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SELF-REGULATION INTERVENTIONS WITH A FOCUS ON LEARNING STRATEGIES

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Since ancient times we have tried to understand and harness our ability to identify, reflect upon, and take actions to control our own thoughts, feelings, emotions, actions, and destinies. This past quarter century has witnessed incredible progress in our understanding of diverse aspects of self-regulation. This book is a testament to our progress and many important aspects of self-regulation that have been identified and studied (e.g., motivational and cognitive management strategies), and many of the contexts in which it can be used (e.g., adult, mathematics, and reading education; effort management programs) are discussed. The purpose of this chapter is to address self-regulation in relation to the acquisition, use, and control of students' learning strategies. Learning strategies include any thoughts, behaviors, beliefs, or emotions that facilitate the acquisition, understanding, or later transfer of new knowledge and skills. We briefly describe a model of strategic learning that demonstrates the relationships among students' learning strategy knowledge, learning strategy skills, and self-regulation, as well as other variables that significantly impact learning and achievement. We also describe a sample of the interventions that have

been developed to help college-level students become more strategic learners; highlighting a highly successful program developed at the University of Texas at Austin. We start with a historical overview of some of the research and development work that has focused specifically on understanding or modifying the acquisition, use, and control of learning strategies. This overview helps to explain how researchers have come to understand the self-regulatory processes involved in strategy use.

I. HISTORICAL OVERVIEW

In the early 1970s, the information processing model of cognition (Simon, 1979b) was proposed as a viable way to conceptualize cognitive processes and products. With the establishment of this model (or, perhaps more accurately, family of models), the cognitive revolution (see Simon, 1979a, for a review) was in full swing and the early battles were being fought. Within this new field of cognitive psychology, a consensus was growing among researchers that thoughts or mental processes could be studied and understood directly. This work led to an evolving focus on information processing research and models that emphasized that cognition was something that could be controlled through cognitive and metacognitive processes (Brown, Collins, & Duguid, 1989; Flavell, 1979; Garner, 1987; Pressley & McCormick, 1995), particularly in academic and training learning contexts (Wang, 1983; Weinstein, 1978).

II. LEARNING STRATEGIES CAN BE MODIFIED OR LEARNED

One of the first practical applications of these new information processing theories was in the area of memory strategies that could be used in educational settings (Wood, 1967). Research on mnemonics and advances in our understanding of associative networks (Wang, 1983; Weinstein, 1978) paved the way for researchers to investigate different types of training that could be used to improve students' paired-associate learning (e.g., Danner & Taylor, 1973). The model of what it meant to be a learner was shifting from viewing the learner as a passive receptacle for knowledge to the leaner as an active, self-determined individual who processes information in complex ways (Weinstein, Underwood, Wicker, & Cubberly, 1979). This shift in thinking led to development of the concept of planful and self-directed "cognitive strategies" (Weinstein, 1978; Weinstein et al., 1979). This shift and the ideas and concepts that have been derived from it have been cited among the major accomplishments in instructional research in the last 30 years (Rosenshine, 1995). In particular, the conceptu-

alization of cognitive strategies is seen as a critical development in both instructional research and educational psychology, because knowing about and using learning strategies is a major factor for discriminating between low achieving students and those who experience success (Alexander & Murphy, 1998; Pintrich & De Groot, 1990; Weinstein, Goetz, & Alexander, 1988). One of the most important findings in the early strategy literature was that cognitive learning strategies represent a mutable factor in promoting academic achievement for students (Pintrich, Brown, & Weinstein, 1994; Weinstein, 1978).

Using cognitive learning strategies involves the intentional manipulation of information by the learner through processes such as repetition, elaboration, or reorganization of the material in such a way that the new information is able to be stored in the learner's associative network and accessed for retrieval. Weinstein and her colleagues (Weinstein & Meyer, 1991) further defined cognitive learning strategies as including the following three critical characteristics: they are goal-directed, intentionally invoked, and effortful.

As researchers learned more about cognitive strategies, they became interested in answering the following questions: Are they modifiable? Can we teach students how to improve their repertoire of learning strategies and will this affect their academic achievement? In an early study in this area, Weinstein (1978) demonstrated that cognitive strategies could, in fact, be modified through instruction. After a 6-week training program, junior high school students improved their learning performance for both laboratory (e.g., paired-associate word lists) and everyday learning tasks (e.g., a shopping task). In the early 1980s, a large number of researchers began investigating the effectiveness of specific memory strategies, such as mnemonics and categorization strategies (e.g., Bean, Inabinette, & Ryan, 1983). Many of these studies, which examined the effectiveness of strategy use, were investigating strategies that students had learned largely on their own, rather than those that they had learned from planned direct instruction. Several researchers also investigated how strategies spontaneously developed in children (e.g., Bjorklund & Zeman, 1983; Wade, Trathen, & Schraw, 1990). Although it did seem that strategies could develop spontaneously, their development was dependent on students' exposure to effective models of the use of specific strategies and to environments that provided opportunities for practice. However, many students did not have exposure to effective memory strategy use, and even when they did, not all students took advantage of the information provided to them in their environment (Bielaczyc, Pirolli, & Brown, 1995).

Only recently have effective programs focusing on learning to learn been developed, and most of these are at the college level under the rubric of "developmental education." Developmental education focuses on helping college students succeed and excel in their postsecondary studies by

deepening their prior knowledge in critical subject areas (e.g., mathematics), helping them to develop effective and efficient reading skills, or helping them to develop more effective learning and study strategies (e.g., the course to be described later at the University of Texas and programs offered through learning centers at many institutions). Over time, many developmental education programs at the college and university level have shifted their focus to developing students' self-regulation and strategic learning strategies and skills in a variety of areas related to student success and retention to graduation (e.g., DuBois, 1995; Hattie, Biggs, & Purdie, 1996; Lipsky & Ender, 1990; Weinstein et al., 1997).

III. THE NATURE OF STRATEGIES AND STRATEGY INSTRUCTION

Although the importance of providing strategy instruction is clear from the work described in this and other chapters in this volume, how to go about providing strategy instruction is less clear and less well established. Many researchers are developing integrated approaches to examine strategic and self-regulated learning (e.g., Boekaerts, 1997; Pintrich, Marx, & Boyle, 1993; Weinstein et al., 1997). Many of the topics that are part of these integrated systems and are critical to strategy instruction (e.g., motivation) are more thoroughly described in other chapters within this volume. We only briefly discuss these areas and their importance to learning strategy instruction.

The primary goal of strategy instruction is to help students become "good strategy users" or "good thinkers" (Pressley, Borkowski, & Schneider, 1987; Pressley, Forrest-Pressley, Elliott-Faust, & Miller, 1985; Pressley & McCormick, 1995). One thing we mean when we say "good strategy user" is a student who possesses three kinds of knowledge about strategies: declarative, procedural, and conditional. Declarative knowledge is simply knowing about a variety of strategies (Paris, Lipson, & Wixson, 1983); for example, what does summarizing in your own words mean? Procedural knowledge is knowing how to use these strategies (Anderson, 1990; Garner, 1990); for example, knowing *how* to summarize in your own words and being able to do so effectively. Acquiring these two types of knowledge implies very different types of instruction. Students may obtain declarative knowledge about strategies by simply being told about them. However, these students will need hands-on practice with these strategies in order to learn *how* to use them. I may know the components of a three-part essay, but I had to create many essays before I felt that I knew how to write one. Acquiring conditional knowledge about strategies also requires a specialized type of instruction. Conditional knowledge is knowing when (and when not) to use particular strategies (Paris et al., 1983). Students need to

know the strengths and weaknesses, or costs, of using different strategies. Some strategies are applicable in some situations and not others, although the conditions might look the same on the surface. For example, mind mapping (mapping out relationships within the content being studied) is an excellent method for learning important material or material that is very complex or difficult for a student. However, mind mapping is a very time-intensive strategy and cannot be used for all of a student's learning needs. Therefore, for students to be effective in their use of any given strategy, they must first obtain conditional knowledge about when that strategy might or might not be effective. A good base of conditional knowledge can provide the foundation for transfer of strategy knowledge and skills to new situations (Garner, 1990; Paris et al., 1983).

IV. TYPES OF LEARNING STRATEGIES AND THEIR RELATIONSHIP TO OTHER STRATEGIC LEARNING COMPONENTS

An early taxonomy of learning strategies was provided by Weinstein and Mayer (1986). In this taxonomy, five categories were delineated: rehearsal, elaboration, organization, comprehension monitoring, and affective strategies. Three of the categories represent strategies that operate directly on the information to be learned to aid in acquisition and organization of the information. The remaining two categories represent strategies that provide metacognitive and affective support for learning.

Strategies that aid in acquisition and organization of information can be applied to both basic and complex learning tasks. Basic learning tasks involve rote or verbatim memorization or learning. Complex learning tasks involve higher-level conceptual or content learning. For both basic and complex learning tasks, one of three types of strategies, either rehearsal, elaboration, or organization, can be used to master information, depending on the learner's purpose in acquiring the information.

Rehearsal strategies are used to select and encode information in a verbatim manner. Rehearsal strategies that are used for basic learning tasks involve recitation or repetition of information. Rehearsal strategies used for complex or content learning tasks include copying material, taking notes, and underlining or marking texts. Elaboration strategies are used to make information meaningful and to build connections between information given in the learning material and a learner's existing knowledge. Elaboration strategies for basic learning tasks include creating mental imagery and using mnemonic techniques to associate arbitrary information to personally meaningful knowledge. Elaboration strategies for complex

learning tasks include strategies that manipulate the information by paraphrasing, summarizing, creating analogies, relating the new information to prior knowledge, questioning, and trying to teach the information to another person. Organizational strategies are used to construct internal connections among the pieces of information given in the learning material. Organizational strategies for basic learning tasks include sorting or clustering related information based on common characteristics or relationships. Organizational strategies for complex learning tasks include outlining or diagramming the information and creating spatial relationships using strategies such as networking.

In addition to the strategies the learner uses to interact directly with the learning material, Weinstein and Mayer proposed two types of support strategies that could be used to enhance the acquisition of knowledge. Comprehension monitoring strategies and affective control strategies were thought to work in concert with the previously defined strategies for both basic and complex learning tasks. Comprehension monitoring strategies are metacognitive strategies used to assess the learner's understanding of the learning material and to executively control the use of acquisition and organizational strategies. Comprehension monitoring strategies include self-questioning, error detection, and problem solving.

Affective and support strategies are used to help focus the learner's attention and maintain the learner's motivation. Affective and support strategies include positive self-talk, anxiety reduction, and time management.

As can be seen in the Weinstein and Mayer (1986) taxonomy, as well as more recent conceptual work by other researchers, the use of cognitive strategies does not occur in isolation. Self-regulated and strategic learning involve integrated processes. The invocation and use of cognitive learning strategies is connected to other aspects of self-regulation such as motivation and metacognition (Paris & Cunningham, 1996; Pressley & McCormick, 1995). For example, from both empirical and anecdotal evidence it is clear that knowing what strategies to use and knowing how to use them is not enough. Students must want to use them and must maintain that desire throughout the learning task. To use cognitive learning strategies effectively, students must be able to manage the amount and direction of their effort, must be motivated to engage in the task, and must be volitional in their use of strategies (Corno, 1994).

The kinds of goals students have also impacts their strategy choice (Paris & Cunningham, 1996). Strategy use must be goal directed. This aspect of strategic learning has two implications. Goals are required so that strategic learners have a reference point to use for continued self-evaluation. The types of goals they set also may impact the kinds of strategies they select and the way they implement them (Pintrich, 1989).

V. MODEL OF STRATEGIC LEARNING

Broadly defined, students' learning strategies include any thoughts, behaviors, beliefs, or emotions that facilitate the acquisition, understanding, or later transfer of new knowledge and skills. In the past, researchers and educational program developers usually have focused on one or a subset of topics within this broad definition, such as cognitive elaboration strategies or student motivation. Current work is more purposefully examining the interaction among two or more components or factors related to the acquisition and use of learning strategies. This change is a result of increasing understanding of the nature of student learning and school achievement at all educational levels. Like most areas of self-regulation, it is the interaction among varying factors that results in successful learning and transfer of new knowledge and skills. The components and factors that seem to have the greatest impact on students' acquisition and use of learning strategies are summarized in a model developed by Weinstein (Weinstein, Husman, and Dierking, in press), which is an extension of an earlier model developed by Weinstein and Mayer (1986). This model focuses on variables that impact strategic learning, that is, learning that is goal driven. Weinstein's model of strategic learning (Weinstein et al., in press) has at its core the learner: a unique individual who brings to each learning situation a critical set of variables, including his or her personality, prior knowledge, and school achievement history. Around this core are three broad components that focus on factors that, in interaction, can tremendously influence the degree to which students set and reach learning and achievement goals. These three components are referred to as skill, will, and self-regulation (see Figure 1). Both the components and the interactive nature of the model are discussed further in Section VIII, which describes the strategic learning course at the University of Texas at Austin.

VI. TYPES OF STRATEGY INSTRUCTION AND THEIR EFFECTIVENESS

Several researchers have reviewed the literature available on programs designed to teach cognitive learning strategies. (When searching this literature, it is important to note that most developmental educators describe their programs that provide instruction in cognitive strategies as "study skills programs"; Hattie et al., 1996.) Simpson, Hynd, and Burrell (1997) created a program classification as a starting point for evaluating the effectiveness of particular types of strategy instruction. In our discussion of this classification scheme we highlight one of the most important criteria for evaluating the success of cognitive strategy instruction. That is,

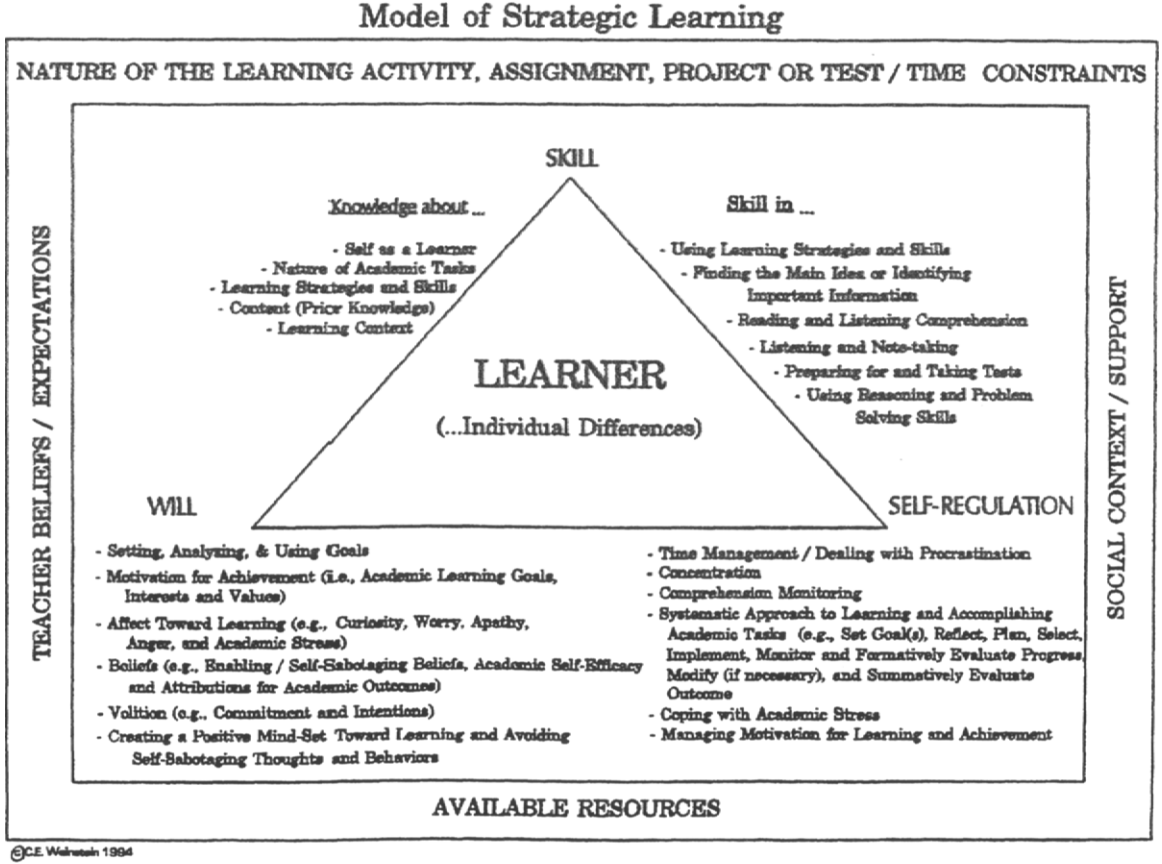

FIGURE 1 The Model of Strategic Learning. © C. E. Weinstein, 1994.

what is the degree to which students transfer the strategies and skills they learn to other contexts they encounter in academic settings, following their participation in a learning strategies course? This question is central for researchers and for both policymakers and educators concerned about the feasibility and practicality of providing strategy instruction. If transfer to other academic coursework and future learning tasks does not occur, these programs are of little value to the students or the institution.

Simpson et al. (1997) divided academic assistance programs into five general categories. The first category includes learning-to-learn courses that are semester-long, for-credit courses that are developmental in nature rather than deficit oriented. These courses are based on conceptual work in psychology and education (e.g., see the other chapters in this volume), and tend to focus on assisting students to become self-regulated learners by developing a repertoire of learning strategies that they can modify and adapt to novel situations. Learning-to-learn courses tend to be more process oriented as well. Students are encouraged to identify and utilize appropriate strategies based on the learning conditions they experience in the other courses they are taking concurrently with the learning-to-learn course. Such an orientation appears to enhance transfer because students develop an awareness of the conditions associated with a given academic task and then select the strategies that best fit the conditions, their goals, and their relevant prior knowledge and skills. Learning-to-learn courses have been demonstrated to increase grade-point averages, retention, and graduation rates significantly (Weinstein, 1994; Weinstein et al., 1997). This type of strategy instruction also has been referred to as adjunct instruction, because it is presented as an adjunct to the usual content-area courses (Weinstein, 1994; Weinstein & Meyer, 1994).

Simpson et al.'s second category is supplemental instruction or paired courses. Like learning-to-learn courses, these are generally developmental in nature and involve the embedding of strategic learning concepts (learning and study strategies) within the content of a specific course or in supplemental sessions (e.g., labs and small group seminars). As a result, these programs promote academic success in relation to a specific course or subject matter, and are less likely to be transferred to other courses. These programs appear to impact the grades obtained within the specific course positively, but do not seem to have much impact on the grades achieved in other courses (Simpson et al., 1997).

The third category is required programs for underprepared students. This category includes summer interventions and bridge programs (between high school and college). These programs are generally required for certain groups of first year students who are considered to be at risk for being underprepared for college. The summer or bridge programs generally focus on reading, writing, and more traditional study skills to prepare students for the coming academic year. Unfortunately, these programs are

likely to result in much less transfer of learning strategies due to the lack of concurrent course work in which to practice using the strategies and due to the time lag between when the strategies are learned in the summer and when they can be applied in the fall.

Simpson's fourth category is approaches integrating reading and writing. These programs are sometimes known as writing-to-learn or writing-across-the-curriculum programs, and are generally process- (as opposed to product-) oriented programs. The format of these programs varies, but typically it involves courses where a writing course is paired with a reading or content course. Writing courses also may be embedded within learning strategies or other courses. The goal of these programs is to enhance the writing proficiency of students as well as to enhance performance in the content area course. These programs have not demonstrated consistent results (Ackerman, 1993).

Simpson's fifth and last category includes learning assistance centers that provide a wide variety of services, such as self-paced and small group skill-specific programs to improve reading, writing, and various study skills as well as tutoring in specific subject areas. Students make use of these usually brief stand-alone services as they feel the need. Whereas each of the services provided by the centers is generally independent of the others, there is no overarching learning theory or conception guiding the provision of the services. Due to the varied offerings and the student-initiated nature of these programs, very little quantitative data on their impact on academic achievement and transfer are available.

It seems that the learning-to-learn end of Simpson's continuum has the greatest potential for positively impacting academic performance and transfer of skills as demonstrated through cumulative grade-point average, retention, and graduation. Learning-to-learn programs tend to be process-oriented programs that provide students with conditional knowledge as well as declarative and procedural knowledge. They also tend to provide a range of strategies and a self-regulation process to manage their application across varying academic challenges.

Another method that has been used to help students develop effective learning strategies within the context of a content area course is called the metacurriculum (Weinstein & Meyer, 1994). Instructors who use the metacurriculum provide direct instruction concerning motivational, self-regulatory, and cognitive strategies as it specifically relates to their content area (see Entwistle & Tait, 1992, for examples). Embedding the instruction within the context of a class provides an opportunity for immediate and authentic use of learning strategies. In their review of learning skills interventions, Hattie et al. (1996) found that learning skills courses were most successful when they were taught in context. This finding is consistent with other data on situated cognition (Brown et al., 1989). These findings make a strong case for the incorporation of strategy instruction into teacher training programs. Teachers need to be able to effectively show

their students how to learn course material most effectively. Although it is clear that this form of instruction can be an effective way to help students develop strategies within a domain, it is not clear that it is the most effective way to provide strategy instruction to all students in varying contexts. There are both pragmatic problems and conceptual problems with relying on the metacurriculum for all strategy instruction. The pragmatic problems are due to the fact that many instructors (particularly at the postsecondary level) feel that they have too little time to cover the course material, much less provide strategy instruction as well. The conceptual problems arise from the transfer issues raised earlier. Although some students are able to effectively transfer what they learn in a specific course to other novel situations, this seems to require a deep understanding of the strategies and how to use them (Salomon & Perkins, 1989). Students who have experienced consistent modeling of strategic learning and have a rich prior knowledge base of both strategies and content information may need only strategy instruction imbedded in a content course. However, for students who are considered at risk for failure or low performance in school, it is much more likely that they have less experience and prior knowledge about strategies, and require more practice and instruction. This kind of practice, for all practical proposes, can be provided only in a separate, or adjunct, course.

VII. IMPORTANT COMPONENTS OF ADJUNCT COURSES

Based on the research and applied literature, there are several components that seem to be needed for an adjunct course to be successful. The first is that there must be ample opportunity to practice using the strategies on authentic tasks. Students not only need to understand that strategies exist, they also need to know how to use them. It is not enough for students to be told to apply a strategy any more than it is enough simply to be told to ride a bicycle. At first learning how to ride a bicycle may seem cumbersome and difficult. However, over time, if we are provided with opportunities to practice, we can become proficient. It is the same with strategies. With guided practice and feedback we can become proficient enough at using a strategy that it becomes invisible to us and we are able to focus fully on learning the content.

The second component is that to enhance transfer, cognitive strategy instruction needs to be taught using a model (Hadwin & Winne, 1996). According to Sternberg and Frensch (1993), there are four mechanisms of transfer that, taken together, have critical implications for learning-to-learn courses. The first mechanism is encoding specificity, in which the retrieval of information from memory is dependent on the manner in which the

information was encoded. Information that is encoded as context specific or self-contained is likely to be accessed within that context. Students in a learning-to-learn course need to complete assignments that require them to apply components of the model to a variety of contexts. Stahl, Simpson, and Hayes (1992) suggested that having students practice the strategies being learned on real course work from other classes results in more natural strategy transfer.

The second mechanism is organization, which refers to how the information is organized in memory. Information that is organized within a clear framework and is connected to prior knowledge is likely to facilitate retrieval of that information (Alexander & Judy, 1988). Therefore, strategic learning courses should encourage students to become involved in actively seeking to organize information into a format that is meaningful to the students themselves. With a framework in mind, the learner can identify which information is important or critical for them to focus on and which information is of secondary importance or just supporting details. This is also one of the reasons why it appears to be helpful to use a conceptual model in a learning strategies course.

Sternberg and Frensch's third mechanism for transfer is discrimination, which refers to the tagging of information as relevant or irrelevant to a novel situation. If the instructor provides a model for the students to use to organize the information they are learning, the students can use the model to help them discriminate between relevant and irrelevant information in novel situations, thus improving transfer (Salomon & Perkins, 1989).

The fourth mechanism is set, which is how the learner mentally approaches a problem or learning task; that is, whether or not the learner is planning to transfer or use what he or she is are learning. To maximize the transfer of information presented in adjunct learning-to-learn courses to courses the students will participate in during the rest of their academic experience, the students need to know how helpful the strategies are and how they have helped others who are similar to them. The students need to value and feel efficacious about using those strategies (Pintrich & Schunk, 1996; Schunk & Zimmerman, 1994).

VIII. THE NATURE AND IMPACT OF A COURSE IN STRATEGIC LEARNING AT THE UNIVERSITY OF TEXAS

The course we describe was originally developed by Weinstein in 1977. A major purpose of this course is to provide learners with an awareness of the range of learning strategies and techniques available to them, the conditions that influence the selection and application of strategies (i.e.,

when to use which strategy), and a process for managing and evaluating the application process. Thus, this course addresses not only the declarative and procedural knowledge of learning strategies, but also the conditional knowledge by teaching students how to assess the learning situation and identify which strategies or techniques most likely will produce the desired outcome within the constraints and resources (personal and contextual) of any given situation.

One critical aspect of this course is that Weinstein's Model of Strategic Learning (Weinstein et al., in press) is at its center. The development of interventions specifically designed to help students become more strategic, successful learners is a relatively new phenomenon. Although interventions have been developed for late elementary, middle, and high school students, the most extensive interventions have been developed for postsecondary students.

An underlying concept of the Model of Strategic Learning is that learners need to be aware of elements from all four major component areas of the model: skill, will, self-regulation, and the academic environment. The use of a model in the design of a course and the direct teaching of that model helps the students to make the necessary abstractions for transfer to occur (Salomon & Perkins, 1989; Stahl et al., 1992).

The course begins with an overview of an outline version of the model. This provides students with a glimpse of the larger picture of the various factors that impact their academic performance. Throughout the course the students are not only taught specific strategies, they are also taught how the strategies fit together and interact with the other elements and larger components in the model. It is the interactions among components from all four areas (skill, will, self-regulation, and the academic environment) that are crucial for strategic learning, transfer of learning, and ultimately students' academic success, retention, and graduation (Hadwin & Winne, 1996).

Prior to the introduction of the model, the students are given extensive assessment instruments, including a reading battery and the Learning and Study Strategies Inventory (Weinstein, Schulte, and Palmer, 1987). The Learning and Study Strategies Inventory (LASSI) is used in this course to provide students with diagnostic and prescriptive information for each of the 10 scales, which include aspects from the skill, will, and self-regulation components of the Model of Strategic Learning.

Within the skill component, knowledge about oneself as a learner, knowledge about different academic tasks, and knowledge about context is assessed. Knowledge about oneself as a learner is important because it is a key step toward metacognitive awareness (a critical feature of strategic learning) (Pintrich, Wolters, & Baxter, in press) and the ability to think strategically about learning. This includes knowing one's strengths and weaknesses as a learner and one's attitude, motivation, and anxiety level

toward learning. This provides crucial information for conditional knowledge, because it cues learners to areas where they may anticipate problems in a given situation so that they may plan to avoid or minimize those problems.

Another element of the skill component is knowledge about different types of academic tasks, which includes an understanding of what is required to successfully complete a given academic task (e.g., writing a term paper), that is, the steps to be taken and how much time should be required. This directly impacts conditional knowledge by clarifying what needs to occur to reach a desired outcome.

Knowledge about the learning context is also a critical factor for strategic learners in terms of both their understanding of the academic environment and their instructor's beliefs and expectations, as well as their perception of the instrumentality of a course. For example, how will their performance in a particular course be evaluated and how will that evaluation impact them? How does the content of the course relate to their future academic, personal, or occupational goals? By providing instruction about these aspects of strategic learning and linking them to the effective use of cognitive learning strategies, the students obtain valuable conditional knowledge. By recognizing the importance of the information a course contains for their future goals, students may understand more readily the need to learn about and use strategies that are more effective for long-term retrieval (Husman & Lens, 1999). This implies that learners know which strategies are helpful to them for long-term retrieval of information. This is where the learning strategies element of the skill component of the Model of Strategic Learning comes in.

Knowledge and skill acquisition strategies that help to build bridges between what learners already know, the new things they are trying to learn, and how they could potentially apply the course content to current or future academic situations are used to increase knowledge of context as well as the participants' level of understanding of the course content. Such strategies help to build meaning for learning and encourage students to learn in such a way that their new knowledge will be easier to recall and use (Pressley & McCormick, 1995). If students understand the conditional knowledge necessary to successfully use and manipulate a strategy, they are more likely to acquire and transfer the strategy to new situations (Paris et al., 1983). Students in the learning-to-learn course are taught declarative, procedural, and conditional knowledge about three general types of knowledge acquisition strategies: rehearsal, elaboration, and organization. During the semester (approximately 14 weeks with 3 hours of class per week) students are provided with opportunities to apply these strategies to specific course content in their other classes. Providing students with the opportunity to apply strategy instruction to actual course material is considered critical for both acquisition of strategy knowledge and transfer

to new situations (Hadwin & Winne, 1996; Rosenshine, Meister, & Chapman, 1996; Simpson et al., 1997; Stahl et al., 1992). Specifically, after the students have considered their academic goals for the semester through class assignments and assessments and have considered their own academic strengths and weaknesses, they are provided with an overview of the information processing theory that is the basis for the strategy instruction. After the students have developed some degree of theoretical understanding for why strategies work, how they can help them, and how knowledge acquisition strategies fit into the model of strategic learning, they are required to complete a class assignment. This class assignment requires the students to use two new learning strategies while they are studying for another class and report on the strategies' effectiveness. By requiring the students to engage in using and evaluating these new strategies, the students get valuable experience and practice. By providing the students with an understanding of both information processing theory and how knowledge of strategies fit into the model of strategic learning, the students are better able to transfer what they learn to courses outside of those they use during the practice assignment.

Knowledge about strategies and knowledge of the contexts the strategies are to be used in are, of course, not enough. The students must also want to use the strategy. Students must be aware of their goals and how those goals impact their academic performance (Hadwin & Winne, 1996). As we said previously, strategies are simply tools used in the service of goals. How the strategies will be used or whether they will be used at all is determined in large part by the students' goals and their motivational orientation (Pintrich, 1989). Before strategy instruction can begin, students must first examine their goals and their motivation for being in school. Therefore, the first few weeks of the course are devoted to examining the will component of the model. This component includes elements such as motivation for attending college or taking a particular course, setting, analyzing, and using goals, anxiety about performing well in learning situations, and attitude toward learning and the degree to which education is valued. These are all-important variables for initial learning and subsequent transfer to other course work. Motivation and attitude toward learning are also closely related to knowledge of context. The instrumentality that the learner perceives for the course content affects his or her motivation for actively participating and the value he or she places on the course (Eccles, 1983; Husman, 1998; Husman & Lens, 1999). In addition to the perceived value of a course, the presence and types of students' goals for the class can have a significant effect on the degree to which they are strategic in their learning in the course (Heyman & Dweck, 1992; Pintrich, 1989). Students who are performance oriented and motivated primarily by extrinsic factors (e.g., grades) tend to use surface-level strategies (e.g., rehearsal strategies), whereas students who are motivated by their enjoy-

ment of the learning process tend to use deeper strategies (e.g., elaboration strategies). The course helps students to develop and examine their goals in the first few weeks of the course through both direct instruction and completion of an extensive project. By helping students become aware of the relationship between their goals and their academic achievement, students learn that they can consciously control their own thoughts and behaviors. The process of regulating motivation and strategy use creates a bridge to the self-regulation component of the model.

From the self-regulation component of the model, the systematic approach to learning plays a crucial role in contributing to academic success and enhancing retention and graduation rates. This approach cues students to consider all aspects of the model in planning for and completing academic tasks. Throughout the learning-to-learn course, students use this approach on projects involving material and assignments from other courses they are taking concurrently. This provides them with opportunities to practice transferring their use of this self-regulatory technique. Briefly, the systematic approach to learning involves eight steps:

1. Setting a goal
2. Reflecting on the task and one's personal resources
3. Developing a plan
4. Selecting potential strategies
5. Implementing strategies
6. Monitoring and formatively evaluating the strategies and one's progress
7. Modifying the strategies if necessary
8. Summatively evaluating the outcomes to decide if this is a useful approach for future similar tasks or if it needs to be modified or discarded for future use

The middle of the course is focused on providing training in specific learning strategies that the students are then encouraged to use in their other courses as part of the projects involving the systematic approach. This provides the students with the practical experience of applying strategies in different contexts while maintaining a metacognitive awareness about their activities and the success or problems they encounter.

The last portion of the course is devoted to reintegration of the components and elements of the model. The purpose of this is to emphasize for the student the heuristic nature of strategic learning and assist the student to understand the interactive nature of the model. Both the initial introduction of the model and the final reintegration of the parts of the model provide the students with the tools they can use to make mindful abstractions about the course. The issues involved in transfer are also directly emphasized.

Salomon and Perkins' (1989) concept of high-road transfer, particularly forward-reaching high-road transfer, and their concept of "mindful abstraction" seem to fit quite well with the tenets of Weinstein's Model of Strategic Learning as well as other conceptions of self-regulated learning. In each of these conceptions the learner is metacognitively aware that the information being learned has potential current and future applications outside of the original learning context. Salomon and Perkins (1989) stated that the main characteristic of the high road to transfer is the mindful generation of an abstraction during learning. This abstraction then can be applied in the future to a new problem or situation. The mechanism by which this takes place is the deliberate process of separating cognitive elements from the context in which they were learned and considering them for application in quite different contexts.

Research and evaluation data for this course have been obtained in a number of ways. From semester evaluations of the pre- and postdata on the Nelson Denny Reading Test (Brown, Bennett, and Hanna, 1981) and LASSI scores, it was found that students evidenced highly significant gains on these measures. However, given the importance of transfer issues in cognitive process learning contexts, data concerning the long-term effects of the course will be highlighted. The question addressed with this study was what impact the course had on students' subsequent GPAs and retention at the university over a 5-year period. The most interesting data concerning transfer data appears in the fifth-year followup statistics. Approximately 55% of the students who entered in 1990 and did not take the strategic learning course graduated after 5 years; this statistic has remained about the same for a number of years. However, despite significantly lower SAT scores and significantly lower motivation scores on the LASSI Motivation Scales, approximately 71% of the students who successfully completed our course (primarily those who did not drop out or fail due to excessive absences) graduated after 5 years. This 16-point difference is a dramatic finding that supports the long-term retention effects of an intervention in learning strategies. In addition, the cumulative GPAs for these students were higher than for the general population. These data offer strong support for the importance and impact of developmental education that emphasizes learning strategies for students at risk for academic failure or low achievement.

IX. FUTURE DIRECTIONS FOR LEARNING STRATEGIES RESEARCH

We have come a long way in our understanding of learning strategies and their role in strategic, goal-driven learning. However, we still have crucial issues and questions that need to be addressed both for our

conceptual understanding of the processes and variables involved and for building a more solid foundation for the development of applications at all educational levels and in diverse educational settings, both in and out of formal school environments. For example, there is a need for more research that investigates the development and use of learning strategies and processes by young children and early teenagers. What are the precursors of effective strategy use? How can we facilitate the development of these skills at differing ages? What can we do to help teachers incorporate learning-to-learn activities into their classroom teaching? We also need to investigate further the nature of transfer of cognitive skills. How do we facilitate high-level transfer across tasks and content areas? How do we help students learn to cue themselves to transfer strategies? We need more refined models that learners can use to help them identify the most critical skill, will, and self-regulation elements they must consider in a given learning situation. How can we help them learn to take more control of their own learning processes and outcomes? Finally, we need to investigate the changing nature of learning in computer and distance learning environments, and the implications for both the roles played by learning strategies and the design of these learning environments.

This list is not in any way meant to be exhaustive, but it is reflective of the vibrant nature of the field of self-regulation and the critical needs we face in preparing for the learners and learning demands of the 21st century.

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