Educational Psychology Review, Vol. 9, No. 1, 1997

Some of the Reasons Why Preparing for Exams Is So Hard: What Can Be Done to Make It Easier?

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Why it is so difficult to prepare for academic exams is reviewed with respect to recent research. Textbooks, teaching, and information processing characteristics of students all contribute to undermining effective learning and review. Recommendations are made about how instructors can make it easier for students to review and appraise their test readiness, as well as about how students can make a difference in the quality of their own preparations for tests.

KEY WORDS: studying; teaching; information processing; learning strategies.

INTRODUCTION

A common question to a college professor is, "How can I prepare for your exam?" Here is an answer that might be offered to a student making such an inquiry. "Read the textbook critically with an eye toward learning the important points in the text. Often in class, I will highlight key points covered in the text. Make certain you note those points and go back to the text to study that material carefully. Relate what we are covering in the class to what you know already. When you are reading the text or looking over your notes, make certain you understand the points being made and self-assess whether you are ready for the type of test I give."

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1040-726X/97/0300-0001$12.50/0 © 1997 Plenum Publishing Corporation

After hearing this response, a student might mimic John Astin's Gomez character from the Addams Family television series, "And now, you know." Of course, the implication is that the professor's recommendation was difficult or impossible to carry out effectively.

In fact, preparing for tests often is very difficult for students. Thus, the first part of this article takes up the multiple challenges in preparing for academic examinations. In the second part, we discuss insights that are emerging from the literature about how to improve students' abilities to prepare for academic examinations. Even with these advances, however, much has to change for test preparation to become easier.

Although most of the evidence reviewed here was generated with respect to secondary and higher education, when there is important complementary evidence with younger students, it is presented. The type of class we envisioned as we constructed this article was a typical textbook- and lecture-driven undergraduate course. Although our own predilections are to favor more innovative approaches to instruction, we do not expect the traditional model to end anytime soon. Hence, it is appropriate to analyze the textbook-and-teacher approach. Throughout the article, we point out research challenges and opportunities that remain, for there is much to be learned about making test-taking easier for students.

CHALLENGES TO EFFECTIVE TEST PREPARATION

Getting ready for an exam is difficult for a number of reasons. When inconsiderate textbooks and inadequate teaching are offered to students who are not especially good information processors, the frequent result is students who are in no position to review effectively for upcoming exams.

Inconsiderate Texts

The textbooks that students read in preparation for examinations often are dreadful. For example, The Committee on High School Biology Education (1990), comprised of elite scientists and science educators, concluded that just about everything that could be wrong with contemporary biology textbooks is wrong with them. The books are encyclopedic, attempting to mention everything, and are filled with many new terms. Often, the texts are not factually accurate and can conflict with information presented in class. Many school text authors do not understand biology well enough to explain the ideas covered in the texts they write. The books are often illogical and incoherent (see also Sutman, 1992) and much less organized

than they could or should be (e.g., Chambliss and Calfee, 1989). The writing does not prompt the reader to relate information in the text to prior knowledge, nor are related points covered in various parts of the text related well to one another (see Britton, Gülgöz, and Glynn, 1993a). Illustrations are often decorations rather than explanatory (Levin, 1982; Woodward, 1993), and often do not clarify important concepts or make important points more memorable (Levin and Mayer, 1993). The readability of texts often is mismatched to their intended students. Many texts are boring.

Textbook Difficulty Relative to Students' Reading Ability. Even excellent readers might have difficulties with such books, if they could stay awake to get through them. Unfortunately, in general, high school and college students are not excellent readers, a point we expand on later. In any case, every college classroom has students varying in reading ability. Thus, in most courses, the reading levels of a course textbook are above the reading levels of at least some students who must use it.

Inadequate Teaching

Teachers vary in how well they convey course information and expectations to students. Teaching makes a huge impact on the ease with which students can prepare for examinations.

Difficulties in Notetaking from Inconsiderate Teachers. Notetaking in class is an almost universal experience in high school and college (Hartley and Marshall, 1974; Nye, Crooks, Powley, and Tripp, 1984; Palmatier and Bennett, 1974) and is the primary means of creating a record of information presented in classes (Suritsky and Hughes, 1991). Such notetaking is valuable, for information recorded in notes is much more likely remembered later than content not noted (Aiken, Thomas, and Shennum, 1975; Bretzing and Kulhavy, 1981; Kiewra and Fletcher, 1984). Notetaking promotes learning during class and facilitates later review (Divesta and Gray, 1972). It can help students connect lecture content with their prior knowledge (Peper and Mayer, 1986) and detect the underlying structure of information presented in class (Einstein, Morris, and Smith, 1985).

It is often difficult to create excellent notes, however. Particularly relevant to this point is van Meter, Yokoi, and Pressley's (1994) ethnographic interview study about notetaking. The University of Maryland students in their study reported many challenges to the creation of high quality notes. One challenge came from inconsiderate teachers who present material too fast for their students to understand, are vague, and/or

are disorganized in their teaching. Some teachers fail to separate the points they are making. Some fail to stick to lecture and/or course outlines. Poor teachers fail to signal important information — for example, by not placing it on the board, slowing down for emphasis, or repeating important points. The Maryland students reported that the notes produced in courses with inconsiderate lecturers were much less valuable in test preparation than notes produced in courses with considerate lecturers.

The Maryland students also perceived that it takes awhile to learn how to take notes. They believed that students learn how to take notes within particular courses, making adjustments to the styles of particular professors and as the accountability demands in a course become more obvious (e.g., after an exam or two). The Maryland students also perceived that their notetaking skills improved over their college years. They felt that they became more selective and better organized note takers. If these perceptions are accurate, students particularly are at a disadvantage in preparing for tests early in a course relative to later and earlier in their education relative to later.

Failures to Specify Testing Demands. Examination demands play a large role in determining how and what students study and learn in a course (e.g., Fredericksen, 1984). Test performance, in turn, depends in part on awareness of upcoming test demands (see Lundeberg and Fox, 1991, for a review). Students beginning a course, however, often do not know what types of questions will occur on exams or how difficult the questions will be. Lack of knowledge about testing demands can undermine effective test preparation. For example, students report not knowing what lecture information to note until they have experienced an exam or two in a course (van Meter *et al.*, 1994).

Not-So-Good Information Processing by Students

Good readers use a variety of strategies to understand what they read, with these strategies regulated in part by metacognitive knowledge about when and where to use particular strategies. Good readers also monitor how well they are performing on a task, with their emerging understanding of their progress (or lack of it) important in their on-line decision making about whether to continue doing what they are doing or shifting to a new approach. Strategies are used in interaction with extensive, deep, and connected prior knowledge (Pressley and Afflerbach, 1995). Such good information processing is highly motivated, in part because good information processors believe that they are capable of performing the academic tasks presented to them, if they exert effort to use

effective strategies they are learning in combination with their content knowledge (Borkowski, Carr, Rellinger, and Pressley, 1990; Pressley, Borkowski, and Schneider, 1989). Unfortunately, such good information processing is anything but universal among students. We review here a number of ways that student information processing can fall short of what is needed to prepare efficiently and effectively for examinations in textbook-and-lecture courses.

Reading Strategy Deficiencies. Our understanding of how good readers construct meaning from text has improved dramatically in the past two decades. One methodology that has contributed greatly to increasing understanding of comprehension processing at its best is verbal protocol analysis of skilled reading. For example, in Wyatt *et al.* (1993), college professors read articles in their areas of expertise, articles directly pertinent to their work. They talked aloud about what they were doing and thinking as they proceeded through text. University professors, in fact, do a great deal to understand what they are reading.

Every reader in the Wyatt *et al.* (1993) study flexibly applied a variety of strategies as they critically read articles. These included (a) anticipating/predicting information in text, (b) testing predictions as reading proceeded, (c) looking for information relevant to reading goals, (d) jumping forward and backward in text to find particular information, (e) varying reading style according to the relevance of text to reading goals, (f) paraphrasing/explaining what was in text, and (g) constructing conclusions or summary interpretations. In short, the social scientists that Wyatt *et al.* (1993) studied were extremely active readers.

Collapsing across all of the protocol analyses in the literature, as Pressley and Afflerbach (1995) did for the 40+ verbal protocols of reading studies to date, the case can be made that Wyatt *et al.*'s (1993) analysis captured reading at its best. That is, the strategies that were salient in Wyatt *et al.* (1993) emerged as important in Pressley and Afflerbach's (1995) analysis.

What is most relevant here, however, is that the strategic processing of students is much less extensive than the strategic processing of the very best readers, such as domain experts reading in their areas of expertise. No category of student in any study of protocol analysis ever duplicated the extensive use of strategies reported by Wyatt *et al.* (1993) or others who analyzed the reading of experienced professionals in their areas of expertise (e.g., Lundeberg, 1987). Thus, one reason students have difficulty preparing for a test is that students' meaning-construction strategies during reading are not nearly as extensive as the reading strategies of excellent readers.

Consider a dramatic example produced by Barbara Snyder (1988). University students were observed as they studied 12 pages of textbook material. After an initial reading, participants were permitted to restudy, and were asked to continue until they thought they could answer 80% of the questions on a multiple-choice test like those commonly administered in undergraduate courses. During the first reading, most students simply read the text from beginning to end. The most frequent type of restudy was nonselective rereading. Of course, this pattern of simple beginning-to-end reading and rereading contrasts substantially with the active reading documented in the studies reviewed by Pressley and Afflerbach (1995), but is consistent with other data documenting the rote nature of much of college student reading (e.g., Cordon and Day, 1996; Turner, 1992).

Background Knowledge Deficiencies. One important reason to go to school is to acquire knowledge. The implication of this is that students often lack extensive background knowledge that is relevant to what they are studying. Such lack of background knowledge has profound implications for test preparation. The more one knows about a topic, the easier it is to understand new information about the topic (Anderson and Pearson, 1984). Many processes critical to construction of understanding depend on prior knowledge, including the following: (a) Overviewing a text to determine what is important in it before beginning to read carefully requires knowledge of the topic of the text. (b) Selective attention to important information in a text during reading requires sufficient background knowledge to identify what is important and what is not important. (c) Predicting what is in a text and forming hypotheses about upcoming text, salient processes in effective reading, both depend on prior knowledge. Making a sophisticated guess about what is in text can only occur if there is a prior knowledge basis for guessing. (d) Information in text cannot be related to prior knowledge in the absence of well-developed prior knowledge. (e) Interpretations of text content are not possible without extensive knowledge that can be related to the new information in text. (f) Evaluations of text content cannot occur in the absence of a knowledge base permitting comparisons to other information. In short, without relevant prior knowledge, much less active and critical reading occurs, with the implication being that comprehension of to-be-understood and -learned material is impaired.

Notetaking during lecturing also depends in part on prior knowledge. van Meter *et al.*'s (1994) participants reported that notetaking was much easier in courses in which their prior knowledge was high, even in courses taught by inconsiderate lecturers. When prior knowledge is high, fewer notes must be taken, and there can be greater selectivity, focusing on new information in the lecture.

Prior knowledge is critical if students are to be successful in finding information they are searching for in texts, notes, or other documents. Symons and Pressley (1993) demonstrated that successful search of texts for information depended on prior knowledge. In their study, even if students were successful in finding the portion of text containing information that was being sought, recognition of the information sought depended on prior knowledge. That is, there were students who would find pieces of information they were seeking and then not realize they had found the information they were after (see also Grabe, 1989).

Failures to Use Prior Knowledge. Having background knowledge is one thing. Using it to understand and learn material that could be related to background knowledge is another. In recent years, the Pressley group has conducted a number of studies in which students have been asked to learn factual material, including material in factually dense text. In these studies, when students were induced to relate the text content by answering "why" questions pertaining to it, their learning has been higher (e.g., Woloshyn, Willoughby, Wood, and Pressley, 1990; Wood, Pressley, and Winne, 1990; see Pressley *et al.*, 1992).

Martin and Pressley (1991) conducted an analytical study isolating the cause of this effect: "Why" questions requiring students to justify to-be-learned relationships that are specified in text cause students to relate the information in text to prior knowledge much more extensively than students relate factual information to prior knowledge on their own in the absence of "why" questions. Woloshyn, Pressley, and Schneider (1992) provided additional data consistent with this conclusion. They demonstrated that when students lacked prior knowledge that could be related to new facts, attempting to answer "why" questions had very little impact on learning. In contrast, when students had relevant prior knowledge, instructing them to ask and answer "why" questions dramatically improved their learning. Students often do not relate what they know already to new content, when doing so would make learning much quicker and easier.

Transfer Appropriate Processing Deficiencies. Different types of tests call for different strategies in preparing for them, a principle that Morris, Bransford, and Franks (1977) referred to as transfer appropriate processing. Students often do not adjust their strategies to match testing demands, however, (Mayer, 1985; Woloshyn *et al.*,1992) and therefore, suffer from transfer appropriate processing deficiencies. For example, if an upcoming test focuses on memory of content, perhaps simply going over the material and pounding it in is a good-enough strategy. If, however, the test calls for application of information being studied and thus, real understanding of it, other strategies are more likely to pay off, ones that promote deeper understanding of content. For example, Bielaczyc, Pirolli, and Brown (1991) provided an especially compelling experiment

confirming that self-explanations can positively affect use of material read to solve subsequently presented problems. They taught college students to generate self-explanations about relations between examples and text as they read lessons concerned with LISP programming. This self-explanation instruction also included teaching students to use a series of self-questions aimed at increasing learner awareness of whether they understood the lessons and increasing ability at finding particular pieces of information in text and understanding ideas. Control subjects in the study spent the same amount of time attempting to memorize and recall the content of lessons. The most important outcome in the study was that self-explanation training improved students' abilities to apply the programming skills they had learned in the lessons to new problems — and the more self-explanations a student generated, the greater the application skill. There is a growing body of data substantiating that when students need to understand material, rather than just remember it, self-generating and responding to inferential questions about the material pays off (e.g., King, 1989, 1990, 1992). The outcomes in these same studies are consistent with the conclusion that college students typically are not engaging in such elaborative processes on their own.

But what if the exam is only a memory exam, as is often the case in college courses? Students should be informed that not all memory tests are alike. Although repeated reading might be sufficient to prepare for many types of multiple-choice tests requiring recognition of ideas (Ghatala and Levin, 1975), free recall demands more. In that case, the student must be able to retrieve and organize the content during the test. For that to occur, study must be much more active, including distillation of important points in a text, organization of them (e.g., with a conceptual map of the ideas in the text), and rehearsing the retrieval of the ideas (e.g., Ruddell and Boyle, 1989; Simpson, Hayes, Stahl, Connor, and Weaver, 1988).

In short, it is not enough to be strategic. Students must be appropriately strategic, matching the strategies they deploy to testing demands. Unfortunately, there is a lot of reason to believe that students, when they are strategic at all, often are transfer appropriate strategy deficient.

Mismonitoring of Understanding/Learning and Test Preparedness. Often people do not know that they do not yet know. Pressley *et al.* (1990a, b) provided dramatic demonstrations of this phenomenon. In their research, college students read short passages and were asked to report the main ideas immediately after completing their reading. Immediately after attempting to report each main idea, the student rated confidence in his or her response. Most of the time, the students, in fact, did identify correct main ideas. Most pertinent here, however, was that readers were almost as confident in their incorrect responses as in their correct answers, with their confidence high for both correct and incorrect answers to main idea questions.

The lack of awareness during learning from text observed by Pressley *et al.* (1990a, b) is not isolated. Indeed, a great deal of evidence suggests that adults' monitoring of text comprehension and learning is far from perfect. Students often do not know whether they have comprehended text, and they often do not know whether they are ready for a test over content covered in text (e.g., Epstein, Glenberg, and Bradley, 1984; Glenberg, Wilkinson, and Epstein, 1982; Maki and Berry, 1984; Pressley, Snyder, Levin, Murray, and Ghatala, 1987). Such lack of awareness undermines effective study, because knowing that one is not prepared for a test motivates additional study. Lack of awareness of which information is understood and/or already learned is a critical deficiency because it is hard to focus study on what is not yet learned when there is little awareness of which parts of the material have not been mastered already (see Pressley and Ghatala, 1990). Overconfidence about future test performance is common, especially when the demands of an upcoming test are well understood (Pressley and Ghatala, 1989). When the testing demands are not understood, preparing for a test is made even more difficult.

Search Inefficiencies. Even if a student knows that he or she does not know something that needs to be known, there is no guarantee that the student is able to find the information needed. John Guthrie and his colleagues (e.g., Guthrie, 1988; Dreher and Guthrie, 1990; Guthrie, Bennett, and Weber, 1991) have determined that search of documents — such as texts — is extremely complex, involving (a) forming a goal (i.e., knowing what one is looking for), (b) selecting the portions of a text to be searched, (c) extracting the relevant information, and (d) integrating the information found with other knowledge. High school and university students often fail to find information they are seeking in a textbook even though it is there (e.g., Dreher and Brown, 1993; Guthrie and Dreher, 1990; Symons and Pressley, 1993). If the information that students need is not in texts but rather at the library, the search challenges increase, with many students inefficient in finding the articles and books they seek in the library (e.g., Kobasigawa, 1983). Not surprisingly, students are no more efficient in searching texts they consult in the library than they are textbooks (Nelson and Hayes, 1988). In short, preparing for tests is made difficult because students often have difficulty finding the information they need to know.

Anxiety. Some students are very anxious, with such anxiety impacting negatively on their study. One of the most important principles in cognitive psychology is that humans have limited conscious processing capacity — that only a very limited amount of information is held in consciousness at one time (Miller, 1956). Anxious students often cannot prevent thoughts of academic disaster from entering consciousness as they study — thoughts such as, "I'm

never going to get this," and "I'm having so much trouble." Such thoughts consume some of the limited short-term capacity that is available, capacity that might otherwise be used to study the material before them (e.g., Tobias, 1979, 1985). Moreover, high anxiety can motivate off-task behaviors. Doing anything other than the anxiety-producing activity is less emotionally aversive. There are clear individual differences in the ability to remain focused on a task, in the ability to shield out task-competing thoughts (Kuhl, 1984, 1985), with students who fail to do so often performing below their potential. For excellent analyses of how anxiety and emotions can disrupt academic performance, see McLeod and Adams (1989) collection of essays on affect and mathematical problem solving. Increasingly, both academics (see Baumeister, Heatherton, and Tice, 1994, especially Chap. 5; Wegner and Pennebaker, 1993) and the lay public (Goleman, 1995) are recognizing that smartness requires keeping emotions under control when tackling cognitively demanding tasks.

Low Motivation. Often students believe they cannot do well in a course. If the course is far in advance of their current levels of preparation, they may be right. An important self-regulation principle for students should be to place themselves in classes that are within reach for them. Consistent with many motivational perspectives, the classes should be enough beyond them to be challenging, but not so far beyond them that the demands cannot be met (see Chaps. 5 & 9, Pressley with McCormick, 1995a, b). We have seen enough instances of students getting in over their heads to know that one reason a student can have difficulties getting ready for exams is that she or he is mismatched in preparation to course level, with motivation to do the coursework declining as the mismatch becomes ever more apparent.

Other times the match between student preparation and course level is fine. Even so, competitive schooling environments imply to many students that they cannot do well in courses relative to others. Students often infer, or worse yet, are told explicitly, that ability determines achievement — ability that they seem to lack relative to classmates (see Nicholls, 1989). The result is a belief that achievement is out of one's control. Believing that one cannot do well on an upcoming test, and that there is nothing that can be done about it because of lack of ability, makes test preparation difficult.

Putting It All Together: A Bad Case Scenario

Consider this possibility. A freshman is enrolled in a course with a poorly written textbook and an inconsiderate lecturer, one who presents material quickly and in a disorganized fashion. The freshman is not much different from other freshmen, lacking strategic sophistication and coming to the course with little background knowledge in the subject area, with the result that much

of reading is accomplished by beginning-to-end reading and rereading. He or she keeps up with the assignments and perceives that the text and lectures are being understood. Even so, this student, who has a history of academic anxiety, is beginning to go crazy with apprehension. These feelings are intensified every time the teacher reminds the students in the course that they cannot really understand the material being covered. The professor is obsessed with the idea that the course covers content only accessible at a deep level to extremely intelligent people with an innate talent for working in the subject area, an innate ability that students in the course lack.

To make matters worse, the student prepares for the first exam, expecting a multiple-choice test. Unfortunately, the exam is essay, with the requirement that the student's own interpretations of course content be included in answers, based on his or her experiences that could be related to the course content. Not having related much of what was read or discussed in class to personal prior knowledge during original reading and restudy, and having given no thought to higher-order organizations in the material because of a focus on details in anticipation of a multiple-choice test, the student does poorly on the exam.

Armed with knowledge that subsequent tests will be essay tests, the student prepares more intensively for the next exam, really reading and rereading text and notes, believing that burning such ideas into the mind is the correct way to prepare for an essay test. This is despite the fact that the student knows from freshman writing class that the first step in preparing an essay is to plan it — that is, the student fails to transfer appropriately the essay organizational strategy learned in writing class to another context involving a different type of essay (i.e., short essay responses on an in-class exam). The student does not fully understand that different academic tests require different study strategies, and that strategies sometimes can be flexibly adapted and transferred from one academic task to a structurally similar academic task (e.g., from long essay writing occurring over several weeks, as in freshman writing, to preparation for short essay writing during a timed exam). The student blows the second exam, only able to get an unorganized collection of ideas into the blue book. The anxiety is intense during the exam and intensifies with every thought of the third exam.

We wish this were a straw man version of poor test preparation, but unfortunately, the student just described seems far too familiar. Although we know a great deal about how to re-engineer schooling and teaching and how to educate students so as to avoid the situation just described, doing so requires massive shifts in how students are educated. We review next just what is known about improvement of textbooks, improvement of teaching, and development of students that would reduce the numbers of students who experience great difficulties preparing for exams and performing poorly in school.

WHAT CAN BE DONE BY TEACHERS TO MAKE IT EASIER FOR STUDENTS TO PREPARE FOR TESTS?

Some things can be done in the short term by any teacher that helps students prepare for exams. Other changes require much more profound changes in American education and its institutions.

Textbooks

The transparent shortcomings of contemporary textbooks have stimulated many psychologists to think hard about how to redesign texts so that they are easier to read, understand, and use as a learning resource (see Britton, Woodward, and Binkley, 1993b; Ciborowski, 1993). The three approaches to textbook modification have been most supported by recent research (see Pressley with McCormick, 1995a, b, Chap. 14) are described in what follows in this subsection.

Text Connections and Elaborations. Because of advances in theories of discourse comprehension, a great deal has been learned about how to improve sentences and paragraphs so that relationships within them and between them are more obvious. That is, much has been learned about improving text connections and elaborations. For example, intersentential relationships can be flagged by repeating important words in sentences and flagging early in a sentence how the new idea presented later in the sentence is related to previous ideas introduced in the text (i.e., writing sentences so that given-new relationships are clear; Britton *et al.*, 1993a). Rather than assuming students possess background knowledge that permits them to make inferences that render the meaning of a text clear, information needed to understand key points in text can be stated explicitly, with the linkages between the background knowledge and the key points made very clear through elaborations and explicit connections (see Britton, Van Dusen, and Gülgöz, 1991; Britton, Van Dusen, Gülgöz, and Glynn, 1989; Duffy *et al.*, 1989; Graves and Slater, 1991). For example, a contemporary high school history text covering 1965 is probably not well written when it contains phrases like, "Air war in the North," at least compared to this more explicit phasing that does not require as much prior knowledge: "Air war in North Vietnam" (Britton and Gülgöz, 1991).

Text Signals. Relationships between various parts of text are made more obvious by placing signals in text (e.g., Meyer, 1975), including text conventions that flag the structure of the text (e.g., when a cause-and-effect relationship is specified in the text, signaling the cause with the introductory clause, "The cause of X is . . ."). Advance organizers signaling a main point

can be provided before the point is made. Summary statements can be put at the end of sections of text. A variety of words specifying the information considered important by the author can be placed in text, such as "Of less consequence . . .," "More to the point . . .," and "An exceptionally important consideration is . . . ." Texts with clearly signaled hierarchies of information, topical structures that are made clear, salient logical sequences, and causal chains are understood better than texts lacking obvious organization (Chambliss and Calfee, 1989). Graphical outlines summarizing main points and relationships can be included in text as signals as well (e.g., Armbruster, Anderson, and Meyer, 1991; Guri-Rozenblit, 1989).

Illustrations. Memory of text is improved when illustrations overlap the meaning conveyed by the text (Levin, 1982, 1983). Pictures also sometimes stimulate inferences that would not occur if the text alone were read (e.g., Holmes, 1987). A great deal is now known about how to add pictures to text in order to produce various effects on readers, including increased understanding of text (Levin and Mayer, 1993; Willows and Houghton, 1987).

Producing textbooks consistent with the above recommendations is certainly realistic and can be accomplished, as evidenced by research examining Japanese textbooks. Mayer, Sims, and Tajika (1995) found, for example, that authors of Japanese mathematics textbooks do the following: (1) They find many ways to ensure students make connections with their prior knowledge. Thus, such textbooks provide inductive explanations for mathematical rules by linking these rules to concepts with which students are already familiar. In addition, such textbooks make use of multiple representations of concepts to tap into student knowledge bases in alternative ways. (2) Japanese textbook authors go to great lengths to signal relationships explicitly between concepts. Relationships between concepts are made clear by devoting more space to extensive delineation of solution procedures, in contrast to similar textbooks used in the U.S., where more space is devoted to unworked problems. Furthermore, this delineation of procedure follows an inductive route, culminating in the statement of a general rule of the procedure. (3) Illustrations are used effectively, with textbook space allotted for only those illustrations directly germane to the concept of interest.

Knowing how to produce more comprehensible texts is only a beginning, however. At present, there is no widespread commitment among publishers to produce texts that incorporate the improvements validated in research, with publishers much more concerned with covering content specified as mandatory on adoption lists or covered in competing textbooks than with producing understandable text (Britton *et al.*, 1993a, b). Well written, carefully signaled, and effectively illustrated texts will become common only if the marketplace

demands them. One way to make it easier for students to prepare for tests is to favor texts in adoption decisions that are understood by the readership. One way to make it likely that more textbooks are well written and designed is to let textbook publishers know that such matters count heavily in adoption decisions, for publishers respond only to market pressure.

Finally, if it is apparent that students are struggling with a text in the course, than provide alternative texts for them. One economical way to do this in many core courses is to peruse one's bookshelf for texts that could be used in this course, that might be easier for students. Given the many textbooks that are sent on a complementary basis to instructors of core courses in higher education, this is an easily affordable option for many college teachers. (Later, we take up how students can and should stimulate their professors to provide such resources.)

Teaching

Although there are many ways that teachers can improve their teaching (e.g., see McKeatchie, 1994), some are especially salient to students. van Meter *et al.*'s (1994) participants had clear views about what college teachers can do to permit the creation of excellent notes, which are critical in reviewing for tests. For example, the speed of presentation needs to be matched to the difficulty of the material and to the level of background knowledge of students, with slower presentations of more difficult material, especially in presentations to students with little relevant prior knowledge. Organized presentations do much to improve the quality of student notes — for example, notes are improved by lecturers separating important points. Providing students with a lecture outline is a good thing, with the effectiveness of the outline heightened when the lecturer sticks to it during the lecture. Signaling important content also helps (e.g., by presenting it on the board, lecturing more slowly when going over critical information, repeating central ideas and/or announcing what is important).

One very important type of information that teachers can provide to their students is about testing demands, for it is certainly the case that for classroom tests, performance is maximized by receiving a test consistent in format to the test that was expected. Recall performance is enhanced by knowing a recall test will be given, multiple-choice performance is enhanced by knowing the test will be multiple-choice (Lundeberg and Fox, 1991). Students are able to adjust, at least to some extent, their test preparation strategies as a function of task demands (Crooks, 1988), although as was noted earlier, their matching of processing to task demands is often much less complete than it could be (i.e., they are task-appropriate processing deficient).

As far as letting students know about the demands of upcoming tests, most helpful of all might be to provide students with practice test items and tests that are comparable in format and difficulty to criterion tests (e.g., Pressley and Ghatala, 1989; Pressley *et al.*, 1987; Walczyk and Hall, 1989). Doing poorly on such practice tests is a clear signal that more study is needed. Doing well provides a clear signal that the student is ready for the actual examination. Practice tests also are a good review, improving memory of the material covered by the practice items and strengthening connections between that material and related content (Bahrick and Hall, 1991; Glover, 1989).

Development of Good Information Processing in Students

Our view (Pressley with McCormick, 1995a, b) is that good information processing develops over years. Each teacher along the way can play a role, however, and that is what is stressed in what follows.

Instructional Development of Strategies. One of the worst myths we have encountered in education is that learning to read is something accomplished in the elementary grades. There is no compelling evidence that young teens use the diverse strategies documented by Pressley and Afflerbach as associated with expert reading. Much learning to read remains. For example, the social sciences professor serves his or her students well by letting them know how to read an article in a journal, perhaps by modeling such reading for students and by encouraging students to read actively and interpretively.

If a professor takes seriously our suggestion to model text comprehension processes with respect to course readings, the professor will necessarily convey a great deal of information about what students should be acquiring from readings, invaluable information in preparing for exams. Thus, the first author of this paper has been teaching his courses for many years by systematically going through the assigned text and modeling the extraction of important ideas from the readings, and in doing so, making clear to the students the level of detail he expects students to remember and be able to recall on the exam.

Instructors can also teach students how to take and review notes so as to increase meaningful connections between concepts covered in lectures. For example, Kiewra (1991) and his associates (Kiewra, DuBois, Christian, McShane, Meyerhoffer, and Roskelley, 1991) have demonstrated that student learning from lectures increases when students are taught to encode information into a spatial array, with the dimensions of the array representing repeatable categories distinguishing to-be-learned information. Thus, a matrix on food groups might include the types of foods as one dimension (i.e., proteins, fats, carbohydrates) and their characteristics as another dimension (e.g., functions, daily requirements, food sources, potential dangers). Students can be taught to make connections

within cells of the matrix and between cells of the matrix as they review. Thus, the information about the functions of protein might be elaborated to specify how appropriate amounts of protein result in healthy functioning and how inappropriate amounts result in dysfunctions. Students can also be taught to make connections within a dimension, for example, in this case by comparing how the types of food differ in their functions, daily requirements, food sources, and dangers. Students can learn to expand matrices, when it is appropriate to do so, for example, adding information about vitamins when the professor points out that vitamin values of foods will be covered on the exam.

One point that instructors should emphasize is that the strategies they are teaching students have task-appropriate properties. For example, if the professor is going to require on exams the application of ideas covered in the course, that professor should be teaching strategies that increase understanding of the content so that the content is applied. For example, if exams require recognizing analogues of problem situations covered in class, the professor can model structural analysis of problems and matching solution strategies to problems differing in structure. For example, students in a physics class might be taught to think of the flow of electricity as analogous to the flow of water to understand and do problems involving parallel and serial circuiting of batteries. Alternatively, the professor might teach the students to think about the flow of electricity as analogous to a crowd of moving people to solve problems involving parallel and serial circuiting of resistors. When an instructor teaches a strategy, it should be matched to purpose, with the match to purpose made clear to students.

In summary, there are a number of strategies that instructors can teach students, often strategies that are matched to very specific purposes. These include ones for getting information out of lectures and texts and for reviewing that material so as to increase its completeness and meaningfulness through elaborations and connections, including connections to prior knowledge. As we make this point, we also feel it is a hollow one, for there really has not been nearly enough research on the effects of college professors teaching students how to learn in preparation for tests — for example, how to read actively and for high comprehension. Based on what is known about how long and difficult a process it is for younger students to understand strategies and become comfortably familiar with them through constructive application of them, there is reason to doubt that instructor explanations and modeling alone will do the trick. It seems likely, based on the strategy research conducted with children and adolescents, that a great deal of instructor scaffolding and support of strategy use is going to be required if students are to internalize the strategic processes, coming to own them so that they can apply them adaptively and do so routinely (see Anderson and Roit, 1993; Collins, 1991; Pressley *et al.*, 1992b). Just as challenging is the development of instructors who can explain strategies, model their use, and scaffold students' application of them (Anderson, 1992; Pressley *et al.*, 1992c).

Building Background Knowledge. People have an easier time meeting academic demands to the extent they have acquired the extensive prior knowledge possessed by literate people, with the development of such extensive and connected knowledge the product, in part, of years of high quality information covered in school (Pressley with McCormick, 1995a, b, Chap. 4). We can make it easier for students to tackle future academic demands by doing all possible to make certain that important knowledge is developed in our courses. There are many opportunities for this. Thus, examples in a behavioral sciences statistics course can be hypothetical, or they can be derived from the literature, representing to students important substantive research directions and outcomes as points are made about the statistical principles that are the focus of the course. Examples of principles in a psychology of learning course can be hypothetical or be derived from important research and applications, with the latter contributing to students' larger knowledge of psychology as information about basic principles is conveyed. We could go on and on making the point that instruction can be information rich or information poor, with years of information-rich instruction likely to result in much deeper and better connected knowledge than information-poor instruction.

Sometimes in a specific course, there is essential background knowledge that students lack. Rather than leaving them to flounder, we believe it better to attempt to build the knowledge base quickly, if that is possible. Thus, many multivariate statistics courses include an optional section on essential linear algebra for students who did not have previous exposure to matrix algebra. Students who arrive at a graduate course in cognitive psychology with no background at all in cognition can be well served by referral to any of a number of short introductions to cognitive psychology (i.e., review chapters, short texts on the subject). Doing all possible to make up for prior knowledge deficiencies should do much to make course demands more manageable for students.

Encouraging Use of Prior Knowledge. One of the most important research directions at present is determining how students can be encouraged to make use of their prior knowledge to understand the significance of new information they are learning. That is, many students have knowledge they could use but do not apply as they try to understand and learn new material. To the extent students do relate what they are learning to what they already know, memory and application of what is being learned should be enhanced (e.g., Mayer and Cook, 1981). Presumably, the deeper understanding produced by relating new content to old knowledge should make it easier to prepare for tests over the new material. One potent approach for encouraging the development of connections between new content and prior knowledge is to encourage students to self-explain the significance of relationships that are introduced in a course. Consistent with research on elaborative interrogation (see Pressley *et al.*, 1992a) and other basic

research (e.g., Mayer, 1980), teachers should encourage students to ask themselves why new ideas make sense. Research points to the promise of encouraging habitual "why" questioning as a means of increasing understanding. For example, Webb (1989) provided analyses of how those who provide explanations during small-group instruction learn more than others who receive the explanations. Recall also Bielaczyc *et al.*'s (1991) outcomes considered earlier in this article as well as King's (e.g., 1989, 1990, 1991, 1992) work on encouraging college students to question as they process content.

Improving Student Monitoring. Beyond encouraging learning, self-explanation seems to improve awareness of whether material has been learned. For example, the self-explaining students in Bielaczyc *et al.* (1991) monitored more than controls — they were more aware when they understood text vs. when they did not understand it. Being able to explain new relationships to oneself is a good indicator of comprehension, and not being able to do so is a good indicator that more effort is needed.

One component in many effective academic remediation regimens is self-testing (see Meichenbaum, 1977), which is intended to increase awareness of academic preparedness and mastery. That adults often have no idea whether they are ready to take a test, however (e.g., Epstein *et al.*, 1984; Glenberg and Epstein, 1987; Glenberg *et al.*, 1982; Glenberg, Sanocki, Epstein, and Morris, 1987; Maki and Berry, 1984; Maki, Foley, Kajer, Thompson, and Willert, 1990; Maki and Serra, 1992; Pressley *et al.*, 1987; Walczy and Hall, 1989), makes clear that people do much less self-testing than they could do. We believe that an important problem for educational psychologists is to determine how to develop self-testing skills in students, for self-testing has great promise as a method for improving student awareness of test readiness and, hence, for improving studying.

One approach to self-testing, which is to experience practice tests similar in format and difficulty to the criterion test can only occur if such tests are available. Thus, instructors can do much to improve their students' monitoring of test preparedness by making old exams publicly available, especially when old exams are consistent with the demands and difficulty levels of exams in the current course. When such exams are provided to students, the students should be informed that old tests should be used more as a check on preparedness rather than as a study guide. As a study guide, practice tests can lead to overfocussing on the exact content of the old test, which is dysfunctional because the new test might tap other pieces of information covered in the course (see Anderson and Biddle, 1975).

Improving Student Search Skills. Some students in van Meter *et al.*'s study (1994) told the authors about being in classes with extremely inconsiderate lecturers. Their notes would be fragmentary at best and, yet, they knew that much of the exam would be based on material presented in class. What they reported

doing was attempting to find information in their textbooks and meeting with classmates to attempt to reconstruct what went on in lecture. Students often have a need to find information for which they are accountable, information that is out of reach for some reason (e.g., the lecturer is poor, the student missed classes, the textbook is poorly written and indexed, etc.).

Psychologists have made little progress in understanding how to teach students to search for information. Psychologists need to understand how students can learn to search textbooks as well as search in much larger information environments, from the campus library to the infinity of possibilities on the Internet. Developing search skills in students has high potential for payoff, because searching and finding information is a large part of many jobs (e.g., Guthrie and Dreher, 1990). For the present, we believe that professors should be introducing their students to many resources that can be searched for course-related information, including the electronic superhighways that are readily available on most campuses.

The social side of search, which involves approaching others for critical information, is also little studied. van Meter *et al.*'s (1994) participants told us that they did make use of teaching assistants and classmates as sources of information, especially when the lecturer was inconsiderate. Encouraging students to make use of such resources seems important because students can errantly believe that seeking information they need from others is a sign of low ability (e.g., Newman and Goldin, 1990). Such an attribution is always disturbing because it can undermine student use of important sources of information, but it is especially disturbing for the student immersed in a world of poorly written texts and inconsiderate teachers. Sending the message that smart people go to others when they need to fill in gaps in their knowledge makes a great deal of sense.

The first author recalls an episode from his college years. He was taking an introductory course in personality. The lecturer presented information at a very rapid clip. The two weeks dedicated to the professor's own research were especially awful, with him going through slide after slide of data as he would for a convention talk. His remarks were so fast that the first author's notes include a reference that the professor's research was inspired by "*Van Dura's* earlier work on modeling." (Apologies to Albert Bandura!) Students were lost, including the first author. The author had had enough of an introduction to research at that point, however, to know that all of the data being flashed on the screen was in journals and that the references to the articles containing the data could be found through search of the *APA Abstracts*. He did a search using the professor's name and came up with all of the articles from which the professor lectured. The first author aced the midterm on that part of the course, with most other students doing poorly on the test, consistent with the campus lore that students should expect to do poorly on the parts of course pertaining to the professor's own research.

After grades were posted, another student sought out the first author, asking to copy his notes on the research-based lectures, hoping to do better on the final exam questions over that segment of the course. Pressley simply let him copy the research articles, telling his friend that no one could have figured out the professor's work from the lecture presentation. What this anecdote illustrates is that elusive information can be found if an individual knows how to search. Alternatively, it often can be obtained from others. If a person is in a position to provide such information, he or she should do so in a fashion that makes no implication of low ability or lack of effort by the petitioner, a theme continued in the next two subsections on anxiety and motivation.

Reducing Student Anxiety. Unfortunately, there are many professors who send the message to their students that the material being presented is beyond them and that many students will not do well in the course. Perhaps a little bit of anxiety can motivate students to study which in turn can reduce anxiety as information is learned. Other times, however, professor comments produce a great deal of anxiety that can interfere with studying (e.g., by producing distracting thoughts about impending failure). There is nothing in the academic motivation literature to support professor exhortations intended to induce fear in students or make them feel inadequate relative to task demands. Moreover, comments such as, "Nobody earns an A in my class," are being viewed as forms of harassment (McKeatchie, 1994, p. 275). Such comments do nothing for student motivation but decrease it. Professors should refrain from sending the message that students cannot handle course demands or will be able to do so only through unrealistic efforts.

Maintaining and Enhancing Student Motivation. From the time children enter kindergarten, there are disturbing shifts in their confidence. In general, the further along in school students are, the less confident they are that they can accomplish the academic demands made upon them (see Stipek and MacIver, 1989). Perhaps not surprisingly, there are concomitant declines in interest in school (e.g., Wigfield, Eccles, MacIver, Reuman, and Midgley, 1991). Why does education have such a poor track record in maintaining motivation? The answer is complex, but some suspected mechanisms are implicated more often than others. In the space permitted here, it is possible to take up only some of the factors that diminish or bolster motivation.

Academic competition actually undermines the motivation of most students, because by definition, very few can be really top drawer students, the students saliently rewarded relative to classmates in competitive models. An alternative approach to rewarding students based on level of achievement relative to others is to reward for improvement (e.g., Ames, 1984;

Dweck, 1986; Nicholls, 1989). When grading and reinforcement are for improvement, there is always reason to try, with much more reason to do so for the student who would have been at the bottom of the curve in a competitive grading environment. (Why try when it is virtually certain that one's grade will be low anyway?) One reason it is hard for students to get motivated for exams is the certainty of many students that their performances will not compete well for top grades.

Teacher praise can go a long way in maintaining student motivation (Brophy, 1981), with a great deal of evidence that there is far too little praise in some classrooms. One of the terrible realities of American schooling is that many teachers make comments to students that are devastating to them, typically comments about their lack of ability that can undermine confidence for years to come (Brooks, 1990). Keeping students motivated depends largely on their belief they can do the academic tasks they are confronting. Teacher comments indicting student abilities have destructive potential. (Why study when one does not have sufficient ability to do the task in question?) Praising students for their accomplishments and consistently sending the message that success is within their reach if they exert appropriate effort does much to motivate students to work hard throughout a course, including the exertion of great effort in preparation for exams (see Pressley with McCormick, 1995a, b, Chap. 5).

A consistently supported idea in the motivation literature is that tasks just a bit beyond one's current competence are extremely motivating (again, Pressley with McCormick, 1995a, b, Chap. 5, review examples). Tasks that are too easy require little effort, and tasks that are too difficult frustrate rather than motivate. Keeping this principle in mind can do much to keep students motivated. It begins with counseling students into classes, doing all possible to make certain that students are well matched to the levels of the classes they are taking. A reality of American higher education, however, is that a mix of preparation levels occurs in many classes. One solution is the possibility of different readings for students depending on their level of prior knowledge (see Chall, Conard, and Harris-Sharples, 1991, for a detailed argument in favoring of matching reading assignments to students on the basis of ability).

One approach that the first author is trying in his graduate educational psychology courses is consistent with this idea: There are three versions of the educational psychology text written by Pressley and McCormick (McCormick and Pressley, 1997; Pressley with McCormick, 1995a, b), one intended for doctoral students, one intended for master's students with solid preparation in psychology and education, and one intended for undergraduates and beginning graduate students. Students in Pressley's graduate courses have a choice about which text to read, but are counseled as

to the level of text that might be appropriate for them. One way to make it easier for students to prepare for exams is to make certain that the level of course content is appropriate for them. Sometimes this means doing business in ways that are very different from the approaches that have predominated in education — for example, abandoning the practice of assigning the same textbook to all students.

Putting It All Together: A Good Case Scenario

In contrast to the bad case scenario presented earlier, consider a good case. A student arrives at a course with excellent reading, writing, and problem-solving skills, the products of years of education in which such skills have been taught explicitly and encouraged consistently. The student knows when to apply each of the strategies that is known and does so calmly and confidently. In part because of these excellent information processing skills, the student has extensive prior knowledge that can be related to the content presented in the current academic course. That prior knowledge is used to understand the new content in the course by self-explaining new ideas and using background knowledge to figure out why new concepts relate as they do. Such a student understands material presented in texts more easily than classmates less fortunate in their education, who have not developed active reading strategies and habits and who lack extensive prior knowledge.

In this good case scenario, the text was chosen to be appropriate to the level of preparation of the students in the course. The authors and publishers of the text were well informed about writing and illustrating tactics that improve the comprehensibility of text. The book was appropriately signaled so that students could understand material initially and later review it effectively.

The teacher came to each class well prepared, presenting an outline at the beginning of lecture and sticking to it. The presentation was paced appropriately given the students' level of content understanding. As a result, the student had an excellent set of class notes.

The student understood well precisely the type of test that he or she would experience, with several opportunities to self-test knowledge of the course content and preparedness for an upcoming test. The previous exams in the course were on reserve in the library, available to all students for practice. When such practice opportunities were combined with the student's impressive self-testing skills, he or she had a good idea about what content in the course was already mastered and which ideas and reading required more work. For ideas in the course that remained vague, the student knew

to seek help from classmates or the teaching assistant. If that failed, the student was skillful enough at negotiating the campus library and its electronic catalogs and databases to have a good chance of finding material that could help to fill in gaps in knowledge.

The student was highly motivated to study for the upcoming test, largely because the professor had done much to assure students that they had the ability to do the work in the course. In fact, this course was structured so that everyone could get an A, if their test performance was consistent with mastery of the material, with it apparent to all that mastery was possible through diligence and reflection on readings and lecture notes.

Many reading this journal are already professors. To the extent that the case just outlined is typical for one's courses, there is reason for celebration. To the extent that the bad case scenario outlined earlier holds, there is reason to pause, reason to consider what might be done to make it easier for students to meet course demands. Table I provides a summary of ways that any teacher can make it easier for students to prepare for exams. But students can also help themselves, if they are informed by the points made in this article.

WHAT CAN BE DONE BY STUDENTS TO MAKE IT EASIER FOR THEM TO PREPARE FOR TESTS?

We offer in this section some suggestions to students about how to meet the challenges in preparing for tests. For the student, as for the teacher, our suggestions focus on what the student is reading, what the student is getting out of class, and the student's own information processing.

Compensating for Poor Textbooks

If the text is poorly written or above their reading level, students should try to find out if there might be a more readable text on the same topic and use it as a supplement or perhaps even as a replacement text if the actual course book is so bad that little to nothing is being gained from it. Often, the professor will know of alternative texts. In core courses, there are many textbook options. For example, a trip to the local used bookstore will yield many introductory psychology textbooks. Many of these texts follow a similar topical outline. If a student can find one that is organized in the same fashion as the course text, but is much easier for the student to read, life in introductory psychology might be more pleasant with more certain learning.

Table I. How Instructors Can Help Students to Prepare for Academic Tests

Adopt textbooks that are well written, effectively illustrated, and well signaled. (If you are a textbook author — and many college professors are, develop textbooks in which sentences and paragraphs are written to make salient important connections between ideas, sections, and chapters are signaled to make important ideas obvious, and illustrations clarify difficult concepts.)

When teaching courses in which students have vast differences in background, have different readings matched to the various levels of preparation. Consider making alternative textbooks available, ones that are easier for students who experience difficulties with the regularly assigned text.

Provide resources to students who lack essential background knowledge that will permit them to acquire rapidly the prior knowledge they need in order to understand the content of the course they are taking.

Make orderly presentations in class, ones paced so that students can "get it," or at least "get down" in their notes the most important points.

Make certain students understand the nature of the tests they are taking. Make sample exams (e.g., old tests) available to students so they can self-assess their preparedness.

Model and explain strategies for getting the most out of readings and doing so efficiently. Model for the class your own reading of a text.

Teach students strategies for taking notes in your class, such as teaching them to construct matrices based on important dimensions of information in your course. Teach them to review the notes they take, elaborating them to make connections between information in lectures, texts, and their own prior knowledge. Make clear to them that their study strategies should be matched to the demands of the test they will be taking (e.g., through teacher modeling of various strategies, emphasizing the benefits conferred by each in relation to the demands on exams).

Encourage students to relate information in a course to their prior knowledge, for example, to explain in their own words why the ideas and relationships in the course make sense.

Develop in your students the ability to search for information in the content area of the course. If there are important electronic databases in your arena of study, let students know about them, and perhaps even include assignments operating in these databases. If there are alternative textbooks available that might help some students understand course content better, let students know about those books. (Beyond assisting students in acquiring specific information in the course, teaching students how to search for information empowers them to do something that is increasingly required in the world — finding information in the ever-expanding networks of information.)

Do all you can to reduce unrealistic student anxieties about the class and exams. For example, encourage students to seek information from you about unclear points — that is, welcome questions (e.g., never imply a student's question is stupid or naive). Encourage students to interact with one another as well to fill in gaps in knowledge.

Keep motivation high. As much as possible, grade for improvement rather than on the basis of relative standing in a class. (The more diverse the background preparation of students in a class, the more unfair the competitive model, with some students starting well behind other students.) Send the message that doing well in the course is possible, through expending appropriate levels of effort. Praise students for their insights and accomplishments; never derogate a student's ability or imply that the content of a course is beyond the grasp of students enrolled in it. Such messages are anxiety producing in ways that are not motivating — that is, they do not provoke the little bit of apprehension that can get students studying, but rather, a great deal of anxiety that can overwhelm a student.

Sometimes students can obtain such resources without spending a nickel. Professors are sent many complementary texts to consider for adoption in the courses they teach. Often, professors will only be too happy to give a struggling student one or more of these freebies to be helpful. After all, most of the complementary books simply gather dust on the shelf, with most disposed of within 2 years of when they are received anyway because they are replaced by new editions. Especially in introductory courses, professors have books to give. If a professor has not made alternative texts available to the class as a whole, as we suggested earlier, students should not hesitate to ask for them.

Coping with Poor Teachers

When the teacher is hard to understand, students should pay special attention to reading assignments. When assignments are read in advance of the class pertaining to that topic, understanding the readings may increase comprehension of the lecture. When done after the lecture, it may help fill in the gaps in notes and gaps in understanding.

If the teacher makes notetaking difficult, students should try collaborating with other students in the class to pool understandings from the lectures. Many gaps in notes can be filled in this way. There are other benefits from getting together with classmates. For example, sometimes, other students pick up crucial information about future tests that others will have missed, such as the format of a future exam.

In addition, students should ask the teacher about the format of exams. If previous exams are available, students should ask the professor or former students for copies. Sometimes, old exams are kept in campus resources, such as the studies skills center or the library. Good professors do not repeat the same questions, but many follow the same format from semester to semester and emphasize the same topics on their exams. Thus, it is sensible to use old exams for feedback and as sources of general information about exam format and areas of content the professor thinks are important enough to test. It is not wise to use the questions on the exam as a guide for what to study, for this overfocussing will lead to less study of other content that may be very important (Anderson, 1975).

Improving Information Processing

Throughout this article, we have implied that studying is more effective when students use strategies, monitor their test readiness, possess background knowledge they can relate to course content, and are motivated.

Students can do much to increase their knowledge and use of strategies, improve their monitoring of their preparation level, broaden conceptual knowledge related to coursework, and maintain their motivation.

Strategies. It does no good to tell students the names of comprehension and monitoring strategies and suggest they use them. We know based on a great deal of data that the development of the efficient use of a repertoire of comprehension strategies takes time and involves a great deal of practice. Our view is that there is much too little teaching of comprehension strategies at the secondary and college levels. Students should avail themselves of whatever instruction is available and get as much as they can out of it, however. The good news on this score is that many high schools and colleges are now offering study skills courses, which include instruction in comprehension processing, as well as coverage of other essential academic skills — including, for example, search of academic sources for information. The bad news is that such courses are just a start. For them to do much good, students must make efforts, often great efforts, to apply the skills taught in such courses whenever they study. This includes exerting great mental effort to activate prior knowledge before reading, to make predictions, to update predictions as information is encountered in text, to read selectively for information relevant to reading goals, to jump around in text (e.g., to check on points not understood initially), and to interpret text being read in light of one's prior knowledge as well as previous information covered in the course.

As we have already suggested, a good student is also a strategic notetaker, using powerful strategies for reducing lecture input to a manageable amount and organizing it so that important ideas are obvious and memorable. Many students do not have good notetaking skills by the end of high school. It makes sense for students to learn about alternative ways of taking notes and apply newly learned skills during lectures. Again, study skills courses often include a notetaking component that can get a student started in the direction of being a better notetaker. Moreover, because the nature of effective notetaking is an active area of research, it is likely that study skills courses will offer even more powerful insights in the future about effective notetaking, as these courses assimilate approaches such as matrix notetaking (e.g., Kiewra, 1991; Kiewra *et al.*, 1991).

As we write this, we are aware of an important dissertation being completed by Joann Yaworsky at the University at Albany, who is studying the academic lives of students who experienced academic success after a freshmen study skills course vs. those who did not. The secret of success largely was making the effort over the course of 4 years to apply the study skills introduced in the course, both ones that can be applied during reading and ones that can be applied in class. The study skills course is only a start, but such a start is probably helpful to many students.

As students learn strategies, it is paramount that they note when particular strategies are appropriate or helpful. As discussed previously in this article, different types of tests require different types of preparation. Even though pounding in content by repeated reading works for some types of multiple-choice tests (e.g., ones involving a great deal of recognition of facts mentioned in text as discriminated from points not covered in text), such a strategy is unlikely to prepare a student to write an essay contrasting perspectives covered in a course. For that, students are better off analyzing the content they are studying and organizing it with respect to important dimensions. For example, matrix notetaking is likely to prepare students for compare-and-contrast and pro-and-con questions, since it supports organized memory and recall of ideas.

Monitoring. As covered earlier in this article, using old tests to self-test is an excellent way to monitor test preparedness. It should be an approach used whenever there is a term-to-term consistency in a professor's approach to exams, and old exams are available. This tactic is more likely to be successful if the tests are accompanied by keys. Why? In the absence of feedback about correct answers, student awareness of how well they are doing on practice tests is often in error. Multiple-choice practice tests are particularly problematic. In particular, because the incorrect answers for well-constructed multiple-choice items tap ideas related to the question, confidence can be high in an incorrect answer because it seems familiar (Pressley and Ghatala, 1988). Also, as discussed earlier, people sometimes believe they understand the main idea of a reading or lecture even though they have completely missed the point (Pressley *et al.*, 1990a, b). Being able to check against acceptable answers after attempting items on old tests should eliminate the dangers of such mismonitoring.

As far as monitoring whether one has understood the big ideas in a text or lecture, getting together with others in the class also has much going for it (Van Etten, Freebern, and Pressley, in press). Students can explain their comprehension of the ideas in the course with classmates and get feedback from them. They will be exposed to potential alternative interpretations, which also allows students to gauge whether they understand material or not. Disagreements often should lead to discussions that result in students as a group taking a hard look at potentially confusing issues and, hopefully, resolving confusions together that could not be resolved alone. The alternative for students who go it alone is that often they will not recognize they are confused, given the shortcomings of monitoring.

Knowledge. Even if a student comes to a course with little background, that need not stop the development of knowledge during the course over and above what is covered in assigned readings and lectures. Students should read some of the suggested readings, as well as articles cited prominently

in the text and in lectures. Yes, there is only so much time! Even if students do not have the time to read supplementary materials, often they have the time to skim them. Given what students are learning in the course, they might get quite a bit out of such quick readings. Also, a visit to a used bookstore can supply resources to broaden knowledge related to a course. Especially in core courses, there are often alternative textbooks that can be read selectively (i.e., for information not covered in the assigned text) or skimmed as supplements (e.g., to provide re-exposure to some of the big ideas in a course).

Over the entire of a student's education, it makes sense to select courses with respect to background knowledge. Although a case can be made for diversifying courses, a case can be made for depth as well. Thus, fulfilling one's history requirement by taking three courses related to British history permits more depth than a course on British history, one on the French, and another on American history. By taking the three British history courses, the first course will build prior knowledge for the second, which will permit even greater prior knowledge going into the third course. One way to have prior knowledge for much of course work is to take the depth approach rather than the breadth approach.

The more one knows about a topic, the more likely that the knowledge will be readily accessed and related to new information about the topic. Thus, efforts to expand knowledge pertaining to a course increase the likelihood that prior knowledge is accessed and used. Beyond that, however, consistently asking oneself "why" questions when reading and attempting to determine why important relationships are the way they are does much to stimulate the active application of prior knowledge to new content. Even Marilyn vos Savant (1995, pp. 65-70), who is celebrated as the smartest person now alive, uses elaborative interrogation. She is always asking and trying to figure out why. Students should, too.

Anxiety. Students who are extremely anxious should seek out professional assistance. Students can learn to control extreme anxiety by learning to relax and focus attention of the academic tasks at hand. It can take awhile for such treatment to work, even with an experienced professional. Why? Part of the intervention is extinguishing anxiety when studying begins, with such extinction requiring a number of trials. A professional therapist coordinates the various components of such treatment, including therapist modeling of coping with anxiety, teaching and reinforcement of relaxation, pairing of relaxation with the anxiety-evoking cues associated with studying, teaching students to self-reinforce themselves for remaining relaxed while studying, and, in some cases, even hypnotizing students as part of treatment.

Mathematics anxiety can be treated with the result being positive effects on mathematics achievement (Hembree, 1988, 1990). With many students, once they calm down and focus on the academic task, they can learn and achieve. That said, however, it must be remembered that anxiety is often a symptom rather than cause (James, 1884, 1890; Lange, 1885) and hence, for some low ability students, reducing anxiety alone will not cure academic problems. The perspective of self-regulation theorists is that anxiety reduction is most likely to be effective when combined with other interventions aimed at improving processing and learning of academic content, such as teaching of potent cognitive strategies that are appropriate for the content being learned and matched to testing demands (Meichenbaum, 1977). From this perspective, which is consonant with the thinking in this article, reducing anxiety is only part of the solution for a student experiencing academic difficulties.

Motivation. Whenever possible, students should take courses closely related to their previous courses that interested them. When they do so, they enter the course several legs up on other students. First, such students have background knowledge because they have studied closely allied topics. Second, psychologists have known since Dewey (1913) that when interest is high, so is academic engagement. As the mythologist Joseph Campbell (Osbon, 1991, p. 22) advised students, "Follow your bliss."

Perhaps most importantly, however, academic motivation is likely to be maintained when students experience success. Students need to make active efforts to assure success. Before enrolling, they should make certain that they are prepared for a course. If there is a choice of instructors, students should find out which ones are better teachers, and select teachers on the basis of whether other students leave their courses feeling good about what they learned and themselves as learners. Finally, students should attempt to be active learners in the ways outlined earlier in this section, using strategies, getting together with other students to obtain feedback and develop elaborations of ideas covered in the course, and building related knowledge. The more students comprehend because they are reading well, the better they know when they know and when they do not know: The more students know about the topic of the course in general, the more likely it is that they will be successful. With success comes additional motivation to engage the content through active reading and interactions with fellow students and to learn more about the topic. And so it goes. Effective strategies, monitoring, prior knowledge, and motivation interact to produce success, which in turns motivates additional academic engagement and consequent learning of new strategies and concepts, all of which are deployed in evermore sophisticated ways as metacognition about how to use strategies and knowledge increases. Table II summarizes the points made in this section.

Table II. How Students Can Improve Their Preparation for Academic Tests

Learn sophisticated comprehension and study strategies, taking a study skills course, if necessary, as a start to the process. The development of a sophisticated repertoire of strategies that can be used flexibly requires a great deal of practice in their application over a period of years and thus, to make exam preparation easier in the long term, make a point of applying the comprehension and study skills being learned.
Recognize that different tests and tasks require different strategies, and make a point of learning when each of the various strategies you know is useful. Then, use strategies selectively (e.g., preparing differently for tests requiring application of ideas vs. memory of them, differently for tests requiring recognition and discrimination of details vs. organized recall of ideas).
Sometimes, the assigned text is beyond one's reading level. Find an easier text on the same topic (especially easy to do for core introductory and intermediate-level, undergraduate courses). Sometimes professors can recommend (or give students) such texts.
When the instructor makes hard-to-understand presentations, read assigned readings more carefully and completely before class. The knowledge gained from readings can make hard-to-understand lectures more comprehensible.
Meet with other students to compare and complete notes, especially when the teacher is hard to understand, Exchanging opinions with other students in a course about the ideas in a course also provides a great deal of feedback about whether course content is being understood. It also affords an opportunity for errant ideas to be corrected and for learning about alternative interpretations of the ideas in the course.
Study old exams. They are especially informative about test format and serve as a general guide to content likely to appear on exams. Using old exams as practice tests can provide valuable feedback about level of preparedness for an upcoming test.
Read beyond assigned readings to build knowledge related to what must be learned in the course. Even if there is only time to skim related readings, such reading can do much to enrich understanding of course material, including building of essential prior knowledge that renders subsequent course content understandable.
Use a depth approach in planning one's program of studies, by enrolling in a series of related courses when possible rather than many unrelated courses. This approach results in higher entering prior knowledge for the later courses in a series.
Remain calm and confident by applying recommendations made in this table. If anxiety is chronic, seek professional help, for academic anxiety often can be treated, with improved performance one benefit of anxiety reduction.
Select courses carefully so that competence and background knowledge are well matched to course work. This is an important part of experiencing success in courses, which is essential if academic motivation is to be maintained, both the motivation to keep studying in the current course and the motivation to continue in school and to work hard in subsequent coursework.

SUMMARY

In the present, much can be gained from courses by active processing of readings, especially when the lectures are less than fully informative. Much can be learned as well by interacting with classmates about course content to determine whether one has "got it" or to fill in the many gaps following a lecture. It can help to seek supplementary readings (i.e., either easier-to-read materials or materials to increase knowledge related to ideas covered in the course). It makes sense to select courses consistent with prerequisite knowledge and skills. In the long term, the students who find it easier to make it through academia are the ones who do use appropriate strategies, monitor well, have extensive world knowledge, and are motivated. What is outlined here is an approach for test-taking success in the short term and overall academic success in the long term.

In reviewing what has been covered here thus far, there has been a bias in emphasizing individual study. Yet, students often do not study alone, but rather learn together. Shawn Van Etten, Geoffrey Freebern, and Pressley (in press) recently completed an interview study of what students know about preparing for examinations. The students in the study pointed out many advantages of studying in groups. In particular, groups can provide elaborative information, points related to what the students knows already but which are unique. In addition, the individual studying alone has a greater risk of studying the wrong material or coming to misconceptions about the content than does a student studying in a group. The student studying alone also is at greater risk either for understudying or overstudying, since the group provides feedback about test readiness. Groups can be helpful for courses requiring a great deal of memory, with group members testing one another. In short, although much can be said for preparing on one's own, and notably the participants in Van Etten *et al.* (in press) indicated that benefits from group participation were greater when the individual student had studied material in advance, there are very good reasons for students to exit the individual study carrel and meet with other students about upcoming tests.

CLOSING COMMENTS

A common argument is that more is learned in more demanding courses, an argument supported in recent years by research, such as the work conducted by Rohwer and Thomas (e.g., Rohwer, 1984; Thomas and Rohwer, 1987, 1993) with respect to secondary and college courses. If all that educators did was to provide demanding courses, however, there would be much student frustration and even failure. Beyond making demands on students, faculty can provide supports to them as well, ones that promote achievement. Students can seek out supports, too.

Supports serve to sustain student engagement in meaningful academic work. One perspective developed here is that there are multiple ways to support student learning, with the supports cited in this article each making it more likely that expended effort expended will pay off: For example, excellent textbooks matched to students' competence are more likely to produce learning than poorly written texts mismatched to students' competence. Acquiring information that makes up for deficiencies in background knowledge also can do much to promote learning of course content. Well-organized lectures at an appropriate pace support student generation of notes that are helpful in preparing for exams. Practice tests matched in format and difficulty to actual exams inform students about their levels of preparedness and provide opportunities for additional reflection about important course content.

A second important perspective implied in this article is that test preparation ability — the ability to generate one's own supports — is a by-product of information processing capabilities. These include the strategies one knows (or is acquiring) and uses (or is learning to use), the completeness and connectedness of prior knowledge, and the quality of motivational beliefs (Pressley *et al.*, 1989; Pressley with McCormick, 1995a, b). Each instructor has the opportunity to promote the development of such excellent test preparation skills in students by modeling efficient reading, search, and study strategies; encouraging students to use what they already know to understand new content; and structuring courses so as to support student motivation (e.g., conducting class so that students have the sense that with appropriate effort, they can achieve). Students also can avail themselves of opportunities to learn powerful academic strategies, acquire and use information related to course content, and make decisions that positively affect their academic motivation (e.g., elect courses that are matched to their background knowledge; plan their program of studies so that subsequent course work relates meaningfully to previous coursework; and as much as possible, take courses that are interesting to them).

A third overarching implication in this article is that research needs to closely examine pre-college instruction in test preparation and to map the development of test preparation skills longitudinally. Consider notetaking as an example. It is clear that college professors expect their students to have self-regulatory notetaking behaviors. However, a knowledge of what notetaking entails is needed before a student can self-regulate such behaviors. Thus, van Meter *et al.*'s (1994) subjects indicated that their contemporary notetaking behaviors evolved over their college years and that explicit instruction in notetaking would have benefited them greatly. But what instruction is being offered to students *before* they enter college? Preliminary findings of a study being conducted by Yokoi and Pressley suggest that very little, if any, explicit instruction in notetaking is offered to junior high school students. Rather,

teachers at this level seem only to model notetaking behaviors, providing students with no associated metacognitive information (i.e., information about when and where to use notetaking skills or how to adapt them to a variety of academic demands). How do students who initially only copy teacher notes develop into mature, active notetakers, able and likely to construct their own notes? Yokoi and Pressley are trying to find out how notetaking skills are fostered between junior high school and college.

A final overarching implication of this article is that much research needs to be done to flesh out how test preparation can be made easier for students. It seems difficult to make a demanding course manageable to students, by requiring excellent texts, good teaching, and provision of materials supports (i.e., practice tests, supplementary background material). We must determine better if such efforts pay off in terms of student achievement and satisfaction. That is, although a great deal of research can be strung together to support the lines of reasoning advanced here, we prefer to view this article as a statement of working hypotheses that deserve attention as important issues in the psychology of studying (Rohwer, 1984). Consistent with that stance, Van Etten, Freebern, and Pressley are now conducting an ethnographic interview study of college students' understandings about the tests they take. As the results of that investigation emerge, our confidence in the points raised in this article is increasing, and we look forward in the near future to detailing much more completely the challenges of exam preparation as well as how contemporary students rise to those challenges.

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