000b). Mastery-approach goals also relate to students' use of better (deeper) cognitive processing strategies while engaged in academic learning. Mastery goals also relate positively to many motivational indexes such as self-efficacy and positive attributions.

Pintrich (2000b) summarized research on the relation of goal orientations to self-regulatory processes. For example, students who adopt mastery goals are more likely to report monitoring and attempting to control their cognition with various learning and cognitive strategies, and to seek ways to increase their awareness of their understanding and learning. Mastery-approach goals also are negatively associated with the use of less effective or surface processing strategies, whereas performance goals relate negatively to use of deep processing strategies. Mastery-approach goals are positively related to self-efficacy, task value, interest, positive attributions, and affect. Research also shows that mastery-approach goals relate positively to students' attempts to manage their time and effort and to their adaptive help seeking. To date there has been little research conducted on mastery-avoid goals, and this clearly is an area in need of exploration.

More research also is needed on performance goals, and a debate continues in the field about the relative merits of performance approach goals (Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002; Midgley, Kaplan, & Middleton, 2001; Pintrich, 2003). Existing research presents conflicting results with respect to performance goals' relations to self-regulation and different motivational variables. Wolters, Yu, and Pintrich (1996) found that among junior high students an approach performance goal of outperforming others related positively to self-efficacy and use of cognitive and self-regulatory strategies. Wolters and Rosenthal (2000) also found that performance goals related to adaptive motivational regulation strategies. Kaplan and Midgley (1997), however, found no correlation between approach performance goals and adaptive learning strategies among junior high students, but did find a positive relation between approach performance goals and surface processing strategies. Wolters (2004) showed that performance-approach goals did not relate to use of cognitive or metacognitive strategies. Researchers undoubtedly will continue to explore the conditions under which performance approach goals may have beneficial effects on motivation and self-regulation.

One of Pintrich's recent interests was the relation of affect to self-regulation. Linnenbrink and Pintrich (2002, 2004) presented a model in which students' moods about school and learning influence their classroom goals. Students who feel positively are apt to adopt approach goals, whereas those who feel negatively may be more inclined toward avoidance goals; however, the approach–avoidance goals may be either mastery or performance. Thus, students who believe that they have the resources to attain outcomes may be more likely to adopt goals of learning or of demonstrating competence relative to others, and similarly for avoidance goals.

Linnenbrink and Pintrich (2002, 2004) also postulated that achievement goals influenced students' specific emotions, which are typically short in duration and over time fade into more general mood states. Approach goals may be associated with elation (as one approaches a goal) or sadness (when one is not approaching a goal). Avoidance goals may be associated with relief (when the goal is avoided) or anxiety (when the goal is not avoided). Approach mastery goals should lead to an increase in positive emotions and a decrease in negative emotions, whereas performance approach goals may be unrelated to positive emotions and increase negative emotions.

Initial research on this topic has yielded complex results (Linnenbrink & Pintrich, 2004). Research relating positive and negative affect to mathematics learning shows positive effects for effort and cognitive self-regulation but not for learning. Similarly, in science positive affect has been shown to be unrelated to conceptual change but moderately associated with adaptive strategy use and cognitive processing. From this initial research we might conclude that positive affect increases effort and strategy use, but the relation is undoubtedly complex and further research is needed.

Research on Learning, Motivation, and Self-Regulation

The Pintrich model and research conducted by him and his colleagues support the hypothesized links between learning, motivation, and self-regulation (Pintrich & Schrauben, 1992). The general conclusion is that students who display more adaptive self-regulatory strategies demonstrate better learning and higher motivation for learning (Pintrich, 2000b).

For example, Pintrich and De Groot (1990) examined relations among self-regulation (use of metacognitive and effort management strategies), cognitive strategy use (rehearsal, elaboration, and organizational strategies), and motivation for learning and performing well in class among seventh graders in science and English. Using the MSLQ, they found that self-efficacy, intrinsic value (interest in and perceived importance of the learning), cognitive strategy use (e.g., rehearsal, organization, elaboration), and self-regulation (effort management, metacognition) were positively correlated and predicted achievement. Test anxiety related negatively to self-efficacy. Regression analyses revealed that self-efficacy, self-regulation, and test anxiety predicted performance, whereas intrinsic value did not directly affect performance.

Pintrich, Anderman, and Klobucar (1994) worked with fifth-grade students, some of whom had been identified by the school system as having learning disabilities. Children with learning disabilities showed lower metacognitive knowledge and reading comprehension, but did not differ from students without learning disabilities on measures of self-efficacy, anxiety, or intrinsic orientation (reflecting a focus on learning and mastery and interest in reading). Relative to students without disabilities, students with disabilities were more likely to attribute success and failure to external causes (luck, task difficulty, teacher assistance). Differences in motivational and cognitive variables cut across learning disability categories; about equal numbers of students with and without learning disabilities showed low intrinsic motivation but average metacognition, attributional style, and comprehension.

Additional evidence comes from research by Pintrich, Roeser, and De Groot (1994). The authors administered the MSLQ to seventh graders to assess motivational beliefs (intrinsic value, self-efficacy, text anxiety) and self-regulated learning (cognitive strategy use, self-regulation). Positive motivational beliefs related to higher levels of self-regulated learning. The authors also assessed students' perceptions of classroom experiences (i.e., productive classroom work, teacher effectiveness, cooperative work). Intrinsic value later in the school year was related to classroom experience more strongly than intrinsic value early in the year. Self-efficacy, cognitive strategy use, and self-regulation related positively to classroom experience. The results support the idea that motivation and self-regulated learning bear a complex reciprocal relation to each other.

The relation between motivation and self-regulated learning is seen clearly in research by Wolters et al. (1996) with junior high students. Regression analyses across three subject areas (English, social studies, mathematics) yielded a positive pattern of motivational beliefs for a mastery-approach goal and a performance-approach (relative ability) goal orientation to include adaptive levels of self-efficacy, task value, and test anxiety, along with higher levels of cognitive strategy use, self-regulation, and academic performance. In contrast, an extrinsic goal orientation reflecting a desire to obtain good grades was linked with maladaptive motivational and cognitive outcomes.

Taken together, much research by Pintrich and his colleagues reviewed here and research by others supports the predictions of the conceptual framework by showing linkages between motivation, self-regulation, and academic learning (Chapman & Tunmer, 1995; Pokay & Blumenfeld, 1990; Schunk, 1996; Schunk & Swartz, 1993; Zimmerman & Martinez-Pons, 1990). This linkage is significant not only for theoretical reasons but also for classroom practices, because it suggests that motivational and cognitive factors interact in complex ways to lead to learning.

Complexities of Educational Contexts

A fourth major contribution of Paul Pintrich to self-regulated learning was his emphasis on testing predictions of theories and exploring relations among variables in actual classroom contexts. This emphasis derives from his belief that school contexts contained many complexities, the effects of which had to be determined to know how self-regulation occurred. Schools with children are complex places and much different from controlled laboratory settings with adults. These differences affect self-regulatory processes.

This emphasis on complexity is seen in many of the studies by Pintrich and his colleagues summarized earlier in this article (e.g., Pintrich & De Groot, 1990; Pintrich, Roeser, & De Groot, 1994). Myriad social, instructional, and contextual factors can affect how self-regulatory strategies operate. As Pintrich and Zusho (2002) note, "Self-regulation is not just afforded or constrained by personal cognition and motivation, but also privileged, encouraged, or discouraged by the contextual factors" (p. 279).

A clear example of this complexity is seen in research on help seeking, which is an important self-regulation strategy (Newman & Schwager, 1992). All students require assistance at times, to understand material and when confused about what to do. Seeking help from others (e.g., teachers, peers, parents) seems like a natural response; yet wide individual differences occur in students' frequency, amount, and type of help seeking. These differences suggest a complex interplay between social and motivational factors.

Ryan, Pintrich, and Midgley (2001) discussed possible reasons why students might avoid seeking help. Some students may be reluctant because they believe peers will interpret it to mean that they lack competence. Students who feel less socially competent may be more apt to avoid seeking help, fearing negative consequences. Ryan and Pintrich (1997) found that adolescents who felt more socially competent were more likely to seek help and that this relation operated independently of the relation between perceived cognitive competence and help seeking.

Another possible cause involves goal orientations (Ryan et al., 2001). Students who hold a mastery goal orientation should be more likely to seek help than those with a perfor-

mance goal orientation, because the latter are more concerned about how others evaluate them. This relation is complex, however, and may depend on academic competence. Thus, performance goal students whose grades are declining and who are not achieving their goal may be especially vulnerable to negative social perceptions and more likely to avoid seeking help. Lower achieving students may generally feel less inclined to seek help when needed.

Ryan, Gheen, and Midgley (1998) found that classrooms differed in how much help students sought, which suggests differences in classroom goal structures. Students' perception of a classroom mastery goal structure was associated with more help seeking; the perception of a performance goal structure was associated with more help avoidance.

Pintrich's (2000a) multiple goals perspective on motivation has been substantiated by research showing that academic and social goals interact in classrooms to produce achievement patterns not easily predicted by academic variables alone. Further, many personal, social, and contextual variables influence motivation and self-regulated learning, as discussed earlier (Pintrich, 2003). Exploring how these interact with social and instructional factors to affect self-regulated learning remains a challenge for educational researchers.

Development of and Interventions to Enhance Self-Regulation

Paul Pintrich wrote about the development of students' self-regulatory capabilities and interventions to enhance self-regulation. With respect to developmental processes, much research shows that students become more strategic with development and cognitively capable of using both basic and more complex cognitive and metacognitive strategies (Pintrich & Zusho, 2002). Another point is that, regardless of age, novice users of a strategy typically show less benefit from using the strategy than more experienced or knowledgeable users. Thus, in the course of development we see both production and utilization deficiencies described by developmental psychologists (Flavell, Beach, & Chinsky, 1966; Justice, Baker-Ward, Gupta, & Jannings, 1997).

Cognitive factors play a role in the development of self-regulatory competence in two ways (Pintrich & Zusho, 2002). For one, with development students are better able to set goals, assess progress toward their goals, and change strategies as needed. For another, development helps to improve the speed and efficiency of self-regulatory processes (e.g., storage and retrieval of information from memory).

Self-regulation also is affected by developmental influences on epistemological and motivational factors. Epistemological factors involve the theories that students hold about the nature of knowledge and knowing, such as the certainty and simplicity of knowledge, the role of authority in creating knowledge, and justifications for knowing (Pintrich & Zusho, 2002). Students' epistemological theories become more sophisticated with development, with a trend away from more objectivity (e.g., one right answer) and toward more relativity (e.g., possibility of more than one right answer). A similar developmental trend exists with respect to motivational factors. Relative to younger children, older students are more likely to assess self-efficacy more accurately, determine the value of learning, and set goals and evaluate goal progress. These developmental advances heighten the complexity of self-regulation among older students.

Several researchers have used the variables identified by Pintrich (2000b) and others to help advance students' self-regulation skills through interventions. Research supports the idea that students' self-regulatory processes can be enhanced and that better self-regulation results in higher academic performance. Beneficial effects on self-regulation have been obtained from interventions designed to improve students' goal orientations, learning strategies, self-monitoring and self-evaluations (Boekaerts et al., 2000; Schunk & Zimmerman, 1998).

For example, research shows that changing students' goal orientations can lead to better self-regulation and achievement. During science lessons, Meece, Blumenfeld, and Hoyle (1988) found that students who emphasized task-mastery goals reported more active cognitive engagement (e.g., reviewing material not understood). Elliott and Dweck (1988) gave children feedback indicating they had high or low ability, along with instructions highlighting a learning goal of developing competence or a performance goal of appearing competent. Learning-goal children sought to increase competence by choosing challenging tasks and using problem-solving strategies. Performance-goal children who received high-ability feedback persisted at the task but also avoided challenging tasks that might have entailed public errors. Performance goal children given low-ability feedback selected easier tasks, did not persist to overcome mistakes, and displayed negative affect.

Pintrich and his colleagues developed the *Learning to Learn* intervention for college students (Hofer, Yu, & Pintrich, 1998; VanderStoep & Pintrich, 2003). *Learning to Learn* is an undergraduate course designed to teach students basic concepts of cognition and motivation, develop a repertoire of learning strategies, and have them apply these to improve their self-regulated learning. Students attend lectures and participate in laboratories. Topics include principles of information processing, note taking, test preparation and taking, goal setting, and time management. Assessment of the course's effectiveness continues, but evidence suggests that the course increases students' mastery goals, self-efficacy, and interest and value for the course and decreases test anxiety. There also are reported gains in self-regulatory strategy use. Students' motivational beliefs (mastery goals, self-efficacy, interest, value) relate positively to their use of learning strategies (Hofer et al., 1998).

The Motivated Strategies for Learning Questionnaire (MSLQ)

Last, I mention the MSLQ, a measure developed by Pintrich and his colleagues (McKeachie, Pintrich, & Lin, 1985; Pintrich, 1989; Pintrich et al., 1987; see also Duncan & McKeachie, 2005, for a more in-depth discussion). The MSLQ is a self-report instrument used by students to rate themselves on various cognitive and motivational items.

Although different versions of the MSLQ have been used over the years, the instrument always has included motivational and self-regulated learning items. Motivational items assess intrinsic orientation (e.g., interest and challenge of course work), task value (importance and value of material to be learned), control beliefs (how much effort helps), and expectancy for success (self-efficacy). Cognitive strategies include the extent that the student uses rehearsal, elaboration, and organization strategies. Metacognitive activities assessed include planning, monitoring, and self-regulation. Resource management strategies included are time management, study environment, effort management, and help seeking. For each category students rate themselves on multiple items according to how well the item describes them. Total score and subscale scores (e.g., motivation, cognitive strategies) can be used in analyses and related to other variables.

The MSLQ reflects the central thrust of Pintrich's work on self-regulation—the interaction of cognitive, motivational, and behavioral–contextual elements. The scales have good internal reliability and demonstrate moderate correlations with academic performance (Pintrich, 1989). Pintrich and his colleagues have used it in much research, and it has been widely employed by other researchers. The instrument has stimulated much research on self-regulated learning, because it provides researchers with a valid and reliable measure, is easy to administer, and can be used with students of different ages. It is likely to continue as a commonly used instrument as investigators explore new research directions.

PINTRICH'S SUGGESTIONS FOR FUTURE RESEARCH ON SELF-REGULATION

Paul Pintrich was an outstanding theorist and researcher, and in his publications and presentations he discussed issues in self-regulated learning that needed to be addressed and provided suggestions for future research. It would be impossible here to summarize all of his recommendations. He also wrote extensively about future directions for motivation research (Pintrich, 2003) and educational psychology (Pintrich, 1994).

Some general areas he suggested that self-regulated learning researchers address were the definition and measurement of goals and self-regulatory processes, examination of personal characteristics and potential moderator relations, and the roles of control, regulation, intentionality, and automaticity (Pintrich, 2000b). He also emphasized the following areas.

Diversity

There is a clear need for more cross-cultural research and research with ethnically diverse populations. As with much achievement research, most self-regulation research has been conducted in North American settings. Pintrich (2000b) noted, "The emphasis on the individual and the self is certainly paramount in models of self-regulation" (p. 493). To the extent that North American values are not as widespread in non-Western cultures, self-regulation research results may not generalize. Research shows, for example, that meanings of causes of achievement outcomes differ among cultures (Hau & Salili, 1993). Different relations may exist among goal orientations and self-regulation outcomes as a function of cultural background. More research is needed on how self-regulated learning might be moderated by ethnicity (Pintrich & Zusho, 2002).

This issue also is important from a practical perspective. The increasing diversity in American schools—especially the influx of Asian American and Hispanic American children—requires that teachers understand cultural and ethnic differences. Research on diverse populations will help to inform teachers on ways to improve their students' self-regulatory capabilities.

Curricular Integration

Research is needed on contextual influences on self-regulation and especially in different content areas. Principles of self-regulation are assumed to generalize across contexts, but contexts affect students' choices and thus the amount and type of self-regulation possible. Research is needed on self-regulation in content areas such as science, mathematics, and language arts. More research that examines the operation of self-regulatory processes across content areas, such as that conducted by Wolters et al. (1996), is necessary to advance our understanding.

Such research also would have practical benefits because it would show whether certain content areas (e.g., history where lectures are common) are more constraining than others (e.g., sciences with laboratories). Such knowledge would be useful in designing curricula and classrooms that allow for greater self-regulation. Further, because self-regulatory processes may vary depending on the content area, students could learn how to modify processes to fit different content areas.

Developmental Changes

Research is needed on the development of self-regulatory processes and especially on developmental changes in how the component processes merge to affect self-regulated learning. There is an extensive literature on cognitive devel-

opment but far less on the development of motivation as cognitive expertise increases (Pintrich, 2003). Zimmerman and Kitsantas (1997), for example, found that different types of goals produced better performance depending on learners' expertise. Research has shown that motivation often declines with development and advancement in school (Wigfield & Eccles, 2002), which creates the paradox that as students become more cognitively competent their motivation and self-regulation decline (Pintrich & Zusho, 2002).

This type of research will help us better understand when students are most at risk and the factors that may protect motivation and self-regulation (Pintrich, 2003). It also will suggest school and classroom design features that can promote adaptive academic functioning among learners of all ages.

THE LEGACY OF PAUL PINTRICH

Paul Pintrich accomplished much more in his abbreviated life than can be summarized in a short article. He left a broad legacy to the field of education along several fronts.

Theoretical Elaboration

Through his scholarship Pintrich provided much theoretical elaboration of self-regulatory processes. He formulated a framework that serves as the basis for research and interventions. By describing the various areas in which self-regulation can occur and how self-regulated learning processes can interact—especially motivation and cognition—he highlighted the complexity of self-regulation.

Especially noteworthy was his emphasis on motivational processes. Most theory and research on self-regulation has focused on cognitions and behaviors. Pintrich made motivational self-regulation a focus area, infused motivation throughout all phases of self-regulation, and investigated how motivational processes interact with other types of self-regulation. His emphasis on motivation heightened interest in self-regulation among researchers and practitioners.

Exemplary Research

Paul Pintrich was a prolific researcher and scholar. His vita lists over 120 publications, many of which report original research. His research represents a model program. He carefully linked research hypotheses with theory, specified measurement qualities of variables, competently designed and conducted studies, used appropriate data analysis methods, reported results clearly, discussed them in light of theory and prior research, and stated implications of the results for education. The MSLQ has become a standard instrument in self-regulation and motivation research. By conducting such high-quality research he set a standard for scholars to emulate.

Dissemination and Advocacy

Paul Pintrich strongly advocated for the importance of self-regulation in educational achievement. Through publications and presentations, his work reached an audience numbering into many thousands. He developed an international reputation and gave talks all over the world. Few others have done as much as he has in spreading news about self-regulation to audiences worldwide.

Pintrich helped to stimulate growth in the field by showing ways that self-regulation could enhance achievement (e.g., *Learning to Learn*). It is not an overstatement to say that a good part of the current surge of interest in self-regulation among educators stems from his advocacy.

Friend

Paul Pintrich was a friend of many people and also a friend of education. He gave willingly of himself to help others. He mentored numerous students—many of whom have coauthored publications with him—and had close professional colleagues in all parts of the world. In addition to his numerous personal friendships, he was a friend of education. He spoke forcefully and eloquently for education and gladly served the profession at numerous levels: university, state, national, international. He felt a deep sense of gratitude toward many individuals, and he used his expertise and talents to further education by helping others.

Paul Pintrich's legacy will endure because it offers so much. Educators can help to continue his legacy by honoring him through their research, scholarship, teaching, and giving to others what they have received from him.

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