HANDBOOK OF COLLEGE READING AND STUDY STRATEGY RESEARCH

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8 Strategic Study-Reading

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The mark of a successful college student is the mastery of knowing not only what to study but also how to study it. The successful student is a discriminating decision-maker, an expert who has cultivated a repertoire of fine-tuned study-reading strategies, seamless and transparent, the result of much practice and effort. The result of using study-reading strategies effectively is a deep rather than surface understanding of what is read, a fuller understanding of both text and discipline content, and the ability to create critical connections both in and outside of the text. So, what does work? What can we learn from research about strategic study-reading and the cultivation of good study practices? How can college instructors promote a learning environment in which students employ strategic study-reading? Likewise, how can developmental college readers utilize strategic and successful study practices?

In the first edition of this *Handbook of College Reading and Study Strategy Research,* Caverly, Orlando, and Mullen (2000), in their chapter entitled "Textbook Study Reading," introduced a framework summarizing research about study strategies and study systems. Their chapter provided a synthesis of research about outlining, mapping, underlining, and notetaking, as well as research about commonly used study systems, such as SQ3R. Their chapter contextualized textbook study-reading strategies in a tetrahedral model that viewed the contributions of student, task, instruction, and material variables. Their chapter also situated study-reading strategies in a framework based on Weinstein and Mayer's (1985) categorization of basic and complex rehearsal, elaboration, organizational, monitoring, affective, and motivational strategies (see Table 8.1); this framework not only provided an overview of different types of study-reading strategies, but also indicated their level of complexity, noting strategies that are basic and strategies that provide for a deeper processing and understanding of the text. For instance, using mnemonics is a basic elaboration strategy for remembering what is read, while mapping is a complex elaboration strategy that provides a deeper processing of what is read.

Our chapter for this second volume of the *Handbook of College Reading and Study Strategy Research* provides an updated perspective to that original chapter and explores a variety of additional topics relevant to the research about strategic study-reading. A focus of this chapter is a discussion of the implications of research conducted throughout the past 50 years and key recommendations for successful and strategic study-reading in college.

Table 8.1 Study-reading strategies theoretical framework (Caverly et al., 2000, p. 108, based on Weinstein & Mayer, 1985)

	Basic	*Complex*
Rehearsal	Techniques for repeating a list of items, such as common memorizing or rereading the text	Techniques for marking material to be learned, such as underlining
Elaboration	Techniques for generating mental images to remember, such as imaging	Techniques for describing how new information fits into old knowledge, such as generative notetaking
Organizational	Techniques for grouping lists of items, such as mnemonics	Techniques for recognizing and recalling the structure of the information, such as outlining or mapping
Monitoring	Techniques for establishing a learning goal and monitoring one's progress toward that goal, such as SQ3R	
Affective and motivational strategies	Techniques for controlling volitional strategies, such as attention, concentration, anxiety, and time management	

STUDY STRATEGIES AND SKILLS: BASIC DEFINITIONS

While the use of the term *strategy* proliferates in current research about college reading and studying, the field has shifted from the use of the term *study skills* during the past 20 years (Devine & Kania, 2003) to the use of the term *study strategies*. Therefore, it is helpful to visit basic definitions of these terms. Strategies have cognitive, metacognitive, and affective components (Alexander & Jetton, 2000; Holschuh & Aultman, this volume; Nist & Holschuh, 2000). Influencing the success of a student are the student's motivation, beliefs, and use of generative strategies. In other words the selection and use of study strategies are highly dependent on what the student knows, on the student's interest and desire to use them, and on the belief that the effort to use the strategies will make a difference.

Alexander and Jetton (2000) characterize a strategy as "how-to" knowledge with six essential attributes; strategies are procedural, purposeful, effortful, willful, essential, and facilitative (Alexander, Graham, & Harris, 1998). Strategies may be in the form of procedures or guidelines, requiring the reader to make a purposeful effort. According to Alexander et al., strategies are distinct from skills, which they define as essential academic habits that have become routinized, automatic procedures. Devine and Kania (2003) distinguish strategies from skills in that the latter broadly describe academic competencies, such as taking notes during a lecture, while strategies directly promote learning and comprehension, including retention. Nist and Holschuh (2000) and Holschuh and Aultman (this volume) also provide a useful description of the advantages and disadvantages of various study strategies; they provide a synthesis of study-strategy research for organizing information (including using graphic organizers, concept maps, and previews), for isolating key ideas (including underlining, highlighting, annotation), and for elaborating information.

In this chapter we focus on the specific strategies that students select when studying and learning from text, apart from the teacher-selected instructional strategies for teaching students to learn in a content area (such as psychology, history, or mathematics). The focus of this chapter is on student-selected study strategies for comprehending a text, which we call *study-reading strategies* to differentiate them from other study strategies, such as managing time and preparing for tests, that are also important for

success as a student but are outside the scope of this chapter. Therefore, this chapter discusses constraints for effective study-reading, research related to specific study strategies (such as underlining, highlighting, notetaking, summarizing, and mapping), and multiple combinations of strategies, commonly referred to as *study systems*. These systems (such as SQ3R or PLAN) describe procedures using sequential or iterative approaches that employ several strategies for reading and remembering text.

CONSTRAINTS FOR EFFECTIVE STUDY-READING

As noted in Caverly et al. (2000), caution is in order when attempting to generalize the findings of research about study-reading strategies; it is more feasible to view the research in consideration of essential variables related to the student, the task, and materials.

The student: Prior knowledge

Prior knowledge includes "the knowledge, skills, or ability that students bring to the learning process" (Jonassen & Grabowski, 1993, p. 417) and includes both "declarative and procedural knowledge" (Dochy, Segers, & Buehl, 1999, p. 149). As noted by Block and Pressley (2003), essential to comprehension is the process of relating to prior knowledge, "the ability to integrate new information with previous life experiences and texts read" (p. 116).

Dochy, Segers, and Buehl's (1999) extensive review of the research about prior knowledge demonstrates the importance of prior knowledge as an essential variable when considering student study-reading strategies. Alexander and Jetton (2000) note that readers' prior knowledge affects both their perspective on content and the attention they allocate when reading. As noted by Braten and Samuelstuen (2004), "being a strategic reader involves using different strategies as is fitting until the purpose for reading is met" (p. 334). Their study investigated how the student's reading purpose influenced the choice of strategy, moderated by the student's level of prior knowledge about a topic. Their study explored the use of memorization, elaboration, organizational, and monitoring strategies and showed that in some situations reading purpose and the student's prior background moderated strategy selection.

In this chapter we view *prior knowledge* as the individual's personal storehouse of domain knowledge (such as knowing the concepts and principles about science), which influences the depth of understanding when reading. The term prior knowledge can also refer to the student's background reading ability. These two variables of prior knowledge—familiarity with the topic (little background versus much background) and reading ability (i.e. good versus poor readers)—influence not only the strategy selection but also the success of that strategy when studying.

Caverly et al. (2000) summarized the implications of student variables for the study-reading strategies of underlining, notetaking, and outlining or mapping, as noted in Table 8.2. As noted in the summary of the research in Table 8.2, if students have poor reading ability, then the effectiveness of certain study-reading strategies (such as underlining, notetaking, or mapping) is called into question. On the other hand if students are good readers and have much background knowledge about the topic, the use of underlining, notetaking, or mapping can be effective because these readers can spot the main ideas and relevant details in a passage. Therefore, when teaching study-reading strategies to students, an instructor needs to consider both the students' declarative background knowledge (i.e., familiarity with the topic) and the students' procedural knowledge background (i.e., familiarity and facility using reading strategies).

Table 8.2 Student variables: Prior knowledge and ability (adapted from Caverly et al., 2000)

Complex rehearsal strategy: Underlining	• Teaching the use of underlining to students who have a low level of reading ability is not appropriate. Student must first learn how to find main ideas before they learn how to underline them. • The relationship between reading ability and underlining is curvilinear. Good readers seem to have study-reading strategies that are effective and tend to be hindered by imposing underlining on them. Underlining also gives false hope to poorer readers as they randomly underline ideas. • Underlining cannot overcome weak background knowledge or lack of strategies for engaging background knowledge. (p. 110)
Complex elaboration strategy: Notetaking	• Teaching notetaking to students who are unable to recognize main ideas is inappropriate. Notetaking should not be taught until a basic level of literal comprehension is reached. • The effect of engaging background knowledge is unclear because of the small number of studies that have addressed this issue. If background knowledge is engaged before or during reading, notetaking may facilitate recall, either by directing students' attention to the structure of the material if their knowledge is weak or by causing students to impose their own structure onto the material in lieu of the author's. (p. 115)
Complex organizational strategies: Outlining and mapping	• Students need instruction to use outlining or mapping effectively. • Outlining or mapping can significantly improve reading performance among students with lower levels of ability. • Outlining or mapping cannot make up for lack of background knowledge. (p. 121)

The successful reader and self-regulated learning

Useful student-oriented study-reading strategies are those that emulate mature, successful readers in academe. Pressley and Afflerbach (1995) examined verbal protocols and found similar strategies among successful readers: (a) previewing the text to get a sense of the big picture, (b) setting a goal for reading, (c) connecting new knowledge to prior knowledge, (d) holding disparate ideas in abeyance until further reading, (e) monitoring their progress toward their goal and adapting strategies to be more effective, (f) critically reading to assess validity and authority of ideas presented, and (g) reflecting on both the ideas learned and the success of their choice of strategies after reading. In a phrase, good readers actively seek to construct meaning in a cognitive, metacognitive, and affective way. This "self-regulation" of the reading process (Simpson, Hynd, Nist, & Burrell, 1997) has become the focus of study-reading strategies.

Zimmerman (2002) proposed that these strategies follow three general phases. Beginning with a *forethought phase*, good readers analyze both the task defined by the author and the purpose set forth by the instructor, set goals to accomplish that task, and develop a strategic plan to achieve those goals by selecting effective tactics/strategies. Readers also recall past feelings and beliefs in similar situations to motivate themselves and summon the resources to accomplish the goals. Next, readers complete a *performance phase,* where they monitor their progress toward that goal, control their cognitive and metacognitive attention, use imagery where possible, group associated concepts as they add to or change existing knowledge, and revert to fix-up strategies when understanding is not accomplished and the goals are not being met. Third, readers complete a *reflection phase,* where they evaluate the completion of their goals, attribute

cause as they assess their successes and failures in understanding and the strategies they chose to construct meaning, and self-motivate in an effort to continue the successful strategies in the future.

Distinctions among college students exist in using self-regulated strategies (Barnett, 2000; Ley & Young, 1998; Simpson & Nist, 1992). Young and Ley (2005) reported significant strategy use between developmental first-time college students, who lacked strategies such as reviewing notes and rehearsing, when compared with regular admission students. Van Blerkom and van Blerkom (2004) examined the self-monitoring strategies of developmental and non-developmental college students; at the beginning of the semester the non-developmental students reported more strategies and more sophisticated strategies than the developmental students, but when developmental students were enrolled in a college study strategies course, they reported both a greater repertoire and more sophisticated set of strategies than at the beginning of the semester. Thus, when taught study-reading strategies in a college reading course, developmental students gain the background procedural knowledge for strategy use.

The wider implications of self-regulatory processes in the arena of college reading and learning have been linked to the neuropsychological construct of executive functioning of college students (Petersen, Lavelle, & Guarino, 2006), which includes behaviors in planning and organization, goal-setting, time management, task persistence, and multitasking. The role of volition and planning, evident in choices of self-regulatory strategies like time management and concentration, and their influence in study-reading strategies shows the critical link between "strategy" and "self" in successful study practices.

A favorable avenue for helping students become strategic readers has been teaching them to understand the contributions made by them as readers (i.e., the role of background declarative and procedural knowledge, their metacognitive, and conative knowledge [Corno & Snow, 2001]); contributions made by the author of the text they are reading (i.e., ordinal, relational, and story macrostructures); and contributions made by the task for which they are reading (i.e., conditional knowledge). Then, teaching these novice readers a heuristic to remember the steps to orchestrating all these contributions while reading expository and narrative text helps students become strategic readers.

Academic tasks and multiliteracies

The types of tasks required of college students require multiple academic literacies that provide access to academia (Pawan & Honeyford, this volume), quite different in many aspects to literacies required in the workplace, the home, or social communities. Success in college requires understanding not only of certain subject matter content (declarative knowledge) but also an understanding of how to succeed on different types of assessments (procedural knowledge), including multiple choice exams, essays, and performance assessments.

The tasks expected of college students have also changed as a result of the multiple literacies now required to pass college requirements. For instance, during the past 50 years the deliveries of courses have changed. College-level instruction now utilizes newer technologies both in and out of the classroom, including web-based resources, often employing both asynchronous and synchronous learning. Furthermore, a number of post-secondary courses are now offered through distance education programs, particularly in areas of English, humanities, and social and behavioral sciences, as noted in reports surveying the spike in growth in distance learning programs (Cheney, 2002).

Task conditions vary across disciplines and across professors. Nist and Simpson (2000) note that students and professors differ in their perceptions of essential thinking processes. Simpson and Nist (1997) in a case study of students in a university history course showed that students who were flexible in their belief systems about learning and

history, perceptions of task, and strategic approaches were the ones who succeeded in the course; furthermore, when students' perceptions of the task were similar to those of the professor, students performed better in the course. An example of a task was to respond to an essay question that required students to synthesize information from lecture notes and readings with the purpose of drawing conclusions about the people and events they had studied.

Academic literacy tasks most often are explicitly linked to the types of selected response, constructed response, and performance assessments given in college: (a) recognition and recall on multiple choice tests, (b) analysis and synthesis of information on essay tests, (v) analysis and evaluation of data in labs, (d) summarizing and synthesizing research for reports and class presentations. In preparation for these assessments and their work in the classroom students are expected to take lecture notes, complete assigned readings, and complete both independent and collaborative group work.

Essential to success in comprehending texts are tasks that require making appropriate inferences, predicting, identifying main ideas, drawing conclusions, questioning the text, making connections, summarizing essential ideas, creating visual images, looking for clues in the text, and determining the importance of information (Block & Pressley, 2003; Gunning, 2008; Hock & Mellard, 2005; Peterson, Caverly, Nicholson, O'Neal, & Cusenbary, 2000). These tasks can be summarized in terms of a hierarchy of reader purposes based on levels of cognitive processing when comprehending a text: (a) locating information, (b) determining the main idea, (c) applying ideas, analyzing key points, (d) synthesizing information, and (e) evaluating information (Snow, 2002; van Blerkom & Mulcahy-Ernt, 2005).

Caverly et al. (2000) summarized the implications of task variables for the study-reading strategies of underlining, notetaking, and outlining or mapping, as noted in Table 8.3. As noted in this table, the utility of different study-reading strategies varies with the task, such as recalling main points or studying to remember details.

Text materials

A significant variable impacting the choice of study-reading strategy is the text itself, which may be considered easy or hard based on the reader's prior knowledge of the domain. According to the Rand Report (2002), text variability can occur in many dimensions:

a. Discourse genre, such as narration, description, exposition, and persuasion;
b. Discourse structure, including rhetorical composition and coherence;
c. Media forms, such as textbooks, multimedia, advertisements, hypertext, and the Internet;
d. Sentence difficulty, including vocabulary, syntax, and the propositional text base ...;
e. Content, including different types of mental models, cultures, and socioeconomic strata; age-appropriate selection of subject matter; and the practices that are prominent in the culture;
f. Texts with varying degrees of engagement for particular classes of readers. (p. 25)

In a survey of community college instructors Maaka and Ward (2000) reported finding that the types of material instructors preferred to assign were, in order of preference, textbooks, content-specific handouts, and periodicals. Although these results are not surprising, they do provide evidence that the text genre of choice is expository text. The Rand Report (Snow, 2002) acknowledges that "students rarely acquire a deep understanding of the technical, expository material they are supposed to read in their

Table 8.3 Task variables (adapted from Caverly et al., 2000)

Complex rehearsal strategy: Underlining	• Underlining seems to be more effective for intentional recall than incidental recall unless extensive instruction is provided. (p. 113)
Complex elaboration strategy: Notetaking	• Students should be taught to identify the type of test they will be required to take and then adjust their notetaking accordingly. • If the test is to be delayed beyond immediate recall, review is necessary. (p. 119)
Complex organizational strategies: Outlining and mapping	• Outlining and mapping seem to improve students' performance when the task demand focuses more on main ideas than on details; thus, outlining and mapping seem to favor the encoding and recall of main ideas over the encoding and recall of details. • Review seems to be a potential factor for outlining and mapping to improve performance on either immediate or delayed tests as it has been in other study-reading strategies. (p. 125)

courses" (p. 109); as noted in this report, deeper-level comprehension questions (such as analysis, synthesis, and evaluation) are integral for comprehension and need explicit instruction.

Although prior knowledge has an effect on comprehension, text effects, including the type of text genre, influence understanding. Francis and Hallam (2000) asked mature students in a postgraduate course in educational psychology to read texts in different genres about topics in educational psychology; data about genres that they found particularly difficult, such as journal articles reporting empirical research and books on statistical data analysis, showed differences in understanding.

Alexander and Jetton (2000) distinguish text genre as expository (such as encyclopedia), narrative (such as myths and novels), and mixed (such as biography). Further distinctions in text may be characterized as linear, such as print text, or nonlinear, such as online text. As noted by Alexander and Jetton, "one reason genres are important is because they appear to elicit varied processing" (p. 291); readers focus on different perceived importance of what is in the text, particularly in determining structural importance, which pertains to the hierarchical structure of information in the text (Kintsch & van Dijk, 1978).

Caverly et al. (2000) summarized the implications of text material variables for the study-reading strategies of underlining, notetaking, and outlining or mapping, as noted in Table 8.4. As noted in this table, distinctions in text genre, the length of the text, text difficulty, and explicitness of text structure can influence the type of study-reading strategy.

STUDY STRATEGIES

As alternatives to the weaker study-reading technique of re-reading the text to recall what was read, the strategies of underlining (or highlighting), notetaking, mapping, questioning what is read, and summarizing the text provide feasible options when reading and studying from text. Each of these strategies will be addressed in this next section. Underlying cognitive processes for these strategies are the study processes of "encoding, organizing, determining word meaning, using executive control, annotating, structural, and contextual analysis, mapping, outlining, creating a study plan" (Nist, Simpson, Olejnik, & Mealey, 1991, p. 850).

Table 8.4 Material variables (adapted from Caverly et al., 2000)

Complex rehearsal strategy: Underlining	• The effect of underlining in the different content areas is unknown. • Underlining may be more effective with harder passages if performed well and if major points are identified. • Underlining seems to be less effective in longer material (more than 500 words) due to the concept load. (p. 112)
Complex elaboration strategy: Notetaking	• Notetaking should improve performance in any content area, although it has been examined primarily in the social sciences. • Notetaking is more useful for hard material, but not enough data are available to recommend it for college-level material (particularly for poor readers). They must first learn to recognize text structure to find the most important ideas before they learn to take notes on those ideas. • Notetaking seems to be more productive with longer material. It is not pragmatic to use a processing intensive strategy like notetaking on shorter material. • Notetaking tends to be verbatim when the material has an explicit structure; when the structure of the material is implicit, notetaking tends to help students (particularly better readers) impose a structure and thus improve their processing. (p. 116)
Complex organizational strategies: Outlining and mapping	• Because none of the research manipulated content, the influence of this variable on the effectiveness of outlining and mapping cannot be said to be more effective in one content area versus another. However, mapping has a robust effect of being effective in both social science and science material. • Outlining and mapping were generally more successful with material that was deemed at or above the reading level of the student. • The effectiveness of outlining and mapping is more dependent on instruction with longer material than it is with shorter material. • With implicitly structured material, outlining and mapping are effective study-reading strategies for students with low reading ability only if they receive instruction. • Initial evidence suggests mapping is more effective with more complex text structures than simpler text structures. (p. 122–123)

Underlining/highlighting

Although many students approach studying from their textbooks with a highlighter in hand or a pen/pencil to underline their textbooks, this strategy is a complex rehearsal strategy that may benefit some readers but may be less effective for others. As an encoding strategy, underlining main ideas and circling key details is a locating strategy and allows the student to differentiate text details, similar to the von Restorrf effect (Wallace, 1965). However, as noted by Caverly et al. (2000), the downside of using underlining as a study strategy is that it is often overused. Yet, as a student-generated strategy, underlining can be effective (Nist & Hogrebe, 1987; Rickards & August, 1975). Caverly et al. (2000) conclude that:

> underlining should not be taught to students who are not developmentally ready to use it (e.g., those who are unable to recognize main ideas); underlining cannot overcome poor reading ability. Underlining may not help in longer, harder material but the research is scanty. Underlining seems to help only if what the student underlined was on the test. If the test measures concepts not underlined or inferred from

> the text, underlining does not seem to help. Underlining is not effective unless the student is taught to regularly review what they have underlined. (p. 114)

Annotation/notetaking and mapping

As noted as a complex elaborative study-reading strategy, taking notes from textbooks, or when possible, making text annotations, is a popular strategy, particularly when used in combination with underlining. When annotating the text, the student writes brief notes summarizing key ideas, listing ideas, noting relevant examples, making predictions, and underlining key words and phrases (Nist & Simpson, 1988). Eanet and Manzo's (1976) REAP strategy suggests that students first read the text, encode, annotate, then ponder the text; annotations include summary notes, thesis notes, critical notes, and question notes (Vacca & Vacca, 2008).

Kiewra (1989) described the benefit of notetaking in terms of the cognitive processes of coding, integrating, synthesizing, and transforming information that can later be reviewed and recalled. In an investigation of study strategies of college students Cukras (2006) described the benefits of the combination of underlining with annotation, particularly in marking parts of the text with questions for later recall, coupled with a mapping strategy to focus on relationships of concepts or theories.

As noted in Caverly et al. (2000),

> notetaking while study reading a textbook helps students improve subsequent task performance. Given an appropriate instruction, students can produce a set of notes after engaging in deeper encoding processes that is useful to prepare for any type of test. Then, if a delayed task demand requires recall, they can review those notes to help them boost performance. (p. 119)

Since that review, recent research has raised the questions of the use of notetaking for multiliterate tasks. For example, Pardini, Domizi, Forbes, and Pettis (2005) have developed a parallel note-taking strategy using Webnotes, which the students download prior to their lecture classes. As online text, Webnotes supplement the class lectures; thus the notion of learning from "text" includes traditional texts, online texts, as well as the classroom lecture notes as texts. Hartley (2002) challenges the notion of notetaking as a traditional print-based strategy since students can download lecture handouts, PowerPoint presentations, and other Internet materials; these texts in some cases are "the textbook" for the course.

Recent investigations about the utility of notetaking have extended the conversation into the arena of understanding the process of non-native speakers of English. Wilson (1999) conducted a qualitative study of non-native speakers' notetaking strategies for academic texts, revealing their challenge of understanding both the discourse and vocabulary of what they were reading. The relationship of the notetaking strategies of non-native speakers to their performance on assessments in listening, speaking, reading, and writing is also of interest to the assessment community as more authentic measures are sought for this population in both printed text and in computer-based formats (Carrell, 2007).

As a complex organizational strategy, the use of mapping has been shown to be a beneficial strategy for representing text ideas; a meta-analysis of studies using concept maps showed that they are effective for attaining knowledge retention and transfer (Nesbit & Adesope, 2006). Concept maps have been used in a wide variety of disciplines. Doorn and O'Brien (2007) introduced concept mapping techniques in an introductory statistics course; though evidence was weak in support of concept maps for students learning statistics, students using concept maps reported a greater gain in the area of

"active study." Particularly with expository texts that contain both a rhetorical pattern and specialized vocabulary, concept maps provide a spatial view that traditional linear outlines do not show (Romance & Vitale, 1999). Graphic organizers, which include flowcharts, timelines, and tables, provide a visual means of showing the relationships of text ideas (Merkley & Jeffries, 2000/2001; Vacca & Vacca, 2008).

The Caverly et al. (2000) summary about the effectiveness of outlining and mapping still holds true:

> students must be taught how to use the outlining and mapping study-reading strategies. This is particularly true for students with low reading ability and students working with longer material (more than 1,000 words). There is some evidence that students must be taught not only how to use these study-reading strategies but also how to assess the interaction between their purpose for reading (i.e., their knowledge of the task demand) and how well their background knowledge matches the material. Moreover, there are some indications that review might be necessary for students to perform before any test. If students can assess their abilities, the text, and the context, and also adjust their processing accordingly, outlining and mapping seem to be effective strategies for improving the recall of main ideas, although not necessarily of details. (p. 125)

Questioning

Integral to many study-reading systems promoting long-term retention is the strategy of questioning the text, using either questions that are self-generated or those provided by a teacher or textbook, in order to guide comprehension and later review the material (Devine & Kania, 2003). For example, the success of SQ3R and its progenies is due to its self-questioning component (Martin, 1985). The key to its effectiveness is that when students create their own questions about the text, they are actively processing text information, resulting in an improvement in comprehension (Graesser & McMahen, 1993); such questioning may be used in a reciprocal teaching format when students study in pairs (Palincsar & Brown, 1984). Still, the salutary effects of using study questions from textbooks, even when they are not self-generated, have been proven. Brothen and Wambach (2000) reported that developmental college students in a psychology course who used factual questions in a study guide scored higher on quizzes than those students who did not respond to the questions and who relied more on the lecture notes. Similarly, Phillips (2006) reported that community college students in a biology course, when given open-book study questions, improved their study strategies, particularly those students initially targeted as weak or moderate level students.

Yet, when students become engaged in higher-order questioning—that is, answering "why" rather than "what" questions through elaborative interrogation—students are able to recall more information, identify more accurate inferences, and create more coherent mental representations of the text than students who merely re-read the text for understanding (Ozgungor & Guthrie, 2004). In Ozgungor and Guthrie's study college students responded to "why" questions embedded in the text; the benefit of using elaborative interrogation was higher for students who had less prior knowledge about the topic (Ozgungor & Guthrie).

The intent of using a process of question making and question asking is to foster critical thinking, as well as to facilitate prediction, interpretation, and application of what is read (Ambe, 2007). Block and Pressley (2003) consider questioning as one of the essential comprehension processes; it involves the ability to monitor one's reading, to determine the main point of what is read, to determine points of confusion, and to decide on the process needed to construct meaning from the passage. Ciardello (2007)

extends the process of question making to inquiry learning through a strategy called "question-finding;" this term describes student questioning when reading discrepant materials and anomalous situations; the texts that students read contain data that is surprising, unexpected, or against the norm, creating a sense of curiosity.

The use of student-generated questions as a study-reading strategy for college students—in contrast to copying text ideas, highlighting, or notetaking—has been proven to be a more beneficial strategy (van Blerkom, van Blerkom, & Bertsch, 2006); in van Blerkom et al.'s (2006) study students employed a generative strategy that involved making text-based questions in the margin of the text, reading to find the answers, covering and reciting the answers, and then checking for accuracy. Chaplin (2007) reports that college students in an introductory biology course who wrote and shared questions at the knowledge, application, or analysis level of thinking performed better on course exams, had higher GPAs, and had lower withdrawal grades in comparison to students who did not participate in a critical thinking lab requiring self-generated questions. The use of these strategies can distinguish the successful student from one who is less mature; Taraban, Rynearson, and Kerr (2000) in a survey of college students' reading strategy use and academic performance noted that only a small proportion of the student responses indicated sophisticated strategies, such as generating questions about the material or making notes about what was read.

The power of self-generating questions is thus recognized as a study-reading strategy that produces much success. One such intervention design is the Strategic Instruction Model (Deshler & Tollefson, 2006), which integrates student-focused interventions (Learning Strategies) and teacher-focused interventions (Content Enhancement Routines). SIM Strategies (Hock & Mellard, 2005) employ six key reading comprehension categories: (a) identifying main idea, (b) summarizing, (c) drawing inferences, (d)generating questions, (e) creating visual images, and (f) looking for clues. In this model self-questioning is an integral strategy for making predications and inferences.

Summarizing

As noted by Pressley (2002), "The really good, metacognitively sophisticated reader knows that high comprehension requires active reading: predicting, questioning, imaging, clarifying, and summarizing while reading" (p. 305). Similar to creating annotations, summarizing is a complex organizational strategy (Weinstein & Mayer, 1985) directing students to document their understanding during and after reading by recognizing the macro- and micro-structure of the text material. Recognizing these structures fosters comprehension by helping students differentiate important from less important ideas. To teach readers how to see important ideas in text, Brown and Day (1983) proposed summarization rules following Kintsch and van Dijk's (1978) model of text comprehension. These macrorules are sequential and include six steps: (a) delete trivial material, (b) delete redundancies, (c) substitute a superordinate term for a list of exemplars, (d) locate topic sentences, and (e) invent topic sentences for paragraphs that lack them (Day, 1981).

The benefits of summarizing are many for college students. Summarizing can enhance finding main ideas (Garner, 1982), improve meta-comprehension (Thiede & Anderson, 2003), improve test performance (Pena-Paez & Surber, 1990), and foster comprehension when reading multiple texts (Britt & Sommer, 2004; Kobayashi, 2007). Even when summarizing is completed without the text, summarizing can improve deeper processing of text (Kirby & Pedwell, 1991). For some college students summarizing occurs as a spontaneous study strategy (Wade, Trathen, & Schraw, 1990); however, most students benefit from instruction in learning how to summarize. In fact, less mature readers need instruction in how to find main ideas (Garner, 1985) before they can learn to summarize.

However, this positive summarizing effect is contextualized. Being able to summarize does not guarantee being able to recall details, recognize implicit main ideas, or improve metacognition (Hare & Borchardt, 1984). A student's ability to summarize is dependent upon the quality of writing in the text they are reading (Hidi & Anderson, 1986; Kintsch, Mandel, & Kozminsky, 1977). Infrequent summarizing is more effective than frequent summarizing when the task is a subjective assessment (Spurlin, Dansereau, O'Donnell, & Brooks, 1988). Students are very dependent on subheadings when summarizing, so they must also be taught to summarize when subheadings are not present (Lorch, Pugzles Lorch, Ritchey, McGovern, & Coleman, 2001).

Several studies have demonstrated that college reading students can be taught to summarize following these macro-rules. Day (1981) found these rules can be learned by college readers if taught through explicit instruction. However, ability level was a covariate, as lower ability readers needed more help than higher ability students in the subordination rules, along with help in making transfer to a variety of difficult materials. Still, Kamhi-Stein (1993) was able to teach summarization to learning disabled college students and Rich and Shepherd (1993) to Adult Basic Education students.

Summarizing fits a self-regulated learning framework (Zimmerman, 2002). If students are taught to combine multiple strategies when they develop a plan for reading, they can be more successful. Bean, Singer, Sorter, and Frazee (1986), for example, found summarizing instruction helps students create graphic organizers (i.e., maps) and generate questions more effectively than simply reading by outlining or graphic organizers alone.

Other researchers found combining cognitive mapping with summarizing was more effective than either alone (Amer, 1994; Boyle & Peregoy, 1991; Osman-Jouchoux, 1997). Vaughn, Klingner, and Bryant (2001) taught students to be self-regulating through an instructional strategy called Collaborative Strategic Reading. Here, after modeling to the entire class, students took turns in a small group previewing a text, monitoring reading, identifying main ideas, and summarizing the text after reading it. Using writing to internalize a discipline's key concepts and subordinate concepts encourages students to think critically about the discipline, a goal of college learning (Elder & Paul, 2006). There is a rich body of research, summarized by Bangert-Drowns, Hurley, and Wilkinson's (2004) meta-analysis and supported by Emig's (1977) theory, that shows that writing fosters learning, thus providing a sound rationale for using summarization as a strategy when studying.

STUDY-READING SYSTEMS

While each of the strategies noted above may be used independently, the combination of them fosters self-regulation of learning through reading. During the past 60 years, a variety of study-reading systems have been developed and tested to guide the students. One of the most widely used study-reading system is SQ3R (Robinson, 1946; Robinson, 1970; Maxwell, 1997), which stands for the following steps: *Survey* the topic headings and summary, turn topic headings into *Questions*, *Read* to answer the questions, *Recite* to recall the main points and answers to the questions, and *Review* the main points. As reviewed in the first edition of this chapter (Caverly et al., 2000), research about the use of SQ3R with developmental college readers has a rich background. As noted in Caverly et al. (2000):

> several researchers have reviewed the theoretical and/or empirical foundations used to support the use of SQ3R for college developmental readers (Anderson & Armbruster, 1982; Bahe, 1969; Basile, 1978; Caverly, 1985; Caverly & Orlando, 1991; Crewe & Hultgren, 1969; Graham, 1982; Gustafson & Pederson, 1984; Jacobow-

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The Caverly et al. (2000) review investigated a more granular perspective of SQ3R, looking at student, task, material, and instruction variables that influence performance in using SQ3R; they concluded the following:

> A strong student/instruction/task demand interaction seems to be present in the use of SQ3R. Substantial, effective instruction is necessary for students with low or medium reading ability to succeed with this strategy. This instruction should include an attempt to build students' awareness of the effort required in using this strategy. Success is apparent only in long term measures such as GPA. On the other hand, we know very little about the effect of students' background knowledge, or of the effect of material variables, on SQ3R as a study-reading strategy. (p. 130)

Since the publication of the Caverly et al. (2000) chapter, four new research studies were found on SQ3R among college students (Bradshaw, 1998; Cantu, 2006; Kindel, 2000; Krause, 2001). Only one positive effect was found for SQ3R, improving course completion among female college students taking a math class (Kindel), but the effects of the reading strategy were not parsed out of the effects of general study strategies used by these students. Huber (2004) concurs there is little new evidence when reviewing the research on SQ3R.

The popularity of SQ3R as a study system has fostered a growth of study systems during the past 60 years using the basic SQ3R framework of surveying (sometimes called previewing), creating relevant questions, reading for meaning, and reviewing. These adapted approaches intended to address critical processes for student study-reading and the monitoring of learning a content discipline. For instance, SQ4R (Smith, 1961) utilized an additional step, *wRite*, to take text notes in order to answer the questions generated prior to focused reading. The belief that writing is an essential component of a study system in order to recall essential information and learn it well is the basis for PORPE (Simpson, 1986; Simpson, Hayes, Stahl, & Connor, 1988; Simpson & Stahl, 1987). Tested with college freshmen in developmental reading/study courses, PORPE facilitated the creation of well-developed essay responses. In this reading-study system students read passages and completed five steps (*Predict* potential essay questions; *Organize* key ideas in their own words; *Rehearse* key ideas; *Practice* recall of key ideas in analytical writing tasks; and *Evaluate* the completeness, accuracy, and appropriateness of their writing). The value of writing when studying was evident in another study when Maloney (2003) taught her students a heuristic of multiple readings involving previewing, annotating, formulating questions, and summarizing; her students passed the requisite standardized test when students re-took the test.

Similar in concept to SQ3R are a number of other study-reading methods. These include ROWAC (*Read, Organize, Write, Actively Read, Correct Predictions*; Roe, Stoodt-Hill, & Burns, 2007), developed by Roe to emphasize organizing ideas; SQRQCQ (*Survey, Question, Read, Question, Compute, Question*; Fay, 1965), used for comprehending word problems in mathematics; and SQRC (*State, Question, Read, Conclude*; Sakta, 1998/1999), developed to emphasize critical thinking, voicing a

viewpoint, and preparing to defend that perspective in a class discussion. Still other spin-offs of SQ3R were created to help students develop study-reading strategies: (a) S-RUN (*Survey, Read, Underline, Notate*; Bailey, 1988) to emphasize notetaking; (b) S-RUN-R (*Survey, Read, Underline, Notate, Review*; van Blerkom & Mulcahy-Ernt, 2005), developed by van Blerkom to combine Bailey's system with a final review step for studying difficult text material; and (c) P2R (*Preview, Read Actively, Review*; van Blerkom, 2006), developed as a more condensed version to study texts of easy to average difficulty.

Another combinational strategy utilizing a pre-reading component is PROR (*Preread, Read, Organize, Review*; Donley & Spires, 1999), which was found to be effective during the semester taught; however, there was little evidence of transfer to subsequent semesters. In contrast, PLAE (*Preplan, List, Activate*, and *Evaluate*; Nist & Simpson, 1990) was found to improve student performance on a teacher-made test that covered four college textbook chapters when compared to the performance of a control group.

Nist and Simpson (1990) demonstrated that when students used the PLAE strategy reading, their improvement of chapter test performance in college textbooks was significantly better than students who only learned study skills. Similarly, students using a Study Cycle strategy (Jones, 2005) showed significant comprehension gains; in this strategy students applied a self-regulated reading process that involved determining a purpose for reading, developing and applying a plan of appropriate study strategies according to that purpose, selecting from highlighting/underlining, notetaking/annotation, paraphrasing, outlining, mapping, and summarizing (i.e., forethought phase); discussing with other students the effectiveness of the strategies (i.e., performance phase); and evaluating the plan in relationship to the purpose (i.e., reflection phase). She found significant gains in comprehension as measured by a teacher-made test when reading full-length, expository, instructional texts.

Yet another combinational strategy is PLAN (*Predict, Locate, Add*, and *Note*), proposed by Caverly, Mandeville, and Nicholson (1995), who noted that developmental reading students significantly outperformed students in a control group who did not learn PLAN; measures used in this study were achievement on a standardized test, fourth semester GPA, and retention. In a follow-up study, Caverly, Peterson, and Wuestenberg (1996) found that positive effects when using PLAN continued for eight semesters. These effects were replicated in a second follow-up study (Caverly, Nicholson, & Radcliffe, 2004) with college-age students. Follow-up studies with an eighth grade science class (Radcliffe, Caverly, Peterson, & Emmons, 2004) and a fifth grade science class (Radcliffe, Caverly, Hand, & Franke, in press) also documented that students successfully learned the strategy and outperformed a control group; in these two studies classroom teachers learned to teach PLAN after extended professional development following a Transactional Strategy Instructional model (Pressley, El-Dinary, Wharton-McDonald, & Brown, 1998).

The positive benefits of using a study-reading system have been extended into domains that require both intensive and extensive reading for students at all levels of study, including those at the graduate level. For example, Hanau's Statement PIE (Hanau, 1972) was created for reading medical texts; readers used PIE to classify ideas into *Proof, Information*, and *Examples*. Another application is the use of FAIR (Mayfield, 1977) when reading law cases to look for *Facts, Actions* taken in the case, *Issues* decided by the court, and the court's *Reasons* for its decision.

CONCLUSIONS AND RECOMMENDATIONS FOR INSTRUCTION

It seems a self-regulated learning theoretical framework holds great promise for developing strategic readers for traditional textbook reading. Similar benefits have been

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found for self-regulated learning strategies with students when reading hypermedia texts (Azevedo, 2005; more discussion of reading text through technology is presented in Caverly, Peterson, Delaney, & Starks, this volume). Inherent in this framework are descriptors of critical processes for monitoring one's study processes during reading: (a) during the forethought phase to understand the task, set goals, and develop a strategic plan; (b) during the performance phase to monitor one's progress, use appropriate strategies, and use fix-up strategies when needed; and (c) during the reflection phase to evaluate one's performance, reflect on the success of using the strategies, and plan for effortful learning in the future. A key factor in this framework, though, is not the instructor but the student. The focus is on *self* regulation, requiring effort, continued motivation, strategy use, decision-making, continued practice, and reflection.

So, what are the implications for classroom instruction? Martin (2004) suggests that in a self-regulatory framework, considerate of the self as agent, students would be in classrooms in which:

> comfort with risk-taking (i.e. with the possibility and actuality of "being wrong") is encouraged by the teacher ... students are encouraged to evaluate the results of their experimentation, risk-taking, and resultant understanding in relation to the task concerns and difficulties that initiated their learning activity. (pp. 142–143)

The shift in focus is from a pedantic stance to one that fosters students as agents engaged with the tasks, materials, and discussions. The implication of this pedagogical shift is to foster the student's own planning, decision-making, reflection, and evaluation of effective strategies.

This chapter has presented a review of some of the most widely used study-reading strategies and study-reading systems. When considering study-reading strategies and systems from the perspectives of student, task, and text materials, instructors can consider several implications for classroom teaching:

1. Students differ in their prior knowledge about the content (declarative knowledge); instructors can provide sufficient contextual background descriptions that will help students build appropriate mental models about the text, form appropriate inferences, create appropriate text annotations, form relevant questions, and create summaries based on the text readings.
2. Students differ in their prior knowledge about strategy use (procedural knowledge); not all students benefit from the use of the same strategies when reading and learning from text. Therefore, students should be encouraged to select the strategies that are the best fit with their learning goals, level of expertise, and available resources, such as time. Students should also be encouraged to monitor their strategy use and its effectiveness.
3. Instructors can provide feedback to students about their use of specific study-reading strategies. For instance, if students create concept maps based on a text reading assignment, then classroom discussion about the levels of complexity and elaboration of ideas in the map can provide students important feedback about their concept maps and their selection of relevant main ideas and subordinate details.
4. Instructor modeling and think alouds can demonstrate the use of study-reading strategies, such as the creation of critical, question, or summary text annotations. Classroom discussion can help students fine-tune their strategy use. Likewise, classroom discussion about a study-reading system can help students plan for and use the combination of strategies that promote leaning and retention of the material.
5. Academic tasks vary in their complexity, the amount of time needed to complete them, and the types of reading required. Clarification of the assignments helps

students to understand the instructor's perception of the task. Students should be encouraged to select the strategies that help them complete their academic tasks, monitor their effectiveness, and evaluate how well they served the task. Students should also be encouraged to seek clarification about the tasks and to check their perceptions of them with the instructor.

6. Instructors can make explicit their expectations about the relationship of lecture notes and course readings with course exams, so that students can choose the study-reading strategies that will best prepare them for exams. Likewise, study guides, questions, and other class reviews can help students focus on relevant course content.
7. Text difficulty is a factor for students when using study-reading strategies. Instructors can be mindful of the choice of text genre when selecting reading assignments and choose considerate texts (Armbruster & Anderson, 1985), that is, texts that are well-written, match the students' prior knowledge, and match the goal of instruction.

FUTURE RESEARCH AVENUES

The theoretical framework of self-regulated learning helps situate recent research about study-reading strategies and view these studies from constructivist perspectives about how students select, use, and evaluate strategies for gaining meaning from text. Many studies focus on freshman college readers using strategies for working with printed text in liberal arts courses, such as psychology, biology, or history. Future directions for research can expand this repertoire into other domains, including the health sciences, business, science and engineering, and technical trades. As we noted in this chapter, constraints for study-reading strategies are contextualized by the student, task, and text. Unanswered questions about the efficacy of study-reading strategies for different tasks and texts in a variety of disciplines still exist.

In addition, much of the research during the past 50 years has focused on the strategy use of developmental students; only a few of these studies have addressed the diversity of students, including distinctions in language background, culture, or geography. More global distinctions among strategy use of students in and from different countries, including those who are English Language Learners, need to be investigated.

One of the research areas of greatest potential, however, is to investigate the use of strategies originally intended for printed text in the arena of electronic texts. Traditional highlighting, notetaking, questioning, and summarization strategies take on a new form in an online environment, providing non-linear means to interact with text, encode relevant ideas, and review for future tests. The field of literacy has expanded the notion of text to account for many different types of both print and electronic texts, considering tasks involving multiliteracies present in school, workplace, and home (Leu, 2006). It is in this arena of New Literacies that much research is needed for the future.

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