

Self-Regulation and Learning Strategies

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Learning strategies are a bit difficult to define since the nomenclatures used in cognitive educational psychology as well as in strategic and self-regulated learning have not yet been standardized across and within these fields of study. Fundamentally, learning strategies researchers and practitioners generally agree that learning strategies involve the use of cognition, metacognition, motivation, affect, and behavior to increase the probability of succeeding in learning, creating meaningful and retrievable memories, and performing higher-order cognitive tasks, such as problem solving (Boekaerts, Pintrich, and Zeidner, 2000; Paris, Lipson, and Wixson, 1983; Pintrich, 2000; Schunk and Zimmerman, 2007; Weinstein and Mayer, 1986; Weinstein, Tomberlin, Julie, and Kim, 2004; Zimmerman, 2000). Furthermore, the self-regulated use of learning strategies helps enable students to take more responsibility for their own learning now and to become lifelong learners. The rapid development of advanced technology and the ever-expanding nature of workforce training will create ever-increasing demands for individuals to be lifelong learners (Cornford, 2002).

Brief History of the Study of Learning Strategies

The history of the use of learning strategies has been traced back to the time of the caveman and cavewoman. Some anthropologists believe that many cave drawings helped them to remember time cycles, such as when the season of heavy rains came and the migration of animals they could use for food. The ancient Greeks are famous for developing the use of mnemonics

(artificial memory devices). Prior to the development of relatively easy writing tools and forms, they used mnemonics to help remember things like the points they wanted to discuss in a speech. For example, they used methods involving mental imagery, such as the method of loci (places). An orator might create images of the buildings he passed on his way to the forum where he would deliver his speech. Then he would create images to remind him of the points of his speech and associate those images with the buildings on his path. When he began to deliver his speech, he would recall his path and retrieve the images he associated with each building. We still can see remnants of these methods being used today: the ABC song for remembering the letters of the alphabet and the first-letter mnemonic ROY G BIV to help us remember the order of the colors in the spectrum.

During the early 1970s and into the 1980s, after a number of studies provided evidence that these strategies did enhance memory, attention turned toward the cognitive mechanisms by which mnemonics worked. It is this research and the influences of both Flavell's groundbreaking work on metacognition (our thinking about and regulation of our own thinking) and Wittrock's development of his theory of generative learning (our use of active cognitive processing leads to meaningful learning) that led to the study of learning strategies from both an empirical perspective and an applied educational perspective (see Flavell, 1979; Wittrock, 1974). Today, all theories of strategic and self-regulated learning include the use of learning strategies. The next section presents the key components of strategic learning and a model summarizing these components.

Components of Strategic Learning

Strategic learners have the skill, will, and self-regulation needed to be effective and efficient learners in varied educational environments (Weinstein and others, 2004, 2006). These components are summarized in Weinstein's Model of Strategic Learning (Weinstein, Acee, and Jung, 2010). In this model, the components of academic learning that are under a student's control are broken into three categories. Often, in other models (e.g., Zimmerman, 2000), the component self-regulation is used as an overall framework for the merging of skill and will components. Here it is separated out to signify the management role it plays in learning and studying environments. All three components interact with each other to create effective and efficient learning. Much like a gestalt, the whole is greater than the sum of the parts, and it is difficult to attribute causation to any particular component or element in a component.

Skill. Skill refers to critical knowledge about and knowing how to use learning strategies and other thinking skills. Examples of the knowledge students need for success include knowing about the performance demands of different types of academic tasks; knowing about one's own personal strengths, weaknesses, and preferences for how to learn; and knowing

about a variety of learning strategies that can be used to learn different types of content material. Examples of the application of this knowledge include knowing how to use active repetition, elaboration strategies, thinking skills, and prior knowledge to reach learning goals.

Will. *Will* refers to the motivation and affective components of strategic learning that either contribute to or detract from academic success. Examples of the elements that contribute to academic success include setting, analyzing, and using both short-term and long-term goals; using future time perspective and goal hierarchies to generate motivation; developing enabling beliefs; and generating a positive mind-set toward learning. Examples of elements that detract from academic success include self-sabotaging beliefs, low self-efficacy, high anxiety, and external attributions for performance.

Self-Regulation. *Self-regulation* is both the glue and the engine that helps students manage their strategic learning on both a global and real-time levels. On the global level, this component includes using a systematic approach for learning, time managing on a macro level (over weeks, months, and years), using an instrumental approach to help seeking, and managing motivation for learning. On the real-time level, the elements include managing and reducing high anxiety, using metacognition to monitor learning success, monitoring and regulating the use of effective and efficient learning strategies, managing time on a micro level (during a task, over a few hours, or day by day), focusing attention, and maintaining concentration over time.

Types of Learning Strategies

Here we discuss the use of cognitive learning strategies involving rehearsal, elaboration, and organization. Other chapters in this volume discuss metacognition, motivation, and systematic approaches to self-regulation.

Rehearsal Strategies. Rehearsal strategies use repetitive exposure to what the student is trying to learn. Examples of rehearsal strategies include repeating a definition over and over, using flash cards, listening over and over to tape recordings or podcasts of lectures, and highlighting material in a text. However, not all rehearsal strategies are effective and/or efficient for learning and integrating new knowledge and skills. Passive rehearsal strategies, fundamentally based on the mind as a mental muscle model (popular in the nineteenth and early twentieth centuries), promote simple repetition and do not involve much cognitive processing. Passive rehearsal is mindless repetition and usually does not result in meaningful learning that will pass the test of time. In contrast to passive rehearsal learning strategies, active rehearsal learning strategies tend to be more effective for reaching learning goals (Ornstein, Medlin, Stone, and Naus, 1984; Simpson, Olejnik, Tan, and Supattathum, 1994). Active rehearsal strategies involve more cognitive processing and meaning building. In general, the purpose for using

active rehearsal strategies is to create further opportunities for understanding and learning to take place. For example, using foreign-language flash cards to create opportunities to think about the word, look up its derivations, and use it in conversation can be quite helpful compared with the simple repetition of the words on the card (passive rehearsal). Similarly, repeating the definition of a principle can help students apply it on sample problems, thus deepening their understanding of the principle.

Elaboration Learning Strategies. Creating and using elaboration strategies requires active cognitive processing on the part of the learner. Elaboration involves adding to or modifying in some way the material one is trying to learn to make it more meaningful and memorable. Elaboration strategies can take many different forms, including: paraphrasing, summarizing, creating analogies, using compare-and-contrast strategies, trying to apply the material one is learning, teaching it to someone else, and creating and answering possible test questions.

The simplest forms of elaboration are paraphrasing and summarizing. Whereas repetition does not involve complex cognitive processing, paraphrasing and summarizing involve at least some level of processing and understanding. Learners can repeat something they have simply memorized; doing so does not require any understanding. However, transforming new information by restating it in one's own words or highlighting the important information or ideas does require some level of cognitive processing.

More complex forms of elaboration involve progressively greater cognitive effort and more complex thinking, which leads to deeper understanding and more accessible memory structures that can be recalled for both simple memory tasks and higher-order thinking tasks, such as problem solving, application, and analysis (Van Rossum and Schenk, 1984; Weinstein and others, 2006; Willoughby, Wood, Desmarais, Sims, and Kalra, 1997). For example, using analogical reasoning (creating analogies between and among material being learned), comparing and contrasting similar material, and practicing the application of a new principle to sample problems all require more complex thinking than simple paraphrasing and summarizing. In addition, more complex elaboration strategies, such as application, teaching the material to someone else, or discussing and analyzing material with a study partner or group, also help students identify areas of misunderstanding so they can be corrected in a timely fashion.

Organization Strategies. Organization strategies are a category of elaboration strategies that focus on reorganizing and elaborating new material in some type of graphic form. Creating outlines, cause–effect diagrams, mind maps, and relationship diagrams are just a few of the common transformations students can use to help create meaning for new material they are studying (Nilsson and Mayer, 2002). These various forms of graphic organizers (or reorganizers) have the same characteristics of requiring active and often complex cognitive processes as do elaboration strategies.

Creating these representations requires a series of cognitive actions involved in the transformation of what is being learned into graphic form.

Lower-level graphic representations, such as a simple outline, may be less useful than higher-level graphic organizers, such as node graphics. Creating an outline of a topic usually does not involve so much cognitive processing as creating a node diagram with the central point or main idea in the middle and the rest of the information radiating out in branches and subbranches to depict the relationships among and within related topics.

Need for a Strategy Repertoire. It is also important to point out that the specific strategy students use is not so important as the active cognitive processing involved. Some methods may be more useful than others for an individual student. In addition, a student may find some strategies more useful for a particular type of learning task or subject area. This is why it is important for students to develop a repertoire of strategies that spans all three categories of learning strategies. Students need these tools to help them mindfully determine their preferences and to access alternative strategies when their preferences do not work. A carpenter may have a favorite hammer, but she may not be able to use it for all tasks; for that reason, her toolbox contains several hammers that are available when the need arises.

Teaching Learning Strategies

A number of interventions have been developed to help college students become more strategic and self-regulated learners. These range from creating learning center handouts and relatively brief workshops to semester-long learning-to-learn courses and implementing a metacurriculum (teaching learning to learn as part of content courses) (Hattie, Biggs, and Purdie, 1996; Hofer and Yu, 2003; Pintrich, McKeachie, and Lin, 1987; Randi and Corno, 2000; Rubin, Chamot, Harris, and Anderson, 2007; Schunk and Zimmerman, 2007; Tuckman, 2003; Weinstein and Hume, 1998; Weinstein, Husman, and Dierking, 2000; Weinstein and Mayer, 1986; Weinstein and others, 2006).

Learning About Learning: Declarative, Procedural, and Conditional Knowledge

Regardless of which method is used to help students develop an effective and efficient repertoire of learning strategies, students need to acquire three types of knowledge for any strategy to be useful for them: they have to know the basic definition of the strategy (declarative knowledge), how to use it (procedural knowledge), and under what conditions it may be more or less useful for them (conditional knowledge). Acquiring these types of knowledge can help students more effectively and efficiently choose and use learning strategies across different situations. The level of knowledge a student has about a strategy or repertoire of strategies also can help

teachers and instructors determine the type of instructional help a student may need.

Types of Instruction. For students who have a sufficient level of declarative, procedural, and conditional knowledge about the strategies in their repertoire but still need to expand their repertoire, a handout or workshop at a learning center might be useful. In addition, instructors can incorporate the teaching of general and content-specific strategies into their teaching (Barrie, 2007; Weinstein, Acee, and Jung, 2010). For students who are quite deficient in their use of learning strategies, an adjunct course or extended series of workshops might be most useful. The metacurriculum approach—teaching learning how to learn the content in a specific course—also can help students with a poor learning strategies repertoire (Barrie, 2007; Cornford, 2002; Weinstein and others, 2004). The most powerful intervention is a combination of an adjunct course paired with a metacurriculum intervention in students' classes. Learning strategies can be placed along a continuum from highly content specific (e.g., identifying a number sequence) to more content independent (e.g., using time-management strategies). Adding the metacurriculum approach also has the advantage of teaching content-specific strategies that may not be taught in a general adjunct learning-strategies course. This raises the question of how to decide what is best for a given student. One way to decide on an appropriate intervention (and to assess its success) is using some type of assessment.

Assessment of Strategic Learning. Two primary instruments are used to assess students' strategic and self-regulated learning: The Learning and Study Strategies Inventory, 2nd edition (LASSI) (Weinstein, Schulte, and Palmer, 2002) and the Motivated Strategies for Learning Questionnaire (MSLQ) (Garcia Duncan and McKeachie, 2005; Pintrich, Smith, Garcia, and McKeachie, 1991). Both are diagnostic measures, and both are prescriptive in the sense of indicating areas of students' strengths and weaknesses.

The LASSI is a broad-based measure of strategic learning. The LASSI has ten scales with eight items on each scale. These scales are: Anxiety, Attitude, Concentration, Information Processing, Motivation, Selecting Main Ideas, Self Testing, Study Aids, Test Strategies, and Time Management. Each of these scales is related primarily to one of the three components of strategic learning: skill, will, and self-regulation. The conceptual framework of the Model of Strategic Learning (MSL) underlies this instrument.

The LASSI scales primarily related to the skill component of the MSL are Information Processing, Selecting Main Ideas, and Test Strategies. These scales examine students' learning strategies, skills, and thought processes related to identifying, acquiring, and constructing meaning for important new information, ideas, and procedures; and how students prepare for and demonstrate their new knowledge on evaluative procedures. The LASSI

scales primarily related to the will component of the MSL are Anxiety, Attitude, and Motivation. These scales measure the degree to which students worry about their academic performance; their receptivity to learning new information; their attitudes and interest in college; and their diligence, self-discipline, and willingness to exert the effort necessary to successfully complete academic requirements. The LASSI scales primarily related to the self-regulation component of the MSL are Concentration, Self-Testing, Study Aids, and Time Management. These scales measure how students manage, or self-regulate, and control their learning processes through using their time effectively; focus their attention and maintain their concentration over time; check to see if they have met the learning demands for a course, an assignment, or a test; and use study supports such as review sessions, tutors, learning centers, or special features in a textbook or Web site.

The LASSI has been shown to be a valid and reliable measure of strategic learning (Weinstein and Palmer, 2002). The scores on each scale are converted to a percentile scale so that students' relative strengths and weaknesses as well as their relationship to national norms can be examined.

Concluding Comment: The Importance of Learning Strategies and Strategic Learning for Academic Readiness

Currently we are experiencing a worldwide need for our citizens to be better educated, more skilled, lifelong learners who can adapt to the rapidly changing and evolving demands of the modern world. However, at a time when we have increasing needs for an educated and skilled citizenry and workforce, the numbers of students entering postsecondary education who are not prepared to benefit from their studies is increasing. Programs have been developed to help students succeed in higher education, but they tend to focus on reading skills, writing skills, mathematics remediation or enhancement, and basic study skills. Although these programs are necessary and important for academic success, they are not sufficient, and, overall, the results have been disappointing. Why would such powerful interventions result in such small gains in academic success and retention? Part of the answer is that learners also must be strategic and self-regulated so they can take more responsibility for their own learning processes, meta-cognitive control, motivation, and other generative learning thoughts and behaviors.

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