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ASSESSMENT AND TRAINING OF STUDENT LEARNING STRATEGIES

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This chapter focuses on a subarea of learning-to-learn phenomena called learning strategies. Learning strategies are considered to be any behaviors or thoughts that facilitate encoding in such a way that knowledge integration and retrieval are enhanced. These thoughts and behaviors constitute organized plans of action designed to achieve a goal. Examples of learning strategies include actively rehearsing, summarizing, paraphrasing, imaging, elaborating, and outlining. This report presents a categorical scheme for conceptualizing learning -
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strategies. Next, some issues related to assessment and research methodologies are presented. Finally, approaches to teaching learning strategies are discussed.

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Assessment and Training of Student Learning Strategies

Learning-to-learn phenomena have been examined from a wide variety of perspectives (Anderson, 1985; Brown, Bransford, Ferrara, & Campione, 1983; Dillon and Schmeck, 1983; Kirby, 1984; Pressley & Levin, 1983a,1983b; Weinstein and Mayer, 1985). While, in general, this development has served to enrich the field of study, it has also created enormous definitional problems. For the purposes of this chapter, attention will be focused on a subarea called learning strategies. Learning strategies are considered to be any behaviors or thoughts that facilitate encoding in such a way that knowledge integration and retrieval are enhanced. More specifically, these thoughts and behaviors constitute organized plans of action designed to achieve a goal (Anderson, 1985; Paris, in press; Weinstein & Mayer, 1985). Examples of learning strategies include actively rehearsing, summarizing, paraphrasing, imaging, elaborating, and outlining.

This chapter is organized around several themes. First, a categorical scheme for conceptualizing learning strategies will be presented. Next, some issues related to assessment and research methodologies will be presented. Finally, approaches to teaching learning strategies will be discussed.

Introduction

For many years studies of human learning were dominated by the behaviorist school of thought in psychology. This resulted in a total dependence on the effects of external events as determinants of what was

acquired. With the rise in interest in the role of organizational processes and information transformations that take place within the learner, the interest of many researchers was refocused on what had come to be regarded as the black box of the human mind (Melton & Martin, 1972). Many of these earlier studies represented attempts to demonstrate the roles that learners could or did play in facilitating their own learning and recall. Much of the emphasis in these studies was on the extent to which the use of mnemonic devices could enhance recognition or recall memory. Based on the success of these early studies, some researchers went on to examine the processes that underlie the use of menmonic strategies (e.g., Bower, 1970; Paivio, 1971). This work contributed to an evolving interest in the remediation of learning deficits in academically disadvantaged and academically underprepared students. If the processes and and procedures that underlie effective learning could be taught, or enhanced, then an additional and possibly very potent form of remediation could be developed. It was this idea that underlies the motivation for much of the work that has been done in the area of learning strategies, particularly when the focus is on the adult learner.

In the late 1960's and into the middle of the next decade, the majority of investigators in this area concentrated on demonstrating the effectiveness of training designed to teach the use of one or more mnemonic strategies or techniques (e.g., Borkowski & Kamfonik,1972; Rohwer, 1966,1970; Wood, 1967; Yuille & Catchpole,1973). The tasks used most frequently in this work included paired-associate learning, serial list learning, and free recall learning. Notice that these tasks tend to be associated more with laboratory research tasks than with real-world

natural language processing activities. A major change in the more current literature is to focus attention on ecologically valid tasks, particularly those needed to succeed in a post-secondary educational setting (e.g., Dansereau, in press; McCombs, in press; Nickerson, Salter, Shepard, & Herrnstein, 1984; Wittrock, 1985). This change in focus to more applied aspects of cognition has affected the ways learning strategies are now conceptualized, the methods used to measure their acquisition and use, and the procedures and materials used to teach them

Types Of Learning Strategies

Given the relatively young and somewhat disorganized nature of the field, there is not yet one organizational scheme that is generally accepted as a way of classifying learning strategies. However, Weinstein and Mayer (1985) attempted to create a set of categories that reflected both the current state of research and practice. Each separate category is composed of methods that can be used by learners to influence one or more aspects of the encoding process. The ultimate goal for any of these activities is to enhance learning outcomes and performance.

Rehearsal Strategies for Basic Learning Tasks

An example of a strategy in this category would be repeating, in correct serial order, the names of the colors in the spectrum. There are a number of different educational tasks that require simple recall. This is particularly true at the lower educational levels and in introductory

courses at the post-secondary level. A major difference between experts and novices in many content areas appears to be related to the knowledge base that they possess (Chi, Feltovich, & Glaser, 1981; Gagne, 1985; Larkin, 1981). While the structure, organization, and integration of this knowledge base is most important for expert decision making and problem solving, the acquisition of the basic knowledge needed to create a more unified data base is often the first step. As Schmeck (1983) notes, it may not be possible for even the highly intelligent students to engage in deeper forms of information processing until they acquire this knowledge base.

Rehearsal Strategies for Complex Learning Tasks

The learning tasks in this category are more complex and tend to involve knowledge that extends beyond the superficial learning of lists or unrelated bits of information. Strategies in this category would include copying and underlining material presented in a lecture. Generally, they involve repetition aimed at literal reproduction. Like the methods discussed above, these activities seem particularly effective when they provide further opportunities for more meaningful processing to take place, such as the use of elaboration, organization, or comprehension monitoring.

Elaboration Strategies for Basic Learning Tasks

Elaboration involves adding some sort of symbolic construction to what one is trying to learn as a way to make it more meaningful. This can

be accomplished using either verbal or imaginal constructions. For example, the use of mental imagery to help remember the action sequence described in a play and the use of a sentence to relate a country and its major industrial product are both elaborations. The creation of effective elaborations requires that the learner be actively involved in processing the to-be-learned information. Numerous studies have shown this to be an important prerequisite for meaningful learning, versus superficial encoding for recall (Cermak & Craik, 1979; Entwistle, this volume; Marton, this volume; Rigney, 1976; Schmeck, this volume; Weinstein, 1982).

Elaboration Strategies for Complex Learning Tasks

Activities in this category include creating analogies, paraphrasing, and using prior knowledge, experiences, attitudes, and beliefs to help make the new information more meaningful. Again, the major goal of each of these activities is to get the learner actively involved in building bridges between what the learner already knows (in the broadest sense of this term) and what he or she is trying to understand. Trying to apply a principle to everyday experience, relating the content of one course to the content of another one, relating what was presented earlier in a lecture to the current discussion, trying to use a problem solving strategy in a new situation, summarizing an argument, all of these are different ways to elaborate.

Organizational Strategies for Basic Learning Tasks

The strategies in this category focus on methods used to translate

information into another form that will make it easier to understand. The facilitating effect is usually attributed to the processing involved in accomplishing the transformation, as well as the structure imposed. Examples of methods in this category include grouping the battles of World War II by geographic location, organizing animals by their taxonomic category, and listing foreign vocabulary words by their parts of speech. In each of these examples an existing or created scheme is used to impose organization on an unotherwise unordered set of items. Notice that organizational strategies, like elaboration strategies, require a more active role on the part of the learner than simple rote or rehearsal strategies.

Organizational Strategies for Complex Learning Tasks

Organizational strategies can also be very useful for more complex tasks. Common examples of the use of this method with complex tasks include outlining a chapter of a textbook, creating a conceptual diagram of cause-effect interrelationships, and creating a hierarchy of sources to use in writing a term paper. Here, too, it is both the process and the product which seems to contribute to the effectiveness of the method.

Comprehension Monitoring Strategies

Metacognition is used to refer to individuals' knowledge about their own cognitive processes as well as their abilities to control these processes by organizing, monitoring, and modifying them as a function of

learning outcomes and feedback (Brown, 1975, 1978; Brown et al., 1983; Cavanaugh & Perlmutter, 1982; Flavell, 1970, 1981). A subarea within metacognition that is particularly relevant to the present discussion is called comprehension monitoring. Operationally, comprehension monitoring involves establishing learning goals, assessing the degree to which these goals are being met and, if necessary, modifying the strategies being used to facilitate goal attainment. Comprehension monitoring requires several types of knowledge on the part of learners. First, they need to know something about themselves as learners. For example, what are their preferred learning styles? What subjects are easier or harder for them to understand? What are their best and worst times of day? This type of knowledge helps individuals to know how to schedule their study activities and the kinds of resources or assistance they will need to perform efficiently and effectively.

Learners also need to have some knowledge about the nature of the task or tasks they are about to perform, as well as the anticipated or desired outcomes. It is difficult to reach a goal if you do not know what the goal is (see Entwistle, this volume; Marton, this volume). For example, many students experience great difficulty reading a textbook in spite of the large amount of time and effort they devote to the task. In our own research with a learning-to-learn course we have developed at the University of Texas, the problem often turns out to be that the student does not know how to read a textbook. Many of these individuals do not know how to select main ideas and important details for further study. They treat every sentence as if it were just as important as every other sentence. Not knowing about different text structures or how to identify

important information can make reading a textbook an almost impossible task. Thus, it is important that students have an understanding of what is required by different school tasks.

It is also important to access relevant prior knowledge. This can serve two functions. First, it helps with understanding the new material. However, it also helps with preparing for the new learning by instantiating relevant schemata and providing some guidelines for checking the accuracy of new knowledge.

Finally, it is necessary to have some knowledge of strategies that can be used to guide learning or that can be called upon to help when a comprehension problem is encountered. This type of knowledge includes knowing about methods in each of the categories already described. It also includes being able to actually use these methods and knowing when they are appropriate to use. Thus, comprehension monitoring is very intimately related to the selection and use of other strategies in any given learning activity.

Assessing the degree to which goals are met is one of the central tasks in comprehension monitoring. This task is usually accomplished through some form of self-questioning, broadly defined. There are a wide variety of specific methods that could be used to assess one's level of understanding. For instance, attempting to apply a new principle, using a chapter summary to create questions to answer while reading, self-testing while reviewing lecture notes, or attempting to teach the information to someone else (or even pretending that you are teaching it to someone else) are all examples of ways we could assess our level of understanding. It is important to note that many of these activities

overlap with strategies presented in earlier categories. This categorical scheme is not meant to imply orthogonality among the classes of methods. In fact, there is a great deal of overlap between categories. For example, trying to apply a principle to a new situation can be a form of elaboration, thereby enhancing encoding, but it can also be a way to help monitor one's understanding of the principle to see if further study is needed. This interdependence among strategies makes them very difficult to study, particularly when the researcher attempts to isolate the effects of just one type of strategy. The problem is similar to teaching students about a car. Although we discuss separately the ignition system, the braking system, the steering system, and so forth, we know that driving a car is an integrated activity composed of many subskills and requiring varied knowledge. The emergent properties of the integrated system that represents driving a car, however, are too complex to present. It is the same with the strategies that underlie a systematic approach to studying and learning. The whole is too complex to teach or use for conceptual guidance in research so we reduce it for utility and lose several degrees of precision.

Affective Strategies

Affective strategies help to create and maintain suitable internal and external climates for learning (Dansereau et al., 1979; McCombs, in press; Palmer & Goetz, in press; Weinstein & Underwood, 1985). Although these strategies may not be directly responsible for knowledge or skill acquisition, they help to create a context in which effective learning can take place. Examples of affective strategies include using relaxation and

positive self-talk to reduce performance anxiety, finding a quiet place to study to reduce external distractions, and establishing priorities and setting a time schedule as a way to reduce procrastination. Each of these methods is designed to help focus the limited processing capacity of the human information- processing system on the learning goal. Eliminating both external and internal distractions contributes to enhanced attention and concentration.

Learning Strategies Assessment

The rapidly expanding interest in learning strategies assessment is the result of several causes. Among them is the increasingly large numbers of academically underprepared or disadvantaged students entering post-secondary institutions. In response to this influx of students with special needs, many institutions have created special programs to address academic deficits (Noel &Levitz, 1982; Weinstein & Underwood,1985). However, the successful implementation and evaluation of training programs and courses designed to teach learning strategies requires reliable and valid means for measuring students' entry level deficits and their progress. Having the means to diagnose student deficits could contribute significantly to the design of instruction and having the means to monitor progress and course outcomes could contribute significantly to evaluating and improving the effectiveness of the training.

Another reason for the increasing interest in the area of assessment relates to both basic and applied research interests in information processing. The measurement issue in cognitive research is a major

stumbling block to progress (see Garner, in press, for a discussion of this issue). Since cognitive researchers focus on topics that reflect processes that are usually not available to direct measurement, indirect forms of assessment must be developed for more precise research hypotheses to be amenable to study. In response to this need there has been a renewed focus on variations of self-report methodologies that could be used to help gather data about covert strategies.

Approaches to Assessment

One result of the pressures for the creation of useful assessment methods has been the development of a number of instruments designed to measure varying aspects of learning strategy use. Many of these instruments build on the measures that were created to assess students' study practices. Several of these measures are available commercially. A review of a subset of both commercially published as well as developmental or research instruments indicated that many of them concentrate on quite traditional areas of study skills such as note taking, study attitudes towards school and learning, text marking, and test taking (Schulte & Weinstein, 1981; Weinstein, Zimmermann, & Palmer, in press). The specific topics included in these measures are highly variable. This is, in part, a reflection of the definition problem discussed earlier and, in part, a reflection of the relative importance attached to different skills by different authors. Generally, the format used for these instruments requires some type of self-report response. While the data reported for

many of these instruments are quite limited, reliabilities are usually found to be in the acceptable (Anastasi, 1976) range of .80 and above. However, many of the subscales, particularly those that are relatively short, are often found to have somewhat lower reliabilities (.46 to .93).

Since the purpose of many of these measures is to either predict academic performance, counsel students about their study skills, or screen students for entry into or exit from remedial courses, they often used what Svensson (1977) called a "correlational approach." This method of item selection and instrument design emphasizes behaviors, thoughts, and activities that correlate with successful studying but that may not be the direct causes of successful learning and achievement. (For example, many successful students may keep their desk tops clean but that does not necessarily mean that students can raise their grades by cleaning their desks!) Thus, many of the items on these inventories have little use for someone interested in using them as a basis for remediation or for forming the basis for experimental interventions. Many of the authors of these measures selected or created items on the basis of how well they distinguished between students with high and low grade-point averages who had similar IQ and achievement test scores (Brown, 1964; Brown & Holtzman, 1967; Carter, 1985; Christensen, 1968).

Given the way many of the items on study skills instruments are selected, they tend to yield limited information about how students study or learn. Rather, the emphasis tends to be on either historical or preference information, or correlational factors that stress the conditions under which students study. This approach is quite different from what Svensson (1977) called a "functional approach" that stresses identifying

differences in how students learn that directly seem to affect learning outcomes and academic achievement. It was this approach that guided the development of the Learning and Study Strategies Inventory (Weinstein, Schulte, & Cascallar, 1983; Weinstein et al., in press).

The LASSI

The Learning and Study Strategies Inventory (LASSI) was developed as part of the Cognitive Learning Strategies Project at the University of Texas at Austin. Given the problems identified with previous instruments, an attempt was made to create a measure that could be used for diagnosis and that could facilitate the design of remedial learning strategies instruction. Thus, the focus was on either covert or overt thoughts and behaviors that relate to successful learning and that could be altered through educational interventions. In addition, an attempt was made to emphasize items that reflected the functional approach of Svensson.

The earliest step in the development of the LASSI involved analyzing the instruments reviewed by Weinstein and Schulte (1981). This work was supplemented by a review of 47 study skills books, manuals, and program or curriculum guides (see Weinstein et al., 1983 for a description of this developmental work). The topics and subtopics identified in this process were subjected to repeated reviews and analyses using expert judges to create a categorical scheme that could be used to guide item creation or selection. These initial categorical schemes were used to create the item pools from which the final items were eventually selected.

Sources for the initial item pool included published, unpublished, and

experimental instruments, researchers and practitioners in the area of learning strategies, staff members on the project, and psychometric consultants. This first pool of 645 items was trimmed down as a result of several analyses and a variety of pilot and field studies. A wide variety of item elimination criteria were used, including correlations with grade-point average, correlations with the Marlowe-Crowne Social-Desirability Scale, and item content that stressed specialized skills such as creating a bibliography or vocabulary building. Redundant items and those which elicited a very narrow range of responses were also eliminated.

As a result of these steps, a version of the LASSI containing 90 items was constructed. One of the first studies conducted with this instrument examined its test-retest reliability. Ninety undergraduates from an introductory educational psychology course completed the LASSI on two different occasions, separated by a 3- to 4-week interval. The students were given 45 minutes in which to complete their task. A test-retest correlation of .88 for the total instrument was obtained.

Using this version of the LASSI, a set of ten scales measuring different clusters of learning strategies and study attitudes was developed. This process was accomplished by a team of expert judges using several iterations of a modified Delphi technique and by analyses of the scale structures. (See Table 1 for a sample of the items from each of the scales). The topics covered by the ten scales are: anxiety, attitude,

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Insert Table 1 About Here

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concentration, information processing, motivation, scheduling, selecting the main idea, self testing, study aids, and test strategies.

The Anxiety Scale focuses on the degree to which students worry about school and their performance (cf. Entwistle's discussion of fear and failure and the chapter by McCarthy and Schmeck in the present volume). Do students worry so much that it is hard to concentrate? Are they easily discouraged about grades? Are they nervous even if they are well prepared for a test? The Attitude Scale contains items addressing attitude and interest in college. Is school important and worthwhile to the students? How clear are they about their own educational goals? (Once again, see the chapter by Entwistle and the one by McCarthy and Schmeck in this volume for related discussions.) Concentration items focus on students' ability to pay close attention to academic tasks. Are they easily distracted? Can they focus their attention (cf. McCarthy and Schmeck, this volume)? The Information Processing Scale contains items addressing a number of different areas. In fact, studies are currently under way to examine how this scale might be subdivided to provide more useful diagnostic information so that more specific remediation might result. Currently, the areas addressed include the use of imaginal and verbal elaboration, comprehension monitoring, and reasoning.

The next scale is called Motivation (cf. Entwistle, this volume). The items on this scale address willingness to work hard, diligence, and self-discipline. Do the students stay up-to-date in class assignments? Do they easily lose interest in their classes? Items on the Scheduling Scale examine students' use of time management principles for academic tasks. Are they well organized? Do they anticipate scheduling problems?

Selecting The Main Idea items address students' ability to pick out important information for further study. Can they focus on the key points in a lecture? Can they decide what to underline in a textbook? The next scale, Self Testing, focuses on reviewing and preparing for classes and tests. Most of the items deal with some aspect of comprehension monitoring. Do the students review before a test? Do they stop periodically while reading to review the content? Items on the Study Aids Scale examine the degree to which students use support techniques or materials to help them learn and remember new information. Do they complete practice exercises and sample problems? Do they use or create organizational aids? The last scale, Test Strategies, focuses on students' approach toward taking tests and examinations. Do they prepare appropriately? Do they try to tie the material together?

As can be seen in Table 1, the number of items in the various scales ranges from a low of four to a high of seventeen. Part of our current work involves adding new items to the scales that currently have less than eight (Attitude, Scheduling, Select Main Idea, and Self Testing). In addition, the subdivision of the Information Processing Scale and the addition of new scales is also being examined.

A number of studies have been conducted to examine the psychometric properties of the LASSI. The data from a total of 783 incoming freshmen at a small private college in the eastern United States were used to calculate coefficient alphas for each of the subscales (see Table 1). The resulting coefficients ranged from a low of .60 to a high of .89, with the low coefficients associated with the scales having the fewest number of items. (This is one of the reasons that additional items are being

developed for these scales.) These data were also used to develop a preliminary set of norms for the various scales. In a study presently underway, data from approximately 800 students from the entering class in a large public university located in the southwestern United States is being used to validate these results. Only preliminary data are available, but the results are very encouraging. Thus far, only minor differences have been found for the alpha reliabilities and norms of the scales. This high degree of agreement indicates a high degree of stability in these data.

Test-retest reliabilities for the scales have also been obtained. Using the sample of 96 students previously described, and a 3- to 4-week interval, the data set was created. The reliability values ranged from a low of .64 to a high of .81 (see Table 1). Again, the scales with the lowest reliability coefficients were the ones that also contain the fewest number of items.

The validity of the LASSI has been examined using a variety of approaches. When possible, the scale scores have been compared to other measures, or scales, assessing similar factors or constructs. For example, scores on the Information Processing Scale of the LASSI were correlated with scores on the Elaborative Processing Scale of Schmeck's Inventory of Learning Processes (Schmeck, in press; Schmeck, Ribich, & Ramanaiah, 1977). The correlation was .60. Another approach has compared the scores on some of the LASSI scales to appropriate performance measures. For example, scores on the Select Main Idea Scale were compared to scores on classroom tasks involving identifying the main ideas in a series of textbook and reading selections. Correlation coefficients of .40 and above have been obtained.

The final approach used to obtain validity data relates to the purposes for which the LASSI was originally designed. This approach has concentrated on how successfully the LASSI can be used by practitioners and teachers in post-secondary settings. Professors, counselors, advisors, and developmental specialists at more than fifteen different locations in the United States and Mexico have used the LASSI on a trial basis. Thus far, the results have been very encouraging. Users report few, if any, administration problems and a high degree of usefulness.

Part of the motivation for developing the LASSI was the need for a valid and reliable assessment method for use in both the research and the development activities that are conducted as part of the Cognitive Learning Strategies Project. In particular, there was a need for an instrument that could be used to diagnose the strengths and weaknesses of students who participate in the learning-to-learn course developed to test out the research in a real-world setting. This course, which will be described in more detail in the next section, has also been used to help establish user data for the LASSI.

Learning Strategies Training (Post-Secondary)

Learning strategies training programs have been developed for a variety of reasons. Often, they are used by researchers to investigate the effectiveness of strategy components or interactions among components. These programs are also used to examine instructional procedures, transfer, and generalization of strategy use. Finally, they are often

developed as part of a larger remedial or enrichment program for educationally disadvantaged or underprepared students.

Approaches to Learning Strategies Training

A number of different methods have been used to implement learning strategies training at the post-secondary level. The first method, embedded instruction, concentrates on incorporating learning strategies training into existing educational materials, particularly print materials and workbooks (e.g., Jones, in press; Jones, Amiran, & Katims, 1985; Sticht, 1979). Jones' work, in particular, has involved teaching, reinforcing, and cueing the use of strategies from all eight categories in the materials developed as part of the Chicago Mastery Learning Reading Program and as part of the Basic Skills Program of the United States Army. These creative materials have been repeatedly field tested and found to contribute significantly to the reading comprehension of the students involved. Embedded curricular materials are most effective when there are very large numbers of students to teach, problems with frequent teacher turnover or reassignments, or too few qualified instructors for the number of students requiring instruction. When these conditions do not apply, the heuristic nature of learning strategies indicates that they could be taught best in a more direct fashion using a teacher, aide, or developmental education specialist. The following method uses this latter approach.

Another approach uses existing instructional interventions to teach learning strategies. Unlike the embedded approach, the use of a

metacurriculum to teach learning strategies involves teaching them along with the regular content material in existing classes or training programs (Weinstein, 1982). The instructor uses methods that demonstrate, cue, and reinforce the acquisition and use of strategies from all of the different categories. It is a metacurriculum in the sense that it requires an analysis of the regular course curriculum and the learning demands that it places on the students.

Implementing the metacurriculum requires the instructor to integrate learning strategies instruction into the planned and unplanned activities that go on during class. For example, when assigning a textbook for a course, a teacher could pause and discuss the strategies one could use to preview and use a textbook. The assignment of a term paper or project is an excellent time to discuss time management. When using an analogy to help explain a difficult concept is a good time to also discuss elaboration, the role it plays in learning, and how students can use this method on their own. Notice that in each of these examples what is required is that the teacher use a planned or an unplanned activity to focus on the types of learning strategies that might be particularly effective to accomplish the relevant learning goal. By making this information explicit, explaining to students how to use the strategy, providing opportunities for practice and feedback, and periodically reviewing how various strategies can be combined to create an effective study system, instructors are implementing the metacurriculum.

Most researchers and practitioners have tended to use some form of adjunct approach to learning strategies training. Using an adjunct approach involves creating some form of supplementary instruction. This

can take the form of anything from a 2-hour workshop on a particular strategy to a semester-long course teaching strategies from each of the eight categories. Dansereau (1985, in press), McCombs (1981, 1982a,1982b, in press), and Weinstein (Weinstein, Butterfield, Schmidt, & Poythress, 1983; Weinstein & Underwood,1985) have all focused on creating adjunct programs for post-secondary students in job or college settings.

Many of the ideas and methods discussed so far in this chapter have been implemented in a three-credit lower-division learning strategies course created as part of the Cognitive Learning Strategies Project at the University of Texas at Austin. A description of the course, relevant evaluation data, and future directions for both research and development in this area will now be presented.

A Course in Individual Learning Skills

The learning strategies course offered at the University of Texas is part of the undergraduate program in educational psychology. Originally, the course was developed solely as a real-world laboratory to test out research findings described in the literature and from our own laboratory (Underwood,1982). Over time, the service aspect of the course became at least equally important. Currently, 35 sections of approximately 25 students each are offered each year. This does not meet the demand but it does exhaust our capacity to staff and support the sections. The type of student registering for this course is quite variable. However, the majority are lower-division students with either a history of academic

difficulties or students who have encountered problems in their studies at the University of Texas. Among the remaining students, many are advised to take this course in preparation for advanced studies or training.

The overall goal of the course is to help students to take more responsibility for their own learning. Strategies and skills from each of the categories identified by Weinstein and Mayer (1985) are presented (see the Appendix for a detailed overview of the course topics). A variety of instructional methods are used but the emphasis, given the procedural nature of much of the content, is on guided practice and feedback (Anderson, 1985; Gagne, 1985). To facilitate transfer, these exercises are taken from a wide variety of content areas and task types. To facilitate integration, the strategies are discussed in a cyclic manner. First, the instructor briefly introduces the strategy and identifies how it can be used to address a student-identified problem. This discussion is always related back to the model of the successful student presented at the beginning of the semester. Next, the key elements of the strategy are presented along with a few examples. Given the heuristic nature of most learning strategies, this is immediately followed by practice and feedback sessions so students can begin to incorporate the method into their repertoire. Over time, the use of the strategy is reviewed and its relationship to other strategies identified. This is designed to help the student form a more systematic approach to studying and learning rather than just providing a bag of tricks (cf. Schmeck's [in press] discussion of the need to encourage a "unified learning outcome").

The course is evaluated extensively. Part of the data for evaluation is obtained from the entry and exit measures administered to students.

This data includes scores on the LASSI, the Survey of Study Habits and Attitudes (Brown & Holtzman, 1967), the Trait Anxiety Inventory portion of the State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Luschene, 1970), the Test Attitude Inventory (Spielberger, Gonzalez, Taylor, Algaze, & Anton, 1978), and the Nelson-Denny Reading Test (Brown, Nelson, & Denny, 1973). In addition, information is also obtained from class examination scores, homework assignments, in-class activities, student journals, and practice exercises. We have also been able to run several studies that allowed us to obtain follow-up data on some of our students. Finally, the university has helped us to obtain copies of the students' course evaluation surveys.

The patterns we find in these data sets are very exciting. The course has consistently led to significant pre- to post- changes on all of the measures with the exception of the Trait Anxiety Inventory. This result was expected and predicted, however, due to the nature of the underlying construct. The encouraging fact is that all of our other anxiety measures show a very significant improvement in student attitudes and reported decreases in anxiety-related performance problems.

These changes on the self-report measures are backed up by significant improvements on the performance measures. The quality of student work on the in-class and homework assignments shows definite improvement over the course of the semester (as judged by a team of outside experts). Scores on the Nelson-Denny Reading Test show improvements ranging from 14 to 34 percentile points. Finally, there are significant increases in academic grade-point averages compiled from the students' regular coursework (after controlling for the normal increases

one would expect as a function of time). Indirect evidence for the effectiveness of the course is also provided by the current increase in student enrollment (the course originally had 4 sections per year instead of 36) and the reports of academic advisors from a variety of departments at the university.

In addition to being used to help with prescriptions for individual students, these data are also used to guide the continuing development of the course. For example, data from the LASSI indicated that more instructional emphasis was needed on information-processing strategies, and early data from the Test Attitude Inventory indicated that a component focusing on coping with performance anxiety needed to be expanded.

Concluding Comments

The work described in this chapter is still in a relatively early stage of development. Cognitive and educational psychologists have much to learn about the processes and knowlege needed for effective learning. The categorical scheme derived by Weinstein and Mayer (1985) was meant more to stimulate thought about this area than as a definitive classification. While it summarizes our current state of knowlege, there are many weaknesses. For example, how can strategies be tied to content domains? Many researchers and theoreticians now believe that both generic and content domain-dependent strategies must be identified and taught (e.g., Gagne, 1985; Glaser, 1984).

There are also many unsolved problems in the area of assessment. It will be hard for cognitive psychologists to continue to contribute significantly to educational needs unless we can improve our ability to measure, no matter how indirectly, the underlying mediational mechanisms that affect final performance. Continuing research into the development of diagnostic instruments, such as the LASSI is a step in that direction.

Finally, the need for courses or educational experiences that focus on the development of student learning strategies will remain for years to come. The changing demographics of higher education lead to widespread predictions that more and more students will enter post-secondary settings with an inadequate academic background. Since many academically disadvantaged and underprepared students evidence serious learning strategies deficits, it will be crucial that remediation and enrichment be provided.

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APPENDIX

Course Topics

UNIT: Successful Learning

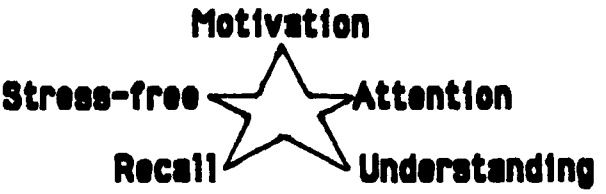
Part One: Becoming a Successful Student

Part Two: Training Your Mind

1. There are certain skills, behaviors and attitudes that distinguish successful learners from those who are not so successful. Part One of this unit describes the characteristics of a successful learner and focuses on a model that can aid students in dealing effectively with academic dissatisfactions. This model of a successful learner incorporates the following variables: motivation, attention, understanding, recall ability, and reduced stress (see "Handout" below).

2. The ability to encode and recall information is a skill which can be developed and improved. In part two of this unit the student is introduced to elementary principles of learning and cognition that lead to a discussion of the differences between rote learning and meaningful learning. These include ways to generate (for oneself) interest in a topic area, the importance of distributed practice and review, how to decide upon goals for learning, connecting new information with existing knowledge, relating new information to everyday life experiences as much as possible, and applying new information. These suggestions provide the student with an appropriate framework for becoming an active learner and for using cognitive learning strategies drawn from information processing models.

HANDOUT: Becoming a successful student



There are certain skills. . .
There are certain behaviors. . .
There are certain attitudes. . .
that distinguish successful learners from those who are not so successful.

If you learn these skills and behaviors and attitudes--and practice them--then you too can be successful in school.

What exactly <u>are</u> the characteristics of A Successful Learner?

1. Motivation--The successful student has an inner drive that makes him or her want to do well. S/He accepts responsibility for doing his/her own learning, and when s/he does succeed s/he knows it was because of his/her own efforts. S/He succeeded because s/he wanted to, because s/he tried his/her best, and <u>luck</u> had <u>nothing</u> to do with it.

2. Attention--A successful learner also is able to pay attention to what is going on at the moment. Instead of daydreaming about yesterday or thinking about what s/he's going to do tomorrow, s/he can concentrate all his or her attention on school-related tasks. S/He will ignore or reduce outside distractions. If his/her roommate insists on playing the stereo at 120 decibels, then someone who is determined to learn his/her homework or do his/her reading will go to the library or someplace where s/he isn't interfered with.

3. Understanding--The successful student also makes an effort to understand the ideas presented in school. When s/he realizes s/he doesn't know enough about a topic to understand it, then s/he gets help, either from the teacher or by talking to other students or by doing some more reading.

4. Recall--A successful learner also is able to recall, and remember, the knowledge, main ideas and principles that s/he needs to know. S/He does this by using the learning strategies that s/he has either learned on his/her own--or has been taught to use in a class similar to this one.

5. Relatively Stress-free--In addition, the successful learner can do all this in a relatively relaxed way--hopefully without too much worry, too much frustration, or too much anxiety.

UNIT: Time Management

Part One: Scheduling

Part Two: Procrastination

1. There are many demands made on a student's time. The emphasis of this unit is to help students structure time so that activities necessary for academic success are accomplished, and there is still time for personal and leisure activities. The value of scheduling and its effect on stress reduction are discussed in this context. Suggestions are given for setting goals, getting organized, establishing study routines, and studying "on the run." Several different types of scheduling are then demonstrated. These include: 1) a personal activities diary, 2) weekly and monthly academic scheduling forms, 3) "to do" lists, and 4) the "COPE" system (Margaret R. Barr, Center for Teaching Effectiveness, University of Texas, Austin, Texas, undated xerox copy).

2. Procrastination is a major obstacle to good time management. Factors that aid and abet procrastination (for example, inappropriate commitments, perfectionism, and self-deception) are dealt with, but the emphasis is on ways and means to overcome the habit of procrastinating. Procedures for

reducing this habit range from the behavioral (e.g., a reward and punishment system) to the cognitive (e.g., establishing positive self-talk).* Additional procedures include written reminders, the five-minute plan, and setting realistic goals. Students are encouraged to deal simultaneously with the behaviors, emotions and cognitions attached to procrastination.

UNIT: Problem Solving

Dealing with academically-related problems is often confusing and overwhelming for the target student population. In this unit students are presented with a problem solving model that will help them deal more effectively with their school-related problems. The seven-step process includes: 1) accepting responsibility for taking care of the problem and being accountable for actions taken; 2) collecting and examining information about the problem; 3) defining what the actual problem is; 4) generating ideas for solving the problem; 5) choosing a plan of action; 6) taking the action; and 7) evaluating whether or not the action taken was effective in solving the problem. Students implement this model over a period of seven weeks and turn in a progress report for each step.

UNIT: Cognitive Learning Strategies

Most current models of information processing suggest that it is necessary to process information at a "deep" or "semantic" level if there is to

*Materials adapted from: Ellis, A., & Knaus, W. J. Overcoming Procrastination. New York: New American Library, Inc., 1979.

be adequate understanding, retention, and recall of information. In accordance with this notion, students are presented with a rationale for using the following cognitive learning strategies: imaginal elaboration, verbal elaboration, and organizational strategies, such as grouping. The characteristics of each strategy are discussed, and students are provided with practice exercises. This material is also related to current conceptions of knowledge acquisition, such as schema theory.

In addition, contrasts are drawn between primary and support strategies. Primary strategies are operations performed on the materials to be remembered. These may range from purely cognitive strategies such as imagery and verbal elaboration to more mechanical strategies such as note-taking and highlighting of textual materials. Support strategies are methods that help the learner maintain a suitable psychological climate for learning or help establish an appropriate learning attitude. These strategies may range from techniques for coping with loss of concentration to the use of physical relaxation routines. Students are also asked to think of ways that the two types of strategies may be used in combination to build a strong study system.

UNIT: Concentration

Concentration is a difficult skill to present because it is a by-product and only happens when we do not think about it. However, the habit of concentration can be developed through self-discipline and practice in becoming actively involved in studying and learning. Discussion revolves around strategies for focusing attention such as highlighting, note-taking, and outlining, and many cognitive strategies for increasing level of

involvement, such as relating the material to-be-learned to already-learned information, organizing it, and generating interest through questioning strategies.

Attention is also given to the relationships between concentration and metacognitive awareness as well as between concentration and the learner as an active processor of information.

UNIT: Listening

The focus of this unit is listening for important information and understanding in an academic setting. It is necessary for students to become active listeners by improving their listening habits, by learning what to listen for, and by becoming involved with the speaker. Differences between hearing and listening are noted, and students are asked to think of good listening as an active process. Several listening problems such as close-mindedness, paying false attention, and daydreaming are discussed, and relevant "cures" for such maladies are presented. These cures include learning how to prepare to listen, becoming aware of the speaker as an individual with information to share, noting and asking relevant questions, thinking ahead, and looking beyond the speakers' mannerisms and idiosyncracies to the content of the message.

UNIT: Selecting Important Ideas

This unit deals with differentiating important from supporting information. A discussion of organizational schemes used in written materials provides a framework for information on using context, using the

author's signs and signals, and recognizing key ideas in reading passages. Also emphasized are the ability to recognize different styles of writing, the different places topic sentences may be found, and the importance of flexibility when trying to determine main ideas. These skills are also related to listening activities.

UNIT: Note-taking

Nearly all students take notes. This unit integrates what the student has learned about good listening skills and finding important ideas with techniques for efficient note-taking (see examples below).

Effective utilization of notes is also discussed in some depth with an emphasis on thinking about and summarizing key ideas, as well as immediate and periodic reviews.

Note-taking

1. Get a written record of each class.
2. Read your textbook in ADVANCE.
3. Use a note-taking system (e.g., modified Cornell model).
4. Use a modified outline form.
5. Watch for signals of importance (e.g., gestures, key words).
6. Write down examples.
7. Write down connections between ideas.
8. Leave blank spaces for what you miss.
9. Don't stop taking notes toward the end of class.
10. Review as soon as possible after class.

UNIT: Text-marking and Outlining

Concentration, attention, and recall are improved only when thinking precedes marking, highlighting or outlining of the textbook. In Part One of this unit, methods for selecting important ideas are reviewed, and a procedure for active text-marking is presented. This procedure emphasizes the value of thinking before marking, the summarization of graphic data, and the identification of relationships among major ideas.

Part Two of the unit is a brief overview of an outlining system. Discussion centers on the major ways that an author may develop a topic, connecting details to major points, and the proper notation for formal outlines.

UNIT: Pre-, During-, and Post-Reading Strategies

Good reading comprehension is a crucial skill at the college level. This unit describes processes for developing good reading comprehension as well as techniques for improving speed and flexibility.

A comprehensive study-reading system involves three stages: 1) a preview, which provides a framework for understanding what the author is writing about; 2) active reading, in which the learner engages in conscious, purposeful, elaborative reading; and 3) a post-reading stage (review), in which the learner evaluates the knowledge gained from the reading and ascertains whether or not there are still gaps in her knowledge.

Reading speed and flexibility are other important skills for students, since many have never learned to vary the way they read to suit the material. A

review of organizational schemes used by writers, skimming and scanning exercises, and opportunities to practice are provided to help students increase reading flexibility.

Note: Much of the material already presented in the course is actively and directly integrated into this section.

UNIT: Reading Comprehension/Comprehension Monitoring

Poor learners often do not recognize that they have failed to comprehend material being studied. In addition, even if they do recognize their lack of understanding they may not know how to correct the situation. In this unit students are taught to deliberately analyze their understanding of materials being studied, and whenever comprehension is incomplete, to switch to a more effective processing strategy.

Several strategies useful for monitoring comprehension and active processing are presented. Examples include: 1) paraphrasing or interpreting difficult passages into the learner's own terms; 2) formulating questions and answers about the material; 3) rehearsing an explanation of the material that the learner might give to a fellow student; and 4) using strategies to aid comprehension, such as using visual imagery to picture how all the information ties together.

Note: Much of the previous material is integrated into this section.

UNIT: Stress, Sanity, and Survival in Academia

Many times students' grades do not reflect their actual abilities, and a major factor is often stress. They get anxious at test time, feel

overwhelmed by the amount of work expected of them, or panic because they feel inadequate to accomplish many tasks. The focus of this unit is on how to manage stress in an academic setting. An overview of a model for handling stress is introduced. The model presents stress as a condition that results from our perceptions and/or beliefs about certain events. This allows.us to gain and maintain some control over how we choose to react to situations, thus reducing the amount of stress experienced.

Ways that stress may be reduced include changing the situation at an environmental level, weakening the connection between the event and physiological/emotional arousal; and changing irrational beliefs, assumptions, and ineffective ways of thinking to be more reality-oriented. Techniques for staying task-oriented and exchanging negative self-talk for positive self-talk are also presented.

UNIT: Test-taking Skills

Exams are an integral part of academic life. Many students face them with a do-or-die attitude and not much else to help them through. In this unit successful preparation and test-taking techniques for both objective and essay tests are presented.

First, a general explanation of how to review for exams is given. The discussion that follows centers on how to study for and take objective tests and how to study for and take essay exams. In the second part of the unit the focus is on a discussion of several related topics. These include "reasoning through to an answer," "test-wiseness principles," "factors influencing failure," "cramming," and "how to make a study-plan guide."

UNIT: Reducing Test Anxiety

This unit is introduced with an unannounced pop quiz. This generates an extremely active discussion in which feelings of hostility and negative thoughts about testing are discussed by the students. The instructor uses his feedback from the students to provide examples of how negative self-talk and self-orientation can keep students from doing their best work on exams.

The rest of the lesson is devoted to a discussion of the components of test anxiety and several cognitive and behavioral techniques that can be used before and during an evaluative situation to reduce anxiety to an endurable or less interfering level. These techniques include actively challenging irrational and negative types of thinking, the practice of thought stopping, how to overcome blocking, using physical relaxation and mind-quieting exercises, and the practicalities of being well-prepared for any exam.

Table 1

Sample Psychometric Properties and Three Sample Items for Each of the LASSI Scales

Scale (# of items)	Test/Retest Reliability	Alpha Reliability
ANXIETY (10)	.81	.82
Sample Items	1. Worrying about doing poorly interferes with my concentration on tests. 2. When I begin an examination, I feel pretty confident that I will do well. 3. Even when I'm well-prepared for a test, I feel very anxious.	
ATTITUDE (4)	.64	.60
	1. Success in school is very important to me. 2. I feel confused and undecided as to what my educational goals should be. 3. In my opinion, what is taught in my courses in not worth learning.	
CONCENTRATION (8)	.80	.82
	1. I often find that I have been reading but don't know what it was all about. 2. I concentrate fully when studying. 3. I find that during lectures I think of other things and don't really listen to what is being said.	
INFORMATION PROCESSING (17)	.79	.88
	1. I try to find relationships between what I am learning and what I already know. 2. When I study I try to somehow organize the material in my mind. 3. When having difficulty recalling something, I make an effort to recall something else that might be related to it.	
MOTIVATION (14)	.79	.87
	1. I read the textbooks assigned for my classes. 2. I hurry my assignments trying to get them out of the way rather than doing a good job. 3. I seem to be able to find all kinds of excuses for not studying.	

Scale (# of items)	Test/Retest Reliability	Alpha Reliability
SCHEDULING (5)	.77	.69

Sample Items

1. I only study when there is the pressure of a test.
2. I make good use of daytime study hours between classes.
3. At the beginning of a study period I organize my work so that I will use the time most effectively.

SELECTING MAIN IDEA (4)	.64	.61

1. My underlining is helpful when I review text material.
2. I have difficulty identifying the important points in my reading.
3. Often when studying I seem to get lost in details and "can't see the forest for the trees."

SELF TESTING (5)	.66	.65

1. I stop periodically while reading and mentally go over or review what was said.
2. I go over homework assignments when reviewing class materials.
3. I seldom review except just before tests.

STUDY AIDS (8)	.70	.69

1. I do not work through practice exercises and sample problems.
2. When they are available, I attend group review sessions.
3. I make simple charts, diagrams, or tables to summarize material in my courses.

TEST STRATEGIES (13)	.79	.83

1. I think through the meaning of test questions before I begin to answer them.
2. I have difficulty adapting my studying to different types of courses.
3. When I take a test, I realize I have studied the wrong material.