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Directed and Spontaneous Transfer of College Developmental Reading Students' Textmarking Strategies.

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Directed and spontaneous transfer of college developmental reading students’ textmarking strategies

Frazier, Deidra Williams, Ph.D.
The Louisiana State University and Agricultural and Mechanical Col., 1991

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DIRECTED AND SPONTANEOUS TRANSFER
OF COLLEGE DEVELOPMENTAL READING STUDENTS'
TEXTMARKING STRATEGIES

A Dissertation

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Louisiana State University
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in partial fulfillment of the
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in
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by

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ABSTRACT

The purpose of this study was to examine directed and spontaneous transfer of college developmental reading students' textmarking strategy use. Two males and two females enrolled in a developmental reading course at Louisiana State University participated. Participants were asked to use textmarking strategies in their introductory biology course. During scheduled meetings with the researcher, participants turned in their annotated material, discussed textmarking progress, and received feedback on the quality of their annotations. Students were also asked to reflect on strategy use in assigned journal entries.

Participants were not asked to use textmarking strategies in any other content course in which they were enrolled. However, at the end of the semester, they were asked to bring in any textbooks in which they had marked to the researcher for analysis of spontaneous textmarking.

Data collection occurred over the 15-week semester and included the following sources: photocopies of participants' textbooks in both the developmental reading and biology courses, journal assignments, transcriptions of audiotaped interviews with participants and developmental reading and Biology 1001 instructors, and student course evaluations of developmental reading. Data were analyzed using constant comparative analysis.
Results indicated that: (a) Although efforts varied, students generally exhibited strong resistance to annotation; (b) students either annotated too much or too little information; (c) students had difficulty distinguishing important from trivial information, organizing information, and paraphrasing, and they initially ignored graphic aids; (d) although students gave varied reasons for adjusting textmarking, their existing knowledge of content material and test expectations appeared to be the strongest factors; (e) perceptions of textmarking utility varied little across students; (f) students' statements of textmarking utility were consistent with their use of the strategy, with the exception of one student; and (g) students gave the same reasons for lack of textmarking transfer to outside courses.

These findings are generally supported by earlier textmarking and strategy transfer research and have several implications for developmental reading programs based on a strategic learning approach. To provide students with reading and study strategies and to promote transfer of these strategies, both training within developmental reading programs and the relation between the developmental reading program and subject disciplines should be considered.
CHAPTER ONE
INTRODUCTION

As students make the transition from high school to college, their reading and studying requirements change considerably. In addition to being required to read vast amounts of difficult text, they must be able to comprehend as well as recall key ideas presented in text to perform well on exams. It is not unusual for students in introductory-level courses to be required to read three, four, or more textbooks for a single class within one semester. To comprehend and retain this much material adequately, effective reading and study strategies are needed. Reading and studying content material involves complex activities such as identifying and selectively attending to relevant information, monitoring comprehension, and taking needed corrective action (Baker & Brown, 1984; Brown, 1980).

To meet the needs of increasingly large numbers of students unprepared to cope with college studies, many postsecondary institutions offer developmental programs (Bray, 1984; Carpenter, 1985). Boylan (1986) estimated that nearly 25% of college freshmen are enrolled nationwide in developmental reading, study skills, or learning strategies courses. Students enrolled in developmental reading courses generally have lower college-entrance test scores and lower standardized reading test scores than
their nondevelopmental counterparts and, thus, are under an additional burden as they struggle to meet the demands of college. Such students may have fewer and lesser developed study strategies and may have a greater need for training in reading and study strategies.

Although most developmental reading programs are designed to provide training in reading and study skills for college survival, instructional approaches vary considerably. Many are based on a skills approach and tend to teach reading skills such as skimming, finding main ideas in isolated paragraphs, and recognizing prefixes and suffixes. Other developmental reading programs are founded on a strategic learning approach which involves leading students to become independent readers of whole and varied texts. The goal of such programs is to provide students with a variety of learning strategies that aid comprehension and memory to meet the demands of college-level reading.

Expert readers use rapid decoding and have large vocabularies, phonemic awareness, knowledge of text features, and many different strategies to facilitate understanding and retention. Non-strategic readers, such as college developmental students, often focus on decoding single words, fail to adjust their reading for different texts or purposes, seldom monitor their comprehension, and have problems organizing and relating textual information
(Baker & Brown, 1984). For these reasons, learning strategies courses attempt to train students to use a variety of reading, study and test preparation strategies with which to deal with text and, it is hoped, become autonomous learners. Students are trained to use active strategies that yield artifacts for later review, such as graphic organizers, maps, concepts cards, and textmarking.

Although some form of textmarking (e.g., underlining, highlighting, writing notes in the text) is usually included in learning strategies programs, some programs emphasize annotation, which involves making marginal notes in the text focusing on key concepts and supporting details as well as potential test items. More specifically, annotation includes (a) summarizing and paraphrasing text information, (b) organizing text information in such a way that main ideas, supporting details, and examples are distinguished, and the relation among ideas (e.g., cause and effect, comparison, sequential) is indicated, (c) using a personalized coding system to abbreviate terms, and (d) noting confusing ideas. Annotations of good quality are well organized, concise summaries that are written in the student's own words. In addition to enhancing comprehension during reading, annotations are useful for test preparation because they yield a study guide that has condensed the large amount of information often assigned for college reading. Rather than reread the text, the
student may simply study his or her annotations to prepare for tests. Thus, annotations are an efficient way to read and study large amounts of text. For these reasons, this strategy has been cited by college developmental students as having the most appeal and transfer to outside courses (Mealey, Frazier, & Duchein, 1990; Nist, 1987).

Transfer is one of the main goals of learning and study strategies courses. If students do not transfer strategy use and if research has not examined strategy effectiveness in and transfer to novel situations, a basic premise of these courses may be suspect. In an analysis of the methodological adequacy of studies of comprehension strategy effectiveness (Pressley, Lysynchuk, D’ailly, Smith, & Cake, 1989), results indicated that only 3 of the 37 studies evaluated assessed transfer of newly learned strategies to school subjects/materials other than those encountered during training. Results of this analysis clearly indicate the need for strategy transfer research.

Because studies show that, given student training, annotation positively affects test performance (Nist & Simpson, 1988), and learning strategy students note annotation as a favorite strategy (Mealey, Frazier, & Duchein, 1990; Nist, 1987), transfer of annotation to outside courses seems likely. However, little research on the occurrence and quality of annotation transfer was found. Nist and Kirby (1989) examined used college
textbooks for textmarking and found that students tended to mark or annotate very little, mark random ideas not useful for exam preparation, and highlight more than underline. Nist and Kirby concluded that it was likely that the students who marked these text were not trained; however if they were trained in textmarking, they failed to do so effectively and consistently. To further investigate these findings, therefore, this study focused on the process and transfer of annotation among college developmental reading students trained in textmarking.

Review of Related Literature

For definitions of terms related to this study, see Appendix A. For a complete review of literature, see Appendix B.

The research on college students' use of textmarking strategies has been approached from two broad perspectives. One view holds that, for successful learning and remembering to occur, students must be actively involved in using strategies that yield artifacts for later review, such as textmarking, notetaking, graphic organizers, and concept cards (Nist & Simpson, 1987; Weinstein, 1987). In contrast, another view suggests that little empirical evidence supports the idea that active study techniques are any more effective than the more passive method of repetitive reading (Anderson & Armbruster, 1984; Reynolds & Shirey, 1988).
Active strategies. The "good strategy user" has been described by Pressley, Snyder, and Cariglia-Bull (1987) as having a repertoire of strategies, including goal-specific strategies that facilitate memory, comprehension, and problem-solving goals; monitoring strategies that keep track of cognition and performance; and higher-order sequencing strategies that organize goal-specific and monitoring strategies to accomplish complex goals. Pressley et al. (1987) also pointed out that in addition to knowing strategic procedures, good strategy users know when and where to apply them; that is, they have conditional knowledge of strategies (Paris, Lipson, & Wixson, 1983). Other researchers have described proficient readers as those who selectively take notes, underline, summarize, elaborate text, and answer questions that occur to them about text material (Cook & Mayer, 1983; Forrest-Pressley & Gillies, 1983).

The idea of an active student role in learning is also noted in the research of cognitive-instructional psychologists interested in the cognitive and metacognitive processes underlying knowledge and skills development (Belmont, Butterfield, & Ferretti, 1982; Bransford, 1979; Brown, Bransford, Ferrara, & Campione, 1983). Researchers interested in effective schooling and classroom learning situations (e.g., Doyle, 1977; Humphrey, 1984; Marshall & Weinstein, 1984; Winne & Marx, 1982) and the development of
innovative practices that promote independence and motivation to learn (Marshall, 1981) also support the conception of an active student role in learning.

Support for the view that the effective use of study strategies necessitates active involvement with text is evidenced by current trends in college developmental reading courses and empirical research. In recent years, there has been an increased interest in helping college students acquire specific, active strategies to enhance their independent learning from text (Nist & Simpson, 1987; Weinstein, 1987). Earlier research by Dansereau et al. (1979) indicated that training undergraduates to use specific reading strategies involving paraphrasing, constructing idea networks, and defining the main ideas and forming relationships between those main ideas, improved performance significantly on both short-answer and multiple-choice tests.

More recently, Nist, Simpson, and Olejnik (1985) found that, of six major study variables (annotating/underlining, recitation strategies, vocabulary, planning for tests, and lecture note format and content), annotating/underlining was consistently more highly correlated with test performance among college students than any other variable. In a related study, college developmental students opted for more elaborative strategies such as annotation and
executive control (a strategy which combines planning, monitoring and evaluating learning) when given a choice of strategies for test preparation (Nist, Simpson, Olejnik, & Mealey, in press). Although both of these strategies were significantly correlated with test performance, executive control, which allowed for the use of varied, appropriate strategies, was more highly correlated with test performance than annotation. These results are consistent with previous findings (e.g., Dansereau et al., 1979; Nist et al., 1985) that showed a moderate, positive correlation between active strategy use and test performance among undergraduates.

Nist (1987) pointed out that two main reasons explain why an active strategy like annotating is powerful: First, good textmarking places cognitive demands on the student and promotes deeper levels of processing. DiVesta and Gray (1972) explain this concept in terms of the encoding hypothesis. That is, learning appears to be enhanced when the strategy focuses on and includes active processing of relevant information in the text. For example, the very act of using a strategy such as annotation seems to facilitate comprehension of text during reading. Second, good textmarking gives students a self-testing device from which to study as they prepare for exams. The hypothesis which accounts for this second idea is the external storage hypothesis (Miller, Galanter, & Pribram, 1960). When
textmarked material is used to review and prepare for an exam, it serves as an external mechanism. Nist (1987) concluded that annotating is attractive to students because it serves the dual function of allowing for the isolation of key ideas at the time of initial reading and of yielding artifacts for later reviewing these ideas for exams.

Nist and Simpson (1988) contended that it is necessary for students to know how to interact effectively with text and give several reasons to support the idea of active involvement. First, because students cannot possibly learn everything they read, they must be able to identify and put into their own words key concepts and supporting details. Second, college students must have ready strategies for putting text information into a form that is easily retrievable because they are tested over large amounts of material, often having only two or three exams per course during a semester. Third, students must interact with text through elaboration and recitation so that information may have greater opportunity to reach long-term memory. In summary, college students are faced with the critical problem of learning and remembering vast amounts of information they are required to read. To meet these demands, they need a repertoire of active strategies.

Passive strategies. Despite the commonly acknowledged need for college students to actively process text in order to comprehend and recall information that will be covered
in exams, students' learning strategy repertoires tend to be limited. College freshmen typically memorize, reread, and "look over" when reading and studying text (Anderson & Armbruster, 1984; Doyle, 1983; Simpson & Nist, 1990; Snyder & Pressley, 1988). These activities tend to encourage passivity rather than stimulate active learning (Simpson & Nist, 1990). However, according to some researchers, passive, repetitive reading is no less effective than active methods. Wade and Trathen (1989) found that students' use of specific study techniques such as notetaking, underlining, and highlighting was not causally related to their learning from text. In a review of experimental research of the effectiveness of underlining, Hartley, Bartlett, and Branthwaite (1980) found that out of 22 studies, 14 indicated that underlining had a neutral effect on test performance and one study indicated a negative effect.

**Summary.**

Inconsistent findings concerning the use and effectiveness of active versus passive study techniques are likely a result of the extreme variance in research with regard to procedure, subjects, and materials; such diverse methodology precludes a basis of comparison (Hartley, Bartlett, & Branthwaite, 1980). Weaknesses of these studies include (a) the failure to replicate natural studying conditions, (b) the reliance on short passages,
(c) the failure to provide sufficient training in strategies, and (d) the failure to allow adequate time for the practice of learned strategies. Because of these drawbacks, generalizability of the results of this research is questionable.

More consistent findings with regard to the use of the specific active strategy of annotation have been found in studies which controlled for the above weaknesses. Overall, both descriptive (Mealey, Frazier, & Duchein, 1990; Nist, 1987) and empirical research (Harris, 1990; Hynd, Simpson & Chase, 1990; Nist & Simpson, 1988; Nist, Simpson, & Olejnik, 1985) support the use of textmarking strategies when students are well trained and have opportunities for practice, feedback, and review.

Transfer. The ultimate goal of strategy instruction is to provide the learner with knowledge or skills that may be transferred to similar situations. Given that students can be trained to use these strategies effectively, research needs to examine whether and how students will actually transfer their use to content areas outside of the learning strategy course.

Cormier and Hagman (1987) stated that transfer of learning occurs when prior-learned knowledge and skills influence the way in which new knowledges and skills are learned and performed. A primary goal of a developmental reading program based on a strategic learning approach is
to teach students strategies to aid their text comprehension and retention of content in a variety of subjects. Students are encouraged to transfer these skills to outside college courses while enrolled in the required strategies course. It is further hoped that students will continue to transfer these skills after exiting the strategies course.

Although some research has been done on short- and long-term retention of factual knowledge, few studies have focused on the transfer of strategies that facilitate comprehension and retention. A study on vocabulary acquisition (Pressley & Dennis-Rounds, 1980) found that spontaneous transfer of the keyword strategy was demonstrated by 18-year-olds in contrast to 12-year-olds who transferred the keyword strategy to new situations only when instructed to use a technique similar to the one used in the initial learning situation. These results strengthen the probability of spontaneous strategy transfer among older students. More specifically, results of this study suggest that college developmental reading students might be expected to transfer strategies to courses outside of their required learning strategies course without explicit direction to do so.

Directed and spontaneous transfer among college students was also examined by Gick and Holyoak (1980). In a study on the transfer of analogical problem solving, Gick
and Holyoak (1980) found that undergraduate students who first read a story about a medical problem and its solution tended to generate analogous solutions to a military problem, provided they were given a hint to use the story to help solve the problem. However, when the problem presented in the military story was substantially disanalogous to the medical problem, transfer frequency was reduced. In addition, when no hint to consider the original story was given, frequency of analogous solutions decreased markedly. These results, unlike those of the study by Pressley and Dennis-Rounds (1980), indicated that transfer of learned procedures in new situations is more likely to occur when students are prompted and when the new task is analogous to the original one.

Other research has shown that fairly high levels of spontaneous transfer can be obtained under certain conditions. Gick and Holyoak (1983) found that circumstances involving training conditions that established generalized rules directly applicable to the transfer task, along with at least two specific examples, produced a high frequency of spontaneous transfer among undergraduates. In this study, subjects were required to solve a radiation problem after comparing two situations involving a military problem and a fire fighting problem. Gick and Holyoak (1983) suggested that this initial
training task fostered abstraction of a generalized schema and, thus, contributed to spontaneous transfer.

Another type of situation conducive to transfer involves retrieval processes. Gick (1985) and Holyoak and Koh (1987) found that college students were likely to retrieve and apply learned skills when they perceived the novel situation to be highly similar to the initial learning situation. In the first study which involved problem solving, identical diagrams were included in both the initial problem-solving session and the subsequent transfer problem. In the second study, also involving problem solving, Holyoak and Koh used a story analogue and a problem situation which had common elements. It appeared that the salient common components of both the story analogue and the transfer situation contributed to a very high rate of spontaneous transfer. In this case, over 80% spontaneous transfer occurred after an interval of several days between presentation of the story and the transfer problem.

Results of the research on spontaneous transfer of problem solving provide direction for research on strategy transfer among college developmental reading students. It seems that spontaneous transfer is more likely to occur when training conditions include generalized rules directly applicable to the transfer task, specific examples of the transfer task, and sufficient similarity between the
initial training condition and the transfer condition. These conditions are all met in a developmental reading course based on a strategic learning approach. Strategy training includes direct instruction, the repeated use of examples, and much practice and feedback. Students are guided to transfer strategies to outside courses.

Other conditions which may be conducive to transfer have been investigated in studies examining metacognition. Some research indicated that transfer may be improved if the student internalizes strategies in the initial learning sessions (Berry, 1983; Berry & Broadbent, 1984). Berry (1983) explained this improvement in terms of metacognitive experience. Metacognition is generally defined as the knowledge a learner has about his or her cognitive skills in different situations, which is used to regulate problem solving or learning (Bender, 1986). Flavell (1979) also pointed out that the cognitive monitoring of on-going learning involves metacognition.

Additional transfer research was conducted by Bender (1986), who examined the effects of vocalization of reasoning, a self-monitoring technique, on the transfer of problem-solving. Subjects included 96 undergraduates assigned to one of four groups composed of vocalizing or nonvocalizing pairs or individuals. Individual and group monitoring in the learning session were promoted through vocalization of reasoning and working with a partner.
Subjects solved four complete concept learning problems in the initial learning session and 48 hours later in the delayed transfer session. Results indicated that individual self-monitoring during initial problem solving was found to improve transfer of problem-solving skills. These results suggest that inducing self-monitoring during learning may lead to a maintenance of the improved performance in later problem solving. Such findings support the need for learning strategy courses to include training in metacognition.

Although the above mentioned transfer studies did not specifically address the transfer of textmarking strategies, results do shed light on the general nature of transfer and indicate the direction further research might take. It appears that both spontaneous and directed transfer are more likely to occur among older adolescents as opposed to younger children, when generalized rules and specific examples directly applicable to the transfer task are given, when the transfer situation is analogous to the learning situation, and when students are trained to individually monitor their learning. In addition, this research indicated the need for studies conducted under more naturalistic conditions. Because much of the research on spontaneous and directed transfer occurred in laboratory settings, results may not be generalizable to classroom situations.
To determine what best promotes strategy transfer among college developmental reading students, the present study investigated direct and spontaneous transfer of annotation. Because most textmarking studies have generally focused on product outcomes, and no empirical research on the transfer of textmarking strategies was found, this study focused on the process and transfer of annotation, a form of textmarking. Attempts were made to examine if and how students transferred annotation, spontaneously and with explicit instruction, over the course of one semester in which training in strategy use initially occurred. The study further explored if and how students altered strategy use for their own unique studying and learning situations.

Need for the Study

Pressley, Lysynchuk, D’ailly, Smith, and Cake (1989) evaluated the methodological adequacy of 37 experimental studies of reading comprehension strategies. Strategies were defined as any actions that students could take to enhance comprehension. Only studies involving the teaching of strategies were included; studies investigating strategy use without instruction were excluded. In addition, subjects in all of these studies were students in grade eight or below. As a final criterion, only experiments that had been published in key refereed journals were included in this review.
The researchers found several weaknesses in the studies' internal and external validity, one of which was that these studies failed to examine long-term effects of transfer of strategy instruction. Though some researchers maintain that the transfer of newly learned procedures is a significant indicator that strategies have been learned well and can be used effectively (Brown, Bransford, Ferrara & Campione, 1983), only three of these studies assessed transfer of newly learned reading comprehension strategies to school subjects or materials other than those encountered during training. The researchers pointed out that this research is directly influencing reading instruction and recommended that future studies include more process measures. Other researchers pointed out that conclusions about instructional effects can be made with greater confidence when the kind of processing that occurs in each condition is documented (e.g., Belmont & Butterfield, 1977). To document subjects' processing in depth, a variety of self-report, interview, and behavioral measures should be employed (Marx, Winne, & Walsh, 1985).

Further support for a qualitative analysis of strategy transfer is based on self-regulated learning theory. Theorists of regulated learning regard students as metacognitively, motivationally, and behaviorally active participants in their own learning processes (Zimmerman, 1986). Self-regulated learners plan, organize, self-
instruct, self-monitor, and self-evaluate at different stages during the learning process. A growing body of applied research has suggested a relation between self-regulated learning processes and student academic achievement (e.g., Bandura, 1986; Schunk, 1984). The role of self-regulated learning during the process of learning strategies and subsequent transfer (or lack of transfer) may be further clarified in an in-depth probe of students' actions and motivations.

Findings from research have pointed to the active role characterizing the learning processes of students who successfully acquire and retain knowledge and skills and apply them in new situations. However, these findings have had little impact on the design and implementation of educational practices in general (Wang & Peverly, 1986). In particular, they have had minimal influence on intervention programs geared toward improving learning efficiency and outcomes for students who need extra instructional support, such as college developmental reading students. Wang and Peverly (1986) explained that one reason for this gap between research and practice has been the lack of a data base that includes detailed descriptions of the learner's role in the learning process.

Pressley et al. (1989) suggested that a possible reason why researchers have neglected to assess long-term and transfer effects is their belief that questions of
treatment durability should be posed only after short-term benefits on trained tasks have been established. It is not clear whether the comprehension strategies considered in the analysis by Pressley et al. (1989) have been demonstrated to be beneficial. In the case of textmarking strategies, however, the extant research strongly suggests that it is effective given optimum training conditions. An investigation of strategy transfer should logically follow evidence of strategy effectiveness.

Some researchers have suggested that although a lack of relevant knowledge may be a factor in many learning problems, a learner's ability to use relevant knowledge in new learning situations is more likely to be a key factor. Flavell (1970) coined the term production deficiency to explain the lack of spontaneous transfer of knowledge. Others (Kaufman & Hallahan, 1979; Ryan, 1981; Torgensen, 1977) proposed that students who have differences in learning may possess both adequate knowledge and an awareness of the need to use that knowledge, but they may lack skill in relating what they know about a task to effective strategies for completing it. This disparity between competence and performance is also reflected in the finding that learners who are aware of the need for deliberate effort and the effectiveness of a specific strategy do not necessarily use the strategy to complete a task (Brown & Palinscar, 1982).
Wang and Peverly (1986) suggested that a lack of metacognitive skills (i.e., "overseeing" processes in learning such as predicting, planning, monitoring, and checking) may be an explanation for the failure of some learners to use strategies to complete tasks. College developmental reading students often lack such metacognitive skills and persist in using the same, ineffective strategies regardless of the outcome. For this reason, programs based on a strategic learning approach include training in self-monitoring of learning in hopes that a greater awareness of learning will increase learning and its transfer to appropriate situations, that is, reading strategies will be applied in regular content courses. Based on the need to consider the learner's unique problems in acquiring knowledge, Wang and Peverly (1986) recommended that future researchers develop a descriptive data base on the role of the learner in the classroom to learn more about what facilitates or prevents the general application of learned strategies to new learning situations.

Strategy transfer is perhaps best placed in perspective by Paris and Wixson (in press) who pointed out that strategies are tools for learning rather than ends in themselves and that learning how to use a strategy is only useful if it is functional and enduring. They further suggested that researchers should track how students
trained in strategy use modify or abandon them through experience, since research (e.g., Adams, Carnine, & Gersten, 1982) showed that modifications in strategy use do occur. Flavell (cited in Garner, 1987) recommended that in addition to tracking students' modification and abandonment of strategies, researchers should investigate why students do not use strategies they have been taught to use. Such research should provide valuable information for those training students in strategy use.

In short, research in strategy transfer is lacking. The extant research has not investigated transfer of effects from experimental settings into natural settings. However, retention and transfer of learning are of major importance for learning strategy instructors. If college developmental reading students use strategies, such as annotation, in the learning strategies course and fail to transfer their use to other courses, then current training practices may need to be redirected.

This study, therefore, investigated college developmental readers' transfer of annotation under the following conditions: (a) the natural setting of both a college developmental reading class in which students must perform successfully to exit from the course and regular content area courses; (b) the use of lengthy, college-level, expository texts; (c) provision for explicit
training in strategy use; and (d) provision for semester-long practice and feedback.

Specific research questions were:

1a When college developmental reading students are explicitly asked to annotate college-level text in their developmental reading course and their textbooks in a content area in which they have been trained to annotate, what is the quality and quantity of their textmarking?
1b How do the quantity and quality of annotations change over the course of the semester?
1c Why do students adjust or not adjust the strategy?
1d What are students' perceptions of the usefulness of the strategy and in what ways do students use the strategy?

2a Do college developmental reading students spontaneously transfer the strategy to any other content area course (besides the one in which they have been trained in annotation) during their concurrent enrollment in the learning strategies course?
2b If transfer occurs, what is the quantity and quality of their textmarking?
2c If spontaneous transfer does not occur, what reasons do students give for lack of transfer?
CHAPTER TWO

METHOD

The purpose of this study was to examine if and how college developmental reading students transferred use of a textmarking strategy to an introductory biology course while they were enrolled in a learning strategies course. The study took place during the Spring 1991 semester, from mid-January to early May.

Participant Selection

Participants were selected from a pool of 66 Louisiana State University students who were enrolled in four sections of a developmental reading and study strategies course offered by the department of curriculum and instruction (EDCI 0011). Students are required to take this course if their standardized test scores indicate deficiency in reading comprehension. More specifically, incoming freshmen who have an ACT-composite score of less than 22 are required to take the Nelson Denny Reading Test (Form E, 1981). Students scoring 12.0 and above exempt the course, and those scoring between 9.1 and 11.9 grade equivalents are placed in EDCI 0011. Although the vast majority of students enrolled in EDCI 0011 in the fall semester are freshmen, students enrolled in the spring typically comprise a mix of freshmen, sophomores, and juniors. This mix was approximately 60%, 30%, and 10%, respectively, during the semester in which the study was conducted. Their ages ranged from 18 to 23. Sixty percent
were female. Seventy-five percent were white, 20% black, and 5% Asian.

On the first day of spring semester classes, all EDCI 0011 students completed a data sheet that asked for the student’s name, sex, age, local address and phone number, high school attended, grade point average, ACT-composite score, indication of previous enrollment in developmental reading, course schedule, work schedule, and extracurricular activity involvement (see Appendix C). The researcher examined these data sheets to determine the pool of students eligible for participation in the study. It was necessary to choose participants who met three criteria: (a) enrollment in the same introductory content area course, (b) enrollment in an introductory course in a content area in which they would be trained to annotate, and (c) enrollment for the first time in developmental reading. Examination of the data sheets revealed that only five students met all three criteria.

These five students were given a brief written description of the study (see Appendix D) which informed students that they could earn extra credit in the developmental reading course and assistance in Biology 1001, the common content area course in which these students were enrolled, in return for their participation. The researcher met with the five students, all of whom indicated an interest in participating, and discussed the
requirements of the project. Students were informed that they would be introduced to annotation, a textmarking strategy, in their developmental reading course and that they would be asked to annotate their Biology 1001 textbooks and meet with the researcher several times throughout the semester.

One of the students decided that the demands of her course load and involvement in sports would prevent her from participating. The other four students agreed to participate and cited receiving extra credit in developmental reading as the primary reason for participation. The extra credit consisted of 50 extra points added to their overall test grade in developmental reading, points that were contingent on students' attendance at scheduled research meetings. Developmental reading students who did not participate in the study were offered equivalent extra credit for handing in to their developmental reading instructors evidence of strategy use in content area courses. A brief description of each participant follows (students' real names are not used).

Student A. Bob was a 20-year-old sophomore, enrolled for his third semester at Louisiana State University. He was described by his developmental reading instructor as a motivated, responsible student whose work was "impeccable." Bob's high school grade point average (GPA) was 3.9, college GPA 2.25, and ACT-Composite score 21. As a full-
time student, Bob was enrolled in developmental reading, Biology 1001, Chemistry 1202, Experimental Statistics 2000, and Math 1550. In addition, Bob held a part-time job.

**Student B.** Tim, an 18-year-old first-semester freshman, was described by his developmental reading instructor as one of the few students who participated in class but who was lax in attending class and in completing assignments. Tim’s high school GPA was 1.81. (His ACT-composite score was not available). Tim was enrolled as a full-time student in Agriculture 1001 and Math 0091, as well as developmental reading and Biology 1001. During this semester, Tim was also employed part time.

**Student C.** Jane was an 18-year-old first-semester freshman. She was described by her developmental reading instructor as generally uninterested in school and reluctant to participate in class, yet she always attended class and completed assignments. Jane’s high school GPA was 2.0 and ACT-composite score 19. As a full-time student, Jane was enrolled in English 1002, Speech 1061, and Math 1435 as well as developmental reading and Biology 1001. Jane was also employed part time during this semester.

**Student D.** Carla, an 18-year-old first-time freshman, was described by her developmental reading instructor as confused and anxious in class, willing to learn but lacking in effort. Carla’s high school GPA was 2.6 and ACT-
composite score 22. As a full-time student, Carla was enrolled in Biology 1001, Speech 1061, Psychology 2000, and Math 0092, as well as developmental reading.

**Developmental reading course**

The developmental reading curriculum consists of teaching students a variety of reading, study, and test preparation strategies for improved learning from both expository and narrative texts. Two narrative texts and four introductory level, chapter-length texts taken from content area textbooks are used. For the semester in which the research occurred, the first and fourth texts were chapters taken from history, the second, a chapter from biology, and the third, a chapter from psychology. Students also read the narrative texts *Man's Search for Meaning* (Frankl, 1959) and *The Great Santini* (Conroy, 1976).

Strategies taught include annotation, mapping and charting (graphic organizers), timelines, questioning, and the use of concept cards, a vocabulary strategy. PORPE (Simpson, 1986), a strategy for prediction of and preparation for both objective and subjective test questions, is also taught and involves predicting, organizing, rehearsing, practicing, and evaluating readiness prior to the exam. In addition, students are instructed in the use of the PLAE model (Simpson & Nist, 1984), a plan for distributed practice of information that
is expected to be on an exam. Strategies are taught via direct instruction. Specifically, the teacher-to-learner model (Nist & Kirby, 1986) is used. This model emphasizes explicit training and modeling of strategies and allows for guided and independent practice and feedback.

Evaluation of the students' course performance is based on homework assignments requiring practice of strategies, metacognitive journal assignments, and objective and essay exams. Students are given four exams over the content area chapters. Students are also given essay exams covering the narrative texts. Students are required to score an average of 80% on all work to exit from the course.

The maximum number of students enrolled in each class was 20, and classes met 50 minutes a day, Monday through Thursday. All four sections of developmental reading were taught by two instructors who used the same methods and materials for teaching. Dana (instructors' real names are not used), Tim's instructor, has a doctorate in reading education and has been coordinator of the University's developmental reading program for two years. She has taught developmental reading courses for five years, three of which were at another university. The instructor for the other three participants was Tom, who has a bachelor's degree in English and a master's degree in education. Tom
has taught developmental reading at this university for two years.

During the last week of class, all students were asked to evaluate the quality of the course and instruction by responding to an instrument consisting of two parts: (a) 15 questions to which students respond using a Likert-scale (1—poor, 2—fair, 3—adequate, 4—good, 5—very good), and (b) an open-ended request for any written comments of a constructive nature (see Appendix E). Question 15 asks students to rate the teaching ability of their instructor. Both instructors have consistently earned teaching ratings of at least 4.5 out of 5 on this particular question, indicating "very good" teaching ability.

**Biology Course**

Curriculum for the introductory-level biology course designed for nonbiology majors included the required textbook, *Biology: The Unity and Diversity of Life* (5th edition, Starr & Taggart, 1989) and an optional accompanying workbook. Course requirements for students in all six sections consisted of four, noncumulative, 50-item multiple-choice exams. Each teacher developed his or her own exams. Though the same content was taught across classes, each teacher placed different emphases on lecture and text material. Bob’s and Jane’s teacher, Ms. Hahn, an instructor, stated that 100% of the material on her exams came from the text and that she lectured exclusively from
the text. Tim's teacher for the first half of the semester, Mr. Kane, also an instructor, stated that roughly 10% of his exams were based on the text and the remaining 90% on his lecture notes. Tim's instructor for the second half of the semester, Mr. Reed, served as an adjunct professor and only stated that it was important for students to read the text. Carla's instructor, Mr. Sean, an associate professor, was not able to specify what percentage of his exams was based on the text and lecture. All of the biology instructors stated that they encouraged their students to read the textbook. Only Mr. Kane indicated that it was possible for a student to pass his course with a "B" without reading the text.

Biology class enrollments ranged from 250 to 300 students. Some sections met three times a week for one hour and others met twice a week for one and one-half hours. Ms. Hahn complained that a large number of students drop out or fail introductory biology because too many students are enrolled in one section. Mr. Sean also lamented the poor conditions for teaching biology and cited poor seating arrangements which prevented all students from seeing and hearing adequately as one of the contributing factors for the high failure rate. All instructors pointed out that these conditions prevented opportunities for discussion between students and instructor and restricted their teaching format to lecture. Widespread campus rumors
also indicated that the course was difficult and had a high failure rate.

Materials and Data Sources

Materials and data sources consisted of a copy of the Biology 1001 textbook, an annotation of this text by experts (see description below), photocopies of participants' marked biology textbooks and other content area textbooks, an annotation checklist, and photocopies of homework assignments pertaining to textmarking for developmental reading, metacognitive journals, and students' evaluations of the developmental reading course. In addition, transcriptions of audiotaped structured and unstructured interviews (see description below) with participants, developmental reading instructors, and biology instructors were included.

Biology 1001 textbook. The 49-chapter text, Biology: The Unity and Diversity of Life, (5th edition, Starr & Taggart, 1989) is used in the introductory-level biology course for nonbiology majors. The text contains headings, subheadings, and major summary statements, some of which are in list form. Summary statements are set off by blue lines above and below and are printed in boldface. Concepts are also reinforced by end-of-chapter summaries, summary illustrations, and summary tables. At the end of each chapter are several review questions corresponding to italic and boldface sentences, with italicized numerals at
the end of each question referring to the pages on which the answers could be located. At least one third of the text is comprised of graphic aids, including illustrations, charts, and diagrams, many of which are combined with written summaries. Because of these qualities, the biology textbook appears to meet Armbruster's (1984) guidelines for considerate text; that is, information is built step by step and key ideas are repeated and highlighted by use of bold print and spacing. An expert in science education at Louisiana State University also considers this text easier to read and understand than many other introductory biology texts.

In addition, within the chapters, numerous topics of social concern from a biological perspective are addressed. Many chapters have case studies that show how general concepts apply to specific situations. Some of the chapters include "Commentaries," which explore such thought-provoking topics as drug abuse, AIDS, and tropical forest destruction. End-of-chapter sections that encourage readers to consider the connections between chapters and units are also included. These components appear to have been included to make the text interesting and relevant to the students.

Although Starr and Taggart's text is considerate according to Armbruster's (1984) standards, participants indicated otherwise. Because of the concept density and
great number of content-specific vocabulary, this text may
be considered difficult, particularly by students who have
little background knowledge of biology.

**Expert annotated biology text.** To establish a
template for comparing student textmarking to expert
textmarking, a panel comprised of the researcher and the
two developmental reading instructors annotated assigned
chapters in the biology textbook after being given
standardized instructions (see Appendix F). The panel
annotated the same chapters assigned to the participants
according to their respective syllabi.

Each member of the panel individually annotated the
biology material. These annotations were then compared for
key ideas, supporting details and examples. Comparison was
made on the basis of content rather than exact wording. A
comparison of the three individual sets of expert
annotations revealed 93-96% agreement on identifying key
concepts. Discrepancies were resolved by discussion.

**Photocopies of participants' biology texts.**
Participants' biology texts were examined for textmarking
at the beginning of the semester. The researcher provided
unmarked textbooks for participants who had bought marked
books. Participants were instructed to read and annotate
all chapters assigned by their biology instructors. A
photocopy of the participants' textmarking was made after
each meeting with the researcher (see Procedures below).
Photocopies of participants' marked content area textbooks. At the end of the semester, participants' content area textbooks other than biology were examined for spontaneous textmarking. Pages that were marked were photocopied.

Annotation checklist. To maintain consistency, the same checklist (see Appendix G) that was used by developmental reading instructors to evaluate students' annotations was also used by the researcher to evaluate participants' biology annotations. This checklist was a slightly modified version of the original annotation checklist by Simpson and Nist (1990). In the original, the first line read, "Your annotations are perfect. Keep up the good work!" In the modified version, the word "excellent" was substituted for the word "perfect." The annotation checklist was used as the basis for written feedback given to participants after analysis of their annotations. In addition to the checklist, feedback included suggestions for improved strategy use as it applied to specific examples in the biology textbook. Students were also praised for their efforts and encouraged to continue strategy use.

Photocopies of developmental reading homework assignments. Copies of participants' homework assignments pertaining to textmarking were provided by the developmental reading instructors. These assignments
included content area chapters from the developmental reading curriculum that participants were required to annotate. Feedback from the developmental reading instructor was also included on some of the annotated passages.

Metacognitive journals. Participants, as well as all students in the developmental reading classes, were given journal assignments four times throughout the semester. Students were asked to reflect on their reading and learning processes when dealing with content in the strategies course. Participants were also given journal assignments in which they were asked to reflect on their reading and learning processes when reading and annotating their biology text.

Student course evaluations. During the last week of classes, all students in the developmental reading classes were asked to evaluate the quality of the course and instruction (evaluation instrument described earlier). Copies of participants' evaluations were provided to the researcher and examined for judgment of course value and any references to textmarking.

Participant interviews. Unstructured interviews with the participants were conducted every two to three weeks throughout the semester. Participants were asked about the tasks and testing demands of their developmental reading and biology courses. Participants were asked about their
specific study habits and preparations for exams, including time spent reading/studying and reasons and rationale for strategy use or lack of it. During these meetings, participants brought their biology textbooks to be photocopied and were given oral feedback on the quality of their annotations.

**Developmental reading instructor interviews.** Structured interviews (see Appendix H) with the two developmental reading instructors were conducted four times during the semester. Instructors were asked questions about the participants who were their respective students. During the first interview at the beginning of the semester, a description of instructors' methods and materials for developmental reading was obtained. Other interviews were conducted during the third week of the semester, midterm, and at the end of the semester.

**Biology instructor interviews.** Structured interviews (see Appendix I) were conducted with three of the instructors at the beginning of the semester and one instructor at midterm to obtain information about biology course requirements. Instructors were specifically asked about teaching format, materials, and exams. In addition, the biology instructors were asked what, if any, strategies they offered to their students to assist content learning.
Procedure

Data collection occurred over the 15-week semester. Instruction in text annotation began in the second week in the developmental reading classes. According to instructors' reports, students were taught, via the teacher-to-learner model (Nist & Kirby, 1986), to (a) write brief summaries in the text margins using their own words, (b) enumerate multiple ideas in an organized fashion (i.e., causes, effects, characteristics), (c) write key information on graphs and charts included in the text when appropriate, (d) write possible test questions in the margin, (e) note confusing ideas with a question mark in the margin, (f) selectively underline key words or phrases, and (g) develop a personalized coding system (Simpson & Nist, 1990). The instructors consulted with each other daily to ensure similar procedures throughout the semester. They modeled annotation via think-alouds using transparencies of text material on an overhead projector. Direct teaching was followed by students' guided and independent practice and instructor feedback. Students were assigned an excerpt from a history chapter in their developmental reading textbooks to annotate for homework. Annotations were evaluated by the instructor using the annotation checklist. Intensive instruction in textmarking continued for a three-week period. Assignments requiring
textmarking continued throughout the semester; however, as direct instruction faded, feedback was given less often.

By the end of the second week, participants were selected and met with the researcher. As mentioned earlier, participants were told that the general purpose of the study was to investigate students' learning processes. They were informed of the requirements for and benefits of participation and were instructed to annotate assigned chapters in their biology textbooks in black ink, to keep records of the date and time spent annotating, and to bring the texts to the researcher to be photocopied (see Appendix J). Participants were told that their work would be examined by the researcher and two assistants.

Participants then met individually with the researcher every two to three weeks for the remainder of the semester. During these audiotaped interviews, participants were given feedback on the quality and quantity of their biology text annotations, evaluated against the template developed by the panel of experts. Participants received written feedback two days after each interview. Also, during these meetings, the researcher probed participants for their reasons for strategy use, or the lack of it, and were asked about the task, time, and testing demands of their developmental reading and biology courses.

To fulfill part of the developmental reading course requirements, participants were assigned journals (see
Appendix K) four times throughout the semester in which they reflected on their reading and learning processes when dealing with content in the strategies course and biology course. The inclusion of metacognitive journal assignments was based on research showing that self-monitoring during learning increases performance and the likelihood of transfer (Bender, 1986). The developmental reading instructors provided explicit guidelines for journal assignments to gain insight to students' thinking processes.

The first journal assignment directed students to evaluate themselves as learners on dimensions such as motivation, attitude, anxiety, test preparation, and time management. The second journal assignment asked students to describe their experience with the first objective exam in developmental reading. Students were specifically asked to discuss their use of strategies in preparation for the exam and their perceived usefulness of the strategies. The third journal assignment, given at midterm, directed students to re-assess their progress as learners on dimensions such as study and test preparation strategies as well as motivation, attitude, and time management. The fourth journal assignment once again directed students to evaluate themselves as learners and reflect on if and how they had changed over the semester with respect to study habits. In this assignment, students were also
specifically asked about their perceptions of annotation. Journal assignments were photocopied and given to the researcher for analysis.

To gain greater understanding of the context of participants' strategy use, interviews with the two developmental reading instructors and four biology instructors were conducted. Interviews with the developmental reading instructors were conducted at the beginning and during the third week of the semester, midterm, and at the end of the semester. Interviews with three of the biology instructors were conducted during the third week of the semester. One instructor who taught only for half of the semester was interviewed at mid-term. Information about the curriculum, methods, and course requirements of developmental reading and biology was obtained. In addition, developmental reading instructors were asked about the progress and performance of the participants.

At the end of the semester, photocopies of participants' course evaluations for their developmental reading class, in which they discussed their experiences with strategy use, perceptions of strategy effectiveness, and intentions to use or not use strategies in future college courses, were given to the researcher. These course evaluations were examined for references to annotation.
During the final interview at the end of the semester, participants were asked if they used textmarking in any of their content courses other than biology. Though they had been encouraged by their developmental reading instructors to use strategies in content courses and were offered extra credit to do so, they were never explicitly asked by the researcher to annotate content textbooks other than biology. Participants who used textmarking strategies in content courses other than biology were asked to bring in these texts to be photocopied. Because participants did not report using textmarking strategies in their outside content courses, no documents were turned in for analysis of spontaneous textmarking. Participants were asked their reasons for lack of transfer and their intentions for strategy use in the future.

The researcher spent approximately 40 hours collecting data, 70 hours transcribing audiotapes, 42 hours analyzing annotated texts (data analysis described below), and an additional 140 hours writing/editing descriptive summaries of interview sessions and organizing data for analysis.

**Data Analysis**

Ongoing data analysis consisted of two main components: (a) document analysis, and (b) constant comparative analysis (Miles & Huberman, 1984). Document analysis was conducted by the researcher, and constant
comparative analysis was conducted by a research team (described below).

**Document analysis.** Students' annotations of text material covered in both developmental reading and Biology 1001 were turned in during scheduled interviews and were analyzed. Every two or three weeks, as annotations were turned in, the researcher inspected them for quantity and quality. To examine quantity, the researcher compared the number of pages actually annotated to the specific pages assigned to be annotated and scored the annotations against the template for main-idea agreement. The researcher calculated the number and percent of main-idea agreement between students' annotations and the template's. To examine the quality of students' annotations, the researcher used the annotation checklist and noted specific difficulties encountered (e.g., finding main ideas, organizing information, paraphrasing) across the different content areas (i.e., history, biology, psychology). In addition, students' distinctive textmarking patterns, such as relying on symbols, marking less toward the end of the chapter, or ignoring graphic aids, were noted. Changes in textmarking over the semester were also documented. Results of document analysis of both developmental reading and biology annotations were provided to members of a research team and used to answer questions 1a, 1b, and 2b.
Constant comparative analysis. Document analysis results, student and instructor interview transcripts, students' journals, and developmental reading course evaluations were analyzed by a research team using constant comparative analysis. The research team consisted of the researcher, a doctoral student majoring in reading education, and a doctoral student with a minor in reading education. As data collection progressed, each member of the team individually read and reread all data sources to answer each research question and compare results within, between, and across students. The team also met every two to three weeks to discuss findings. As this ongoing and recursive analysis proceeded, the researcher developed matrices displaying the data. Data were triangulated across the three researchers and all data sources in an effort to control for possible researcher bias.
CHAPTER THREE

RESULTS

Distinct patterns emerged across, between, and within participants through the development of matrices that were driven by the research questions. The following discussion of results is organized around the research questions and separated into three sections. In each section, questions are answered for each individual student. In the first section, Question 1, parts a, b, c, and d, is answered. In the second section, Question 2, parts a and b, is answered, and in the third section, Question 2, part c, is answered.

Question 1

a) When college developmental reading students are explicitly asked to annotate college-level text in their developmental reading course and their textbooks in a content area in which they have been trained to annotate, what is the quantity and quality of their textmarking?

b) How do the quantity and quality of annotations change over the course of the semester?

c) Why do students adjust or not adjust the strategy?

d) What are students’ perceptions of the usefulness of the strategy and in what ways do students use the strategy?

Photocopies of participants’ annotation assignments for developmental reading and Biology 1001 were examined to
answer Questions 1a and 1b. Biology 1001 annotation assignments consisted of chapters covering each biology exam as specified by the syllabus. Each set of Biology 1001 assignments was analyzed separately.

To obtain a measure of the students' ability to find main ideas from their Biology 1001 texts, the researcher compared the number and content of main ideas identified by the student to those of the template (see Figure 1). The number of each student's main ideas that agreed with the template's main ideas was compared to the total number of template main ideas. This ratio is presented as a percentage. Because the researcher was only interested in ability to find main ideas when the student actually annotated, graphic aids and pages that were not annotated were not included in this calculation.

Figure 6.7 Plant wilt resulting from loss of turgor in cells. (a) At the start of this experiment, ten grams of salt (NaCl) in about sixty milliliters of water is added to a pot containing tomato plants. (b) After about five minutes, wilting is pronounced and the plant is collapsing. (c) After twenty-seven minutes, wilting is severe. The corresponding sketches show progressive plasmolysis (a shrinking of cytoplasm away from the cell walls).

Figure 1. Sample of annotation template for Biology 1001.
To answer Questions 1c and 1d, the researcher and two doctoral students with expertise in reading education analyzed interview data, journal assignments, and student course evaluations. Data sources were triangulated to control for bias.

**Student A - Bob.**

Annotations from history, biology, and psychology, all required in the developmental reading course, were turned in to the researcher for analysis. In addition, three sets of annotations from readings assigned in Biology 1001 were given to the researcher during scheduled interviews.

**Quantity and quality of developmental reading textmarking.** Developmental reading annotations were graded by Bob’s developmental reading instructor, Tom. Bob received scores of 90%, 90%, and 100%, respectively, on these first three sets taken from a 21-page history chapter, assigned throughout the first four weeks of the semester. These scores were derived from a 10-point scale and based on the annotation checklist. Tom reported that although Bob was generally able to identify key ideas and paraphrased well, he initially wrote too much and included extraneous information. Document analysis by the researcher revealed similar trends. Information was paraphrased but written in complete sentences and, thus, extremely wordy. For example, an annotation in the history chapter read, "Nov. 5 1937, Hitler gathers the chief of
armed forces & tells of longterm plans. Col. Friedrich Hosbach is present he takes notes that have helped explain events leading to WWII." Because annotations were written in a running narrative style, often without headings, it was sometimes difficult to separate main ideas. The inclusion of so much information made it unlikely that any main ideas would be omitted.

Annotations in the third set were slightly briefer. Less information was included, and some symbols and abbreviations were used. For example, Hitler was designated as "H," with as "w/," and number as "#." Bob persisted in writing complete sentences, however.

Bob received perfect scores on the next two developmental reading assignments taken from biology and psychology chapters, covered during the sixth through twelfth weeks of the semester. Tom reported that Bob's annotations included key ideas, were paraphrased well, and were briefer. Again, document analysis by the researcher confirmed these findings. These later annotations were more concise and better organized. Rather than written as a running narrative, information was grouped under headings distinguished by underlining or parentheses; supporting details and examples were enumerated and clearly related to appropriate key ideas. Bob also continued to use symbols and abbreviations.
Tom stated that Bob completed all required annotation assignments and turned them in on time and that the quality of his annotations improved each time. Tom also considered Bob to be "most able to apply strategies." Bob's scores on objective tests covering annotated material were not consistent with scores on annotation assignments, however. Scores on the history, biology, and psychology exams were 91%, 80%, and 71%, respectively. Tom pointed out that Bob was a very capable student and that his declining grades probably reflected a lack of effort rather than his ability to use strategies.

Quantity and quality of Biology 1001 textmarking - first document analysis. During the second meeting with the researcher, the fourth week of the semester, Bob's first set of Biology 1001 annotations, covering five chapters was turned in for analysis. Bob reported spending about 4 1/2 hours over eight sessions annotating the five chapters (68 pages). In most sessions, Bob read and annotated six to eight pages in approximately 30-45 minutes. This comprised most of the required reading for the first biology exam. Only the last half of the last chapter was not annotated.

As compared with the developmental reading annotations, the Biology 1001 annotations were similar in style, but less thorough. Key concepts were paraphrased, and annotations were extremely wordy, most written in
complete sentences. Main idea agreement, however, was only 69%; that is, 182 out of 264 main ideas were annotated. Graphic aids, summary statements and chapter summaries were ignored completely. Information found on pages that included mostly graphic aids was not marked at all.

Though annotations were generally wordy, supporting details and examples were often not provided. For example, the terms flagella and cilia were defined, but no examples were given for where and on what organisms the structures may be found. The term lactate fermentation was defined, but no example of products was given (i.e., sour milk).

Although much important information was omitted in the first set of biology annotations, some extraneous information was noted in the margins. Nonessential information often included numerical descriptions. For example, Bob wrote, "photosystem - each cluster of pigments (200-300)," "pigments - 90% harvest light energy - photo.," and "blood cells - 6 to 8 micrometer."

Unlike the developmental reading annotations, more words were abbreviated and more symbols used in the biology annotations. A greater attempt at organization of the biology text was also apparent. Underlined headings, dashes, numbers, asterisks, parentheses, and arrows appeared to be used to indicate relationships. For example, terms and definitions were separated by a dash and
details supporting a main idea were indicated by small dashes listed under a heading. Some supporting details were also enumerated. In addition, arrows were used to illustrate cause and effect relationships in the metabolic pathway and photosynthetic reactions.

Bob indicated during the second meeting with the researcher that he had studied this first set of annotations and felt prepared for the first Biol 1001 exam. However, he later reported scoring only 56% on this exam.

**Quantity and quality of Biology 1001 textmarking - second document analysis.** For the third meeting with the researcher which took place during the eighth week of the semester, 9 chapters were required to be read and annotated. Bob only annotated the first 3 chapters. Bob reported spending 2 1/2 hours annotating chapter 10 (11 pages), 30 minutes for three pages of chapter 11, and 2 1/2 hours for the remainder of chapter 11 and chapter 12 (22 pages). These reports indicate that much more time was spent annotating than had been previously. Although Bob annotated considerably fewer chapters for the second document analysis, his annotations were much more thorough. Bob explained, "I decided to annotate every little thing."

Document analysis revealed that Bob did indeed annotate in much greater detail. Annotations were often complete sentences and, thus, very wordy. Much of the text information was copied verbatim, and little paraphrasing
was apparent. Most graphic aids were marked in some manner, with checks or memos to "study," some of the captions were copied verbatim and some of the pictures were redrawn. Several examples and many supporting details were given for one concept. Summary statements and chapter summaries were marked by checks and often copied verbatim in the margins. Attending to so much information increased Bob's main idea agreement score considerably; main idea accuracy was 86% (89/103).

Although Bob included much more information for the second set of annotations, in a few instances, he picked out the main idea but left out sufficient supporting information or failed to organize it in a clear manner. It appeared that random fragments were copied verbatim and placed under major concepts. For example, Bob copied verbatim phrases in defining the concepts of continuous and discontinuous variation and quantitative inheritance. From the way this information was noted and arranged (all three concepts were listed as separate categories), it appeared that Bob was not aware of the relation of quantitative inheritance to continuous variation; that is, quantitative inheritance actually refers to the transmission of traits showing continuous variation.

Bob appeared to be more actively involved with text for these chapters. In addition to practicing the completion of Punnett squares in the text and at the end of
the chapter, he diagrammed parts of the stages of meiosis throughout the chapters dealing with cell reproduction.

Overall, Bob's second set of annotations were extremely wordy and detailed, and included all parts of the text, (e.g., graphic aids, summaries, problems at the end of the chapter). It appeared that Bob attempted to rewrite the text in efforts to include all of the important information. But because annotations were often verbatim, these annotations were of poorer quality than previous ones, which were paraphrased to a greater degree. For example, as indicated in Figure 2, Bob included important information and used headings and subheadings to organize his annotations but included too many words and copied phrases verbatim.

**AT MEIOSIS**

1) duplicate parental DNA
2) enough energy to provide enzymes to start up metabolic machinery for operation.

*Inheriting the DNA and cytoplasm is fairly straightforward with prokaryotic fission or even with mitosis. Bacteria use fission for asexual reproduction, and many eukaryotes can use mitosis for the same thing (page 139). In asexual reproduction, one parent passes on to offspring a duplicate of all of its genes. This means, of course, that the offspring can only be genetically identical copies, or clones, of the parent.*

The preceding paragraph assumes you know what genes are. But in case you don't, "genes" are specific stretches of DNA, each being the inherited instructions for producing or influencing a specific trait in offspring.

Inheritance is much more interesting with meiosis, the division mechanism that is the basis of sexual reproduction. A typical case of sexual reproduction involves two parent organisms, each with two genes for every trait. Both parents pass on one of each gene to offspring.

**Figure 2.** Sample of Bob's annotation of Biology 1001 material.
Bob indicated that he was better prepared for the second exam than he was for the first one, even though he had only four days in which to read and annotate six more chapters. Although he expected a better grade, he later reported scoring 58% on the exam covering his second set of annotations.

**Quantity and quality of Biology 1001 textmarking - third document analysis.** Bob read and annotated all of the five required chapters with the exception of the last nine pages and last five pages of the last two chapters, respectively. Bob reported spending 1 1/2 hours annotating chapter 13 (11 pages), 1 hour and 35 minutes for chapters 14 and 15 (18 pages), 30 minutes for chapter 16 (5 pages), and 1 hour for chapter 17 (7 pages). Overall, these times indicate that less time was spent on this set of annotations than the previous one.

For the third set of biology annotations, Bob annotated in much the same way as for the second set. Annotations were written in complete sentences and were very detailed and wordy. Information was paraphrased to a slightly greater extent than previously, however, and less information was noted verbatim.

Even greater attention was paid to graphic aids. Although much unnecessary information was noted and many captions copied verbatim on figures and diagrams, Bob related the graphic aids to the text with symbols and
summary comments. For example, next to a diagram of DNA replication, Bob noted with labels and arrows, "parent template - DNA assembly is usually continuous but discontinuous on other - must be assembled behind start tags that become positioned at intervals along parent DNA - enzymes linked in single chain." As previously, Bob identified key ideas with relatively high accuracy - 88% (118/134). Interestingly, in several places where a key concept was missing, supporting information and examples were provided. For example, Bob listed several treatments for phenotypic and genotypic disorders without ever mentioning the main point that ethical problems arise as a result of advances in scientific research. In another example, he listed the following, "peas, beans, corn, flies, mold, bacteria,—short lived,—reproduce rapidly," without ever mentioning that these organisms lend themselves to genetic analysis because of the two stated characteristics.

During the fourth meeting with the researcher and before finding out his grade on the second exam, Bob reported feeling very confident about the third exam. He indicated that he knew much more material on the second exam, thought he made a good grade, and annotated his third set of annotations in the same way. After finding out his grade on the second exam, however, Bob dropped out of Biology 1001 and, thus, did not take the third exam.
Changes in quantity and quality of textmarking. Over the course of the semester, the quantity of Bob's annotations changed considerably. Bob consistently completed all annotation assignments in developmental reading but was less consistent in meeting Biology 1001 requirements. Initially, Bob kept up with annotation assignments but fell behind for the second set. For the third set, Bob kept up with assignments until dropping the course.

The amount of information per chapter annotated increased substantially over the semester in both developmental reading and Biology 1001. As the semester progressed, Bob annotated more material, including all parts of the text such as graphic aids, summary statements, and problems/questions at the end of the chapter. As well as attending to all parts of the text, Bob included more details and extraneous information over the semester.

Overall, Bob spent increasingly more time on Biology 1001 annotations and spent more time at one sitting. For the first set of annotations, Bob spent a total of four and one-half hours on 68 pages, at eight sittings. For the second set of annotations, Bob spent more time on fewer pages, and fewer sittings; five and one-half hours were spent on 35 pages, over three sittings. For the final set of annotations, slightly less time was spent; four and one-half hours were spent on 41 pages over three sittings.
Less change was noted in the quality of Bob's annotations than the quantity. Although slight improvement was noted in the organization of information and paraphrasing, annotations were consistently wordy; Bob persisted in copying verbatim and writing complete sentences throughout the semester. Improvement was also evident in the greater quality of annotations of graphic aids and the use of symbols and abbreviations. Further, Bob moderately, but consistently, increased in ability to identify key concepts.

Reasons for changes in textmarking. To examine the reasons for changes in Bob's textmarking, the research team analyzed data obtained from transcripts of five participant interviews and instructor interviews and photocopies of the first, third, and fourth journal assignments. Bob did not complete the second journal assignment. Also, because he was exempt from the final exam, Bob did not attend the last day of class and, therefore, did not complete a course evaluation. However, during the last interview, Bob discussed his feelings about the developmental reading course with the researcher.

The quantity of Bob's annotations and the amount of time spent on annotations increased considerably over the semester. Although annotations for developmental reading were relatively thorough, the first set of Biology 1001 annotations omitted much information. He reported not annotating the first set of annotations very thoroughly
because he already knew the information. Bob stated during the second interview that he had a fairly strong background in science and made a "B" in high school biology without studying and "C's" in college chemistry and physics. He explained that he would annotate more when he encountered unfamiliar or difficult material. He specifically stated:

The first couple of chapters - I already know all that. Like I'm in the class and it's like mole, atom, and we'll start talking about chemical things and I've already had chemistry and I started annotating it. There's no sense in me annotating that for my knowledge when I already know that. But I know that coming up there is gonna be -I mean it's gonna get a lot harder and that's when my annotations are gonna really be necessary. Some things well, like maybe there's a sentence that's kinda hard and I'll annotate that.

Bob also stated that poor planning and distractions from other people prevented him from spending enough time annotating. He explained:

It's not time consuming as bad as I made it. I made it kinda hard because I fell behind and didn't keep up. I tried to catch up a few days before the test. When I was at home and everything and I would be doing it [annotating] people would call me and I'd have to stop.
Bob’s second and third sets of Biology 1001 annotations were annotated in much greater detail than the first set. Bob gave the fact that he made a "D" on his first exam as the reason for this change and explained that the test had many questions calling for details. He further explained that writing complete sentences was helpful. He specifically stated:

I made a "D" on the exam and I’m really annotating now. I’m annotating every little thing. I mean that test had stuff - some details that and examples that should have been in my annotations. I’m like putting examples in all of my annotations now. I’m really annotating more....I want to write [annotations] in complete sentences because it helps.

Bob also stated that certain information was annotated in greater detail because it was referred to during lecture, or he expected it to be on the exam. Thus, information and graphic aids dealing with stages of meiosis and mitosis were annotated in great detail because they were covered extensively in class lectures. Similarly, information that was not covered in lecture was ignored in the text. For example, Bob skipped several pages in the text that dealt with microscopes because this information was not addressed in the lecture, and therefore not expected to be on the test.
Although the quantity of textmarking increased a great deal over the semester, the quality of textmarking changed very little after the second set of biology annotations. Bob’s greater attention to graphic aids and slight improvement in organizing information and paraphrasing appeared to be a result of feedback from the researcher which specifically addressed these areas. Bob stated that he understood the researcher’s suggestions for improvement and adjusted accordingly. Bob also said that he learned how to paraphrase better by watching his developmental reading instructor model the procedure. He stated:

The very first annotation - he [Tom] said I put a little too much information in it. And then after that I kind of sort of- I listened to him one day in class and he like would read like two or three paragraphs and put that in his own words and then that’s when I started doing it.

It appeared that decisions on what material should be annotated and how much detail annotations should include were based on the following: a) knowledge of material, b) performance on biology exams, c) expectations of test material, and d) feedback from the developmental reading instructor and researcher. It seemed that Bob’s change of attitude from overconfident to more serious stemmed from the combination of these factors. Overall, adjustments of
textmarking resulted in greater quantity, rather than substantial improvement in quality.

**Perceptions of strategy utility.** When asked about the usefulness of textmarking, Bob replied that it helped him understand while reading because of the extra time and concentration required to annotate. However, he also noted the extra time required as a disadvantage of annotation. He specifically stated:

Annotating really helps me to understand information clearer. Annotation helps me comprehend while I am reading, because it made me reread information, therefore, helping me to comprehend the information better. They [annotations] are a pain. I'm going through slow and rereading and rereading - trying to figure out what they're talking about. The only difficulty I had was it was just so long that sometimes I got bored with doing it.

When asked how he used annotations, Bob explained that he read over them to study for exams and felt that it helped him on exams even though his grades in Biology 1001 indicated otherwise. He stated:

Annotation helped me recall information for exams, because I had most of my information in my own words and this helped me. At least I thought it did at the time. [laughing] I made a 56 and 58 on my biology exams. I know it did in reading. I got all A's. I
did great in EDCI 0011. But in biology, I blame it on the teacher, not me.

In summary, Bob considered annotation to be a useful strategy for comprehension during reading and later for test preparation. His use of the strategy was consistent with his statements about its utility. Bob’s adjustments of textmarking were to a great extent driven by his belief that test performance would be enhanced.

Student B - Tim

Annotations from history and biology chapters required in the developmental reading course were analyzed for textmarking. In addition, two sets of annotations from readings assigned in Biology 1001 were given to the researcher during scheduled interviews and later analyzed. Required annotation assignments from psychology were not turned in; Tim stopped attending developmental reading class during the ninth week of the semester.

Quantity and quality of developmental reading textmarking. Developmental reading annotations were graded by Tim’s developmental reading instructor, Dana. Tim received scores of 60%, 70%, 80%, and 90%, respectively, on the first three sets taken from a 21-page history chapter, and the fourth set of a two-page excerpt from a biology chapter, assigned during the first five weeks of the semester. Scores were derived from a 10-point scale and based on the annotation checklist. Dana reported that all
of these grades represented 10% penalties for being turned in late.

Reports from Dana and results of the researcher’s document analysis indicated that Tim’s main problems with annotation were finding main ideas, organizing information, paraphrasing, and providing sufficient details. Overall, Tim simply did not annotate enough. In his attempts to organize material, he frequently used dashes, parentheses, and arrows to connect information. It appeared that these symbols were often used in place of annotation rather than as a part of annotation. For example, a circled star or brackets were the only markings found next to several paragraphs. Many paragraphs simply had underlined or circled words.

Although ability to annotate increased slightly over the first part of the semester, Tim’s test scores in developmental reading declined. Scores on the history and biology exams were 84% and 67%.

Quantity and quality of Biology 1001 textmarking - first document analysis. During the second meeting with the researcher, the fourth week of the semester, Tim’s first set of Biology 1001 annotations were turned in for analysis. Although 6 chapters were required, Tim only annotated the first three. Tim reported spending 7 hours over three sittings annotating the 3 chapters (43 pages).
Four pages were annotated in 1 hour, nine pages in 2 hours, 20 pages in 2 1/2 hours, and 10 pages in 1 1/2 hours.

Document analysis revealed problems in these annotations similar to those noted in the assignments for developmental reading. Tim had difficulty finding key concepts, organizing information, and paraphrasing. Also, in general, Tim did not annotate enough. Although marks and symbols such as underlines, circles, stars, parentheses, and arrows were used throughout most of the material, annotations were sparse. Even when key ideas were noted, supporting details and examples were often not provided, much information was merely marked with a star, and some paragraphs ignored. The failure to annotate entire sections of important material contributed to his main idea agreement score of 69% (114/165). In addition, Tim consistently neglected to annotate graphic aids. In general, the quantity of his first biology annotations was insufficient and the quality poor.

At the second meeting with the researcher, Tim indicated that he did not, as yet, feel prepared to take the first biology exam covering this first set of annotations. He planned to "look over" his annotations in preparation for the exam the next day. Tim later reported making an "F" on this biology exam.

Quantity and quality of Biology 1001 textmarking—second document analysis. Only the first 2 chapters out of
seven required were annotated for the third meeting with the researcher, which took place during the eighth week of the semester. Tim reported spending 1 hour annotating the first 12 pages, and 1 1/2 hours annotating the latter 12 pages.

In general, these annotations differed little from the previous set. Tim still had problems organizing information and including sufficient details and examples. For example, in a description of the events of telephase, Tim numbered the first two events—"1) decondense and 2) extend in threadlike form," without mentioning the important final events, separation of hereditary material from cytoplasm and completion of the nucleus, indicating completion of mitosis. Tim also ignored some sections of text entirely, though to a lesser extent than previously. Symbols and marks without accompanying annotations were also frequently used (see Figure 3).

Considerable improvement was noted in the ability to identify key concepts, however. Tim's main idea agreement was 92% (55/60). Although this percentage represents an increase, it should be noted that material annotated in this set (24 pages) was slightly less than half of the amount annotated in the previous set (43 pages).

Tim also paid greater attention to the whole text. Graphic aids and chapter summaries were marked with stars, arrows, and underlinings. Tim paid particular attention to
tree is a sporophyte (spore-producing plant); it gives rise to the meiospores, in ways that will be described in chapters to come.

![Diagram of life cycle for complex land plants.](image)

**Figure 11.10** Generalized life cycle for complex land plants.

**Figure 3.** Sample of Tim's annotation of Biology 1001 material.

illustrations of stages of cell reproduction. These pictures were often labeled, numbered, and connected with an arrow to statements in the text.

Tim indicated that he read over his annotations to prepare for the exam covering this set of annotations, which was taken the previous day. He later reported making an "F" on this exam.

The second set of biology annotations were the last to be turned in by Tim, who failed to show up for four scheduled meetings with the researcher. In telephone
conversations with the researcher, Tim reported annotating several more chapters in his biology textbook. However, these reports could not be confirmed because Tim failed to meet with the researcher as arranged.

Changes in quantity and quality of textmarking. The quantity and overall quality of Tim’s textmarkings changed very little over the nine-week period in which he met with the researcher. Tim’s efforts were generally lacking in both developmental reading and Biology 1001 and appeared to decline somewhat over the semester. Tim consistently neglected to turn in developmental reading assignments on time and failed to keep up with Biology 1001 annotation assignments. The number of pages annotated for the second annotation assignment for Biology 1001 decreased by nearly half; 43 pages were annotated in the first assignment and 24 annotated in the second. The amount of time spent annotating each page also decreased. For earlier annotations, Tim spent roughly 1 hour annotating four to five pages; for later assignments 1 hour was spent annotating 10 to 12 pages.

Although Tim annotated fewer pages and spent less time per page over the semester, he attended to more parts of the text in later annotations. More attention was paid to graphic aids and summaries. Although annotations of illustrations and diagrams were lacking in detail, the frequent use of underlinings, circles, stars, and arrows
represented an attempt to relate them to other parts of the text.

In general, the quality of Tim's annotations remained poor. Although ability to find key concepts appeared to have increased (from 69% to 92%), this difference is likely inflated because of the lesser amount of information annotated in the second set. Failure to provide sufficient details and examples was evidenced throughout all annotations. Attempts to better organize information were seen in the greater use of symbols rather than real changes in annotations.

In short, Tim's annotations were critically lacking in both quality and quantity. The few changes evident were less material annotated, less time spent annotating specific pages, and greater attention to graphic aids.

Reasons for changes in text marking. To examine the reasons for changes in Tim's text marking, the research team analyzed data obtained from transcripts of three participant interviews and instructor interviews and duplications of the second and third journal assignments. Tim failed to meet with the researcher for two scheduled appointments. In addition, he did not attend the first two days of developmental reading class and stopped attending class during the ninth week. Therefore, he did not complete two of the journal assignments and did not complete the course evaluation at the end of the semester.
However, during the last interview with the researcher, conducted at the end of the semester, Tim discussed his feelings about the developmental reading course.

Changes in Tim’s textmarking appeared to be related to several factors. The most obvious change was Tim’s declining effort, evidenced by the failure to complete developmental reading assignments on time, keep up with biology annotation assignments, and attend developmental reading class and meetings with the researcher. This declining effort seemed to be related to Tim’s lack of self discipline and perceived difficulty of the strategy. Tim reported having problems annotating because he was easily distracted, he had trouble paraphrasing, the text was dense with information and hard to understand, and the strategy was time consuming. Tim specifically stated:

Your mind just gets off wandering sometimes. It’s a lot of information and when I started to annotate I tried to go faster than what I should have. I’m just skipping things all through. I had to go back. Now I just read slower. Its got a lot of the real strong facts in the paragraph you know, like the bold print and stuff. I try to paraphrase in my own words a lot, but I mean it’s sometimes hard, because even when I annotate I use their words, but sometimes if I understand it pretty good I use my own words. It’s
just so many things to annotate you know, a lot of information.

Tim also reported being distracted because he did most of his assignments late at night. He explained:

I play intramural sports and I do much of my studying later in the night. Sometimes to get prepared to study or do an assignment I listen to the radio and get me in that real motivation mood. When I start studying I can really learn something if my mind doesn’t start wandering about back home or what’s going on this weekend.

Tim further indicated that he did not annotate certain material because it was familiar or easy to understand. He explained:

The WWII chapter was much easier and plus you know I knew a lot of things. I knew more things about WWII than I do about biology. If I think I know it real good I just skip over it. I mean I didn’t annotate some WWII things that I knew pretty good. But in biology I don’t think I ever skipped over anything.

It is interesting to note that Tim’s statement about never skipping over anything in biology contradicts results of the document analysis. Tim neglected to annotate a great deal of material in his biology text.

Tim’s increased attention to graphic aids appeared to be a result of feedback from the researcher and test
expectations based on the biology instructor's emphasis on content contained in graphic aids. The researcher specifically recommended annotating graphic aids during the second meeting and on written feedback after the first document analysis. In addition, Tim reported that biology lectures emphasized the stages of cell reproduction and that the exam would include many questions from this area. It is likely that the increased attention to illustrations of mitosis and meiosis was directly related to test expectations.

In general, it appears that changes in Tim's textmarking were a result of five main factors: a) a lack of self discipline and motivation, b) poor ability to use the strategy, c) knowledge of material, d) feedback from the researcher, and e) expectations of test material. All of these factors contributed to his decline in overall effort and increased attention to graphic aids.

Perception of strategy utility. When asked about the usefulness of textmarking, Tim stated that it helped him comprehend text material because it helped him keep his mind on reading. He stated:

If I don't understand something I look back over my annotations. It helps while I'm reading. I mean if I read something and then just go on to the next paragraph and then five minutes later say, "what did I just read."
Tim also reported that annotations were helpful in test preparation. He explained:

When I annotated the WWII chapter it helped me some and the more I did it, the better I got. It helped to the point where it centered in on the important facts and condensed them into smaller statements which made it easier to memorize. I’ve been using this in biology and it truly has an effect because biology is all facts without any or much opinion. So I just broke down each chapter the easiest and probably the best way to approach this class.

It is interesting to note Tim’s belief that his ability to annotate was improving with practice. Results of document analysis were contradictory to this statement.

In summary, Tim considered annotation to be a useful strategy for comprehension during reading and later for test preparation. His use of the strategy, however, was inconsistent with his statements about its utility. Although Tim seemed to think annotation was useful, his use of the strategy was minimal.

Student C - Jane

Annotations from history, biology, and psychology chapters required in the developmental reading course were turned in to the researcher for analysis. In addition, two sets of annotations from readings assigned in Biology 1001 were given to the researcher during scheduled interviews.
Quantity and quality of developmental reading textmarking. Developmental reading annotations were graded by Jane's developmental reading instructor, Tom. Jane received scores of 60%, 90%, 90%, and 90%, respectively, on the first three sets taken from a 21-page history chapter, and one set of an 18-page psychology chapter, assigned throughout the semester. These scores were derived from a 10-point scale and based on the annotation checklist. Tom's report and researcher document analysis revealed that Jane's first annotations were extremely wordy, focused on details rather than key ideas, and were comprised largely of verbatim phrases and sentences. Ability to focus on key ideas improved in later annotations. However, these annotations were still extremely wordy and much extraneous information was annotated. Even though symbols were used and many words abbreviated, annotations were lengthy, often covering entire margins. Also, the failure to use headings to organize information made it difficult to distinguish between concepts (see Figure 4).

Tom reported that Jane completed all required annotation assignments and turned them in promptly. Jane's scores on objective tests covering the history and biology exams were 70% and 72%.

Quantity and quality of Biology 1001 textmarking - first document analysis. During the second meeting with the researcher, the fourth week of the semester, Jane's
The close relationship between the emotions and the endocrine system in man is indicated by observation of institutionalized infants. Such infants, characteristically, are listless and withdrawn and appear profoundly sad. They often fail to grow normally; of ninety-one infants studied in one survey made in the 1940s of foundling homes in the eastern United States and Canada, thirty-four died in the first year of life in spite of good food and careful medical care. Infants who survived the first year were all physically retarded. A number of studies suggest that deprivation dwarfism, as it is called, is the result of underactivity of the pituitary gland, probably both in its production of growth hormone and of tropic hormones as well.

- The Thyroid Gland

The thyroid, under the influence of the thyroid-stimulating hormone from the pituitary, produces thyroxine, which is an amino acid combined with four

Figure 4. Sample of Jane’s biology annotation for developmental reading.

first set of Biology 1001 annotations, comprised of 10 pages, was turned in for analysis. Although 7 chapters were required to be annotated, Jane only annotated the first 4 pages of the first chapter, the first 2 pages of the second chapter, the first 3 pages of the third chapter, and the first page of the fourth chapter; the other 3 chapters were not annotated at all. Jane did not keep records of her time spent annotating but said it "takes so much time."

The first set of biology annotations was very similar in style to the developmental reading annotations. Annotations were very wordy, contained many verbatim phrases, complete sentences, and few paraphrases. No apparent attempts were made to organize information.
Although main concepts were separated by a small space, headings and enumeration were not utilized. Ability to pick out key concepts was relatively low; the main idea agreement was 66% (40/61). Annotations also included far too many details. In addition, graphic aids were consistently ignored and summary sections only starred.

The overall pattern of annotating for biology, however, was different for the pattern in developmental reading. Whereas the developmental reading chapters were consistently annotated from beginning to end, only the first few pages of the biology chapters were annotated. Also, Jennifer underlined more in the biology chapters; as annotations decreased, underlinings increased. Although underlinings in the developmental reading chapters were accompanied with annotations, underlinings in the later pages of biology were not.

When asked about her performance on the exam covering this biology material, Jennifer reported making an "F." She stated, "It was a killer. I knew one out of the 50 questions."

**Quantity and quality of Biology 1001 textmarking - second document analysis.** The first four chapters out of the nine required were annotated for the third meeting with the researcher, which took place during the eighth week of the semester. Again, Jane did not report the specific
amount of time it took to annotate but said that it was
time consuming.

The second set of biology annotations represented an
improvement in quantity and quality over the first set.
The second set of annotations was 4 pages, four times the
number of pages annotated in the first set. Also, these
chapters were more consistently annotated. All parts of
the chapters were annotated except end-of-chapter
summaries. Jane's ability to identify key concepts
increased considerably as indicated by her main idea
agreement score of 93% (110/118). Jane also paid more
attention to graphic aids and summary statements which were
marked with arrows and directives such as G.O. (go over).

As compared with the first set, the second set of
annotations were still wordy and contained verbatim phrases
and few paraphrases. Main ideas were better identified,
however, and these annotations included sufficient, but
fewer, details than did the first set. It appeared that
Jane put forth more effort for the second set; these
annotations were of better quality than the first set.

Jane indicated that she was better prepared for the
second exam covering this biology material, but she later
reported making an "F" on this exam, also. After finding
out her grade, during the ninth week of the semester, Jane
dropped out of Biology 1001.
Changes in quantity and quality of textmarking. Over the course of the semester, Jane's annotations increased in quantity and in overall quality. As well as annotating a considerably greater number of pages (10 in the first biology set, 40 in the second biology set) Jane paid greater attention to the whole text (e.g., graphic aids, summary statements), and was better able to pick out key concepts.

Document analysis indicated little improvement in distinguishing important from trivial information, however. Jane consistently copied verbatim and included too many details. Overall, Jane consistently overannotated.

Reasons for changes in textmarking. To examine the reasons for changes in Jane's textmarking, the research team analyzed data obtained from transcripts of four participant interviews and instructor interviews and duplicates of four journal assignments and the developmental reading course evaluation. Although Jane did complete a course evaluation, she did not write comments about the course as requested. Jane, however, discussed her feelings about the developmental reading course and wrote about them during the final interview with the researcher at the end of the semester.

The quantity of Jane's annotations increased and overall quality improved over the semester. Although annotations for developmental reading were relatively
consistent, considerable changes in annotations for Biology 1001 were evident. Jane explained that she initially annotated little because of two main reasons: a) illness, and b) difficulty understanding the content area of biology and the textbook. Jane reported being ill and unable to study for the first exam. In addition, she stated that she had a very weak background in science and the text "made no sense." For these latter reasons she could not distinguish important from unimportant information or paraphrase. She explained that she would begin annotating, get frustrated and quit after annotating only two or three pages. She would then read the remainder of the chapter without annotating. Even though she annotated all of the biology chapter in developmental reading, she reported having similar problems to those encountered in Biology 1001. She specifically stated:

I’m bad in science. I’m not comprehending [while reading] because I don’t understand what certain things are. In the reading class we’re annotating the biology chapter and it’s so much information you don’t know if it’s important or not - like the WWII chapter though I kinda understand. But for biology you think well... this may not be important, you’re not really sure. I just look at the book [Biology 1001] and it’s like I’ve got this much more to do. I’ll be doing it and all of a sudden it’s like I can’t do this anymore.
I did like beginnings of certain chapters. After I got lost it's like – oh, I can't do this. Once I get lost, well, I read the whole thing. But I annotated what I could and when I got frustrated I just read the thing.

During the third meeting with the researcher, Jane's attitude toward annotating was more positive. She reported being able to understand the information better because it was more familiar to her. When reminded of her previous statement in which she said she "hated annotating," she replied:

I think I would like it if I knew what I was trying to annotate. It's kinda hard if you don't know what to annotate. I just don't feel like doing it. I'm reading the whole thing and I don't know what I'm doing so I better write everything in case I miss something. You know I'm writing too much. I kinda understand this section a lot better. It relates to the human and reproductive stuff. I kinda have an idea. So it's kinda easier to annotate. It's a lot easier, picking out what's more important. The other section was like I had to write everything out because I didn't know what it means. I kinda think I can't annotate if I don't understand what I'm doing, but I guess this section is just easier. I'm understanding more... This I can read it once and then
go back and find out what is important and put it in my own words and stuff. I didn’t know what I was writing really [first set]. I think it’s important but I don’t know what it means. It was a lot easier because I could put it basically in my own words [second set].

Another reason for Jane’s increased efforts in annotating was her fear of failing the course. She explained that she needed to make three “B’s” in order to pass Biology 1001, and was thus trying harder. Jane’s increased efforts in annotating were inconsistent with her previous statement in which she indicated that annotating would not help her on the test because test questions did not come from the text. In the next meeting, Jane, although still negative, indicated a slightly more favorable view about the effect of annotation on test performance. She was apparently willing to annotate, thinking it might possibly help her. She stated, “The thing is about the annotations is I think it’s important but it may not be what’s on the test. That’s what my biggest fear is.”

Although Jane reported her illness as a factor influencing her initial lack of annotating, it appears that Jane’s decisions to annotate were based largely on a) knowledge of the material, b) text difficulty, and c) poor ability to use the strategy (e.g., distinguish important
from unimportant information, paraphrasing). It seemed that Jane's change of attitude from negative to more positive stemmed from the combination of these factors. Overall, adjustments of textmarking resulted in greater quantity and quality.

Perceptions of strategy utility. When asked about the usefulness of textmarking, Jane replied initially that it was a "waste of time" and that it would not help because exam questions did not come from the text. Jane explained that annotating frustrated her, rather than helped her comprehend during reading, particularly when dealing with unfamiliar information. She simply copied information verbatim when she did not understand the text. Jane seemed to be aware that copying information was futile because memorizing these annotations would not help her answer test questions that required application. She stated:

I didn't even think it [Biology 1001 exam] came from the book because when I took the test I looked at it and [later] flipped through the book trying to look for the answers. I found maybe five that were in the book... The reasons I'm not comprehending is that it has a lot of vocabulary words I don't understand... and you have to apply it to the test.

Statements made during the third interview (quoted earlier) and final interview indicate that Jane altered her opinion about the usefulness of annotation somewhat.
She believed that annotation was useful when dealing with easily understood and interesting content. She stated:

Annotation is a good strategy because it made me think about what I'd just read. Sometimes annotation helped me recall information. It depends on the subject. I improved over the semester, especially in developmental reading. Annotation was different. I had to adjust. The information was different and I had to divide up the sections. In developmental reading history was easier. In psychology it was fairly easy. It was very hard in biology and developmental reading biology. But I just don't like biology.

Jane also believed that annotation was time-efficient for "easier subjects," such as history. In a journal assignment, she wrote:

[Annotating] just took up too much time to do. I like it because it helps, and I dislike it because it takes too long. Yes, it helps me with studying. I went over it and it was faster than re-reading.

In summary, Jane initially considered annotation to be a useless and time-consuming strategy. She later considered it to be useful and efficient under certain conditions (e.g., familiar content, easier text). Jane's use of annotation was consistent with her statements about its utility. Her adjustments of textmarking were largely
driven by increased ability to use the strategy, which was
directly related to familiarity with and knowledge of
content and difficulty of text.

**Student D - Carla**

Annotations from history and biology chapters required
in developmental reading were graded by Carla's
developmental reading instructor, Tom, and analyzed by the
researcher. Carla received scores of 60% on the first
annotations and 80% on the last three. Scores were derived
from a 10-point scale and based on the annotation
checklist. Tom reported that Carla missed many key ideas,
focused on details, and failed to organize the information
on the first two sets of annotations. On the last two
sets, Carla missed fewer key ideas and organized the
information better (i.e., enumerated and used headings).
Although Carla did paraphrase text information, she
consistently included too many details. Document analysis
by the researcher confirmed these findings.

Tom reported that Carla completed all required
annotation assignments and turned them in on time before
the ninth week of the semester. During the ninth week of
the semester, Carla stopped attending the developmental
reading class and failed to complete additional annotation
assignments. Carla's scores on objective tests covering
the history and biology chapters were 72% and 78%.
Quantity and quality of Biology 1001 textmarking - first document analysis. During the second meeting with the researcher, the fourth week of the semester, Carla’s first set of Biology 1001 annotations were analyzed. Carla only annotated 14 pages out of five required chapters. She reported spending three hours annotating the first 10-page chapter, and one hour annotating the first four pages of the second chapter.

Biology 1001 annotations were similar to later developmental reading annotations. Although she included too many details, Carla was generally able to find key concepts, as indicated by her main idea agreement score of 97% (59/61). Carla paraphrased most material, copied little verbatim, but included too many words (see Figure 5). Graphic aids were ignored, and summary statements were starred.

Prostaglandins are the most recently discovered hormones. These hormones were given this name because they were first detected in seminal fluid and were thought to be produced by the prostate gland. Actually, most of the prostaglandins in semen are synthesized in the seminal vesicles. These prostaglandins, which are found in the female reproductive tract after sexual intercourse, induce rhythmic contractions in the muscular wall of the uterus. The semen of infertile males has been found to be poor in prostaglandins, and the uterus of infertile females is often unresponsive to these hormones. For these reasons, prostaglandins are believed to play a role in fertilization.

Prostaglandins detected in seminal fluid (though produced by prostate gland)
Prostaglandins synthesized in seminal vesicles
Prostaglandins induce rhythmic contractions in muscular wall of uterus
Semen of infertile poor in prostaglandins

Figure 5. Sample of Carla’s biology annotation for developmental reading.
At the end of the second meeting with the researcher, Carla reported feeling fairly confident about her performance on the exam the next day because she had a "pretty strong background in science." Later, however, she reported making an "F" on the exam.

Carla also hinted that being involved in this research project might have been a mistake. She failed to show up for the next scheduled meeting two weeks later. One week later, she called and dropped out of the study. Thus, Carla turned in only one set of annotations for Biology 1001. Although Carla dropped out of the research study and stopped attending developmental reading class, she continued attending the Biology 1001 class. During the final interview, she reported making "F's" on all Biology 1001 exams.

**Changes in quantity and quality of textmarking.** Few or no changes were noted in the quantity or quality of Carla's textmarking. During the relatively short time that she attended meetings with the researcher (twice during the first five weeks of the semester and once at the end of the semester) and developmental reading class, her annotations improved slightly. Although her ability to identify key concepts increased somewhat, Carla consistently included too many details.

Carla kept up with developmental reading assignments as long as she attended class and annotated all required
material. She did not, however, annotate the required amount of material for Biology 1001 at any time. Carla did not report how much time it took to annotate developmental reading annotations but reported taking a great amount of time to annotate material for Biology 1001.

Reasons for changes in textmarking. To examine the reasons for changes in Carla’s textmarking, the research team analyzed data obtained from transcripts of three participant interviews and instructor interviews and duplications of the first and second journal assignments. Because Carla did not attend the last four weeks of developmental reading class, she did not complete the last two journal assignments for the course evaluation. However, during the last interview with the researcher, at the end of the semester, Carla was asked about her feelings about the developmental reading course.

Carla did not report any reason for the slight improvement in her ability to find key concepts. It is possible that she responded to feedback from her developmental reading instructor, who suggested three times that she go back over annotations and find the key concepts which had been starred for her. Tom reported that Carla responded very little to his feedback. In general, Carla did not adjust textmarking. Because she annotated so little, it is not clear if or how she would adjust use of the strategy, given more practice.
Perceptions of strategy utility. When asked if annotation was useful, Carla explained that it helped her understand while reading but was time consuming and did not help her on exams. In a journal entry after taking the history exam for developmental reading, she wrote:

In the beginning I found annotating difficult, I could never pick out a lot of the important stuff. It's still not easy but I'm getting better (I think). This strategy definitely helps me concentrate more on what I am reading. But, because of the grade I made on this exam, I have a hard time believing that annotating helps much.

When asked about the usefulness of annotation during an interview with the research, Carla responded:

I really despised annotating the WWII chapter [in developmental reading] and I really like the subject; WWII is interesting to me. I stayed up all night and did terrible on the test.... I'm not real good at them. I hated doing them. Annotations help me understand as I read but I have trouble with details. Annotating took forever. I don't have time for that. ... I've studied my annotations before and they didn't help me any better on the test.

In summary, Carla considered annotation to be useful while reading but not helpful for exam preparation. She also complained that annotation was extremely time
consuming. This complaint is not surprising in light of the fact that it took her four hours to read and annotate 14 pages (approximately 17 minutes per page). Overall, Carla's attitude toward annotating was negative. Carla's statements about the utility of annotation are consistent with her use of the strategy, which was minimal.

In the following sections, questions pertaining to textmarking transfer are answered. In each section, discussion is centered around each individual student.

Question 2

a) Do college developmental reading students spontaneously transfer the strategy to any other content area course (besides the one in which they have been trained in annotation) during their concurrent enrollment in the learning strategies course?

b) If transfer occurs, what is the quantity and quality of their textmarking?

To answer these questions, the researcher asked all participants at the end of the semester if they had marked their text for any course other than Biology 1001 during this semester. None of the participants reported textmarking in any other course.

c) If spontaneous transfer does not occur, what reasons do students give for lack of transfer?
The researcher asked the students this question during the last interview. In addition, the research team examined all interview data, journal assignments and student course evaluations to answer this question.

Student A - Bob

When asked why he did not annotate in other subjects, Bob reported that "it wasn't needed" because of the courses he was taking (calculus, chemistry, and experimental statistics). However, he did say that he would annotate in other subjects if it were appropriate. Bob further explained that "appropriate" meant courses that "had a lot of reading." He did not believe that courses dealing with math required much reading or annotating. He stated:

I would annotate in other subjects if it was appropriate. In the fall I'll take chemical engineering, economics, math and chemistry. I might annotate economics or anything I had a lot of reading in... My favorite strategies are annotating and mapping. The [developmental reading] course helped me to learn how to study and manage my time.

Bob was asked if he would have annotated the Biology 1001 text if he had not participated in this study. He first said that he would not have annotated, but then said that he possible would have. He stated:

Well, really, not. But mapping, well, yes maybe annotate some. It's making me read more. I mean that
test [Biology 1001] had stuff - some details and examples that should have been in my annotations. I think the test came from the book. I though the lecture would pretty much cover it, but there was some stuff from that book wasn't in her lectures.

Overall, it appeared that Bob had a positive attitude toward annotation and felt that it was a useful strategy for comprehension during reading and test preparation. The only difficulty he cited was the fact that annotating was time consuming. Statements in the final interview indicate that he would transfer the strategy when it was needed (e.g., courses that require much reading). However, statements about spontaneously annotating (Biology 1001) revealed his reluctance to annotate even in courses that require a considerable amount of reading.

**Student B - Tim**

Tim stated that he did not annotate in other subjects this semester because "it's not necessary to annotate subjects like agriculture and math." He further explained that he was doing fine in these other courses without annotating.

When asked if he would have annotated in Biology 1001 if he had not participated in this study, Tim did not give a definitive answer. He stated, "I don't know. It's hard to say. If I thought it was an important chapter I think I would." Given Tim's past record and statements, it
appeared that his overall attitude toward annotation is apathetic. He noted keeping up with so much material, distractions while reading, and paraphrasing as the main problems with annotation. Although he stated that annotation was helpful during reading and for test preparation, he used the strategy very little even though he agreed to annotate all Biology 1001 chapters for extra credit.

**Student C - Jane**

Jane stated that she did not annotate in other subjects this semester because it was not necessary. She was enrolled in math, speech, and English and reported making "B's" in all of these subjects. Jane said that she would annotate in other courses "if it was needed, like in reading courses." She also indicated that she would enroll in accounting, economics, psychology, philosophy, and theatre in the fall and "might annotate in psychology and philosophy."

Jane reported that the difficulties she had annotating were picking out important information and annotating unfamiliar material. She also stated that annotation was a good strategy for comprehension during reading but not very helpful for test preparation.

**Student D - Carla**

When asked why she did not use annotation in other courses this semester, Carla reported doing well in her
other courses (music, psychology) without using any strategies. When asked if she thought annotation helped, she replied, "Well, no, not really, no more than reading my lecture notes. I've studied my annotations before and didn't help me any better on the test." When asked if she would annotate in future courses, Carla stated, "Well, yeah. I'll annotate a little bit. I won't write much."

Overall, it appeared that Carla had a negative attitude toward annotation. Even though she agreed to meet all requirements of the research project, Carla annotated very little of the required material while a participant in the study, nor did she annotate in Biology 1001 after dropping out of the study. Carla noted that annotation helped her understand what she read but did not help her on exams and was extremely time consuming.

Results of Across-Student Analysis

A global analysis of the data revealed strong patterns across participants. Regarding the quantity, quality, and adjustments of textmarking, perceptions of utility and spontaneous transfer of textmarking, similarities and differences emerged between the four participants. A discussion of the across-student analysis is presented below.

Quantity and Adjustment of Textmarking

Overall, students exhibited a strong resistance to annotation. Although they all completed annotation
assignments required for developmental reading, none kept up with the researcher's annotation requirements relating to Biology 1001. Some students put forth greater effort in annotating than others, however. Bob and Jane increased their efforts to keep up with assignments and annotated considerably more material as the semester progressed. Bob, who annotated a total of 12 1/2 chapters (132 pages) more than any of the other students, kept up with the first and third assignments but fell behind on the second assignment. Jane annotated one chapter (10 pages) for the first assignment and 4 chapters (40 pages) for the second assignment.

On the other hand, Tim and Carla decreased their efforts in annotating material for Biology 1001. Tim decreased the amount annotated by one half, annotating three chapters (43 pages) for the first assignment and two chapters (24 pages) for the second assignment. Carla only annotated 14 pages during the nine week period of her participation in the research.

Quality and Adjustment of Textmarking

The quality of annotations among the four students varied considerably. Three of the students annotated too much, while one of the students did not annotate enough. Bob's, Jane's, and Carla's annotations were extremely wordy and included far too many details and extraneous information, while Tim's annotations were sparse, lacking
in supporting details and examples. Even though feedback from the developmental reading instructors and the researcher addressed these areas, the tendency to write too much or too little was consistent over the research period. Overall, the ability to distinguish important information from extraneous information remained poor, particularly for Jane.

Bob, Jane, and Tim initially had problems paraphrasing and improved only moderately over time. Tim’s annotations, though often verbatim phrases, were not as wordy as Bob’s and Jane’s annotations, which included complete sentences from the text. Although Carla focused on details, she paraphrased most text information well and copied very little verbatim.

Of the four, Tim had the best developed symbol system. His symbols were often used in isolation, however. Several sections of text were marked with underlines, stars, or arrows without annotations. The other three students increased their use of symbols and abbreviations over time but used them in their annotations rather than in isolation.

All students initially had problems organizing information and identifying key concepts, and they consistently ignored graphic aids. Earlier annotations lacked headings, and little attempt was made to enumerate or relate information. Sufficient details and examples
were often lacking. Later annotations were generally better organized.

The ability to identify key concepts was virtually the same (main idea scores ranging from 66% to 69%) for Bob, Tim, and Jane. It is difficult to compare these scores with Carla’s score of 97% (59/61) because she annotated only 14 pages. Scores on later annotations for all students (with the exception of Carla, who only annotated one set) ranged from 88% to 93%. Tim’s score of 92% (55/60) may be inflated, however, because he only annotated 24 pages. Overall, students’ ability to identify key concepts increased.

Perhaps the most obvious similarity among students’ textmarking patterns was the initial inattention to graphic aids. Graphic aids were consistently ignored in all early sets of annotations. Most graphic aids in all later sets, however, were marked in some manner. Although some of the graphic aids were simply starred or noted with directives such as “learn this” or “go over,” others were annotated and connected with arrows to related parts of the text.

In particular, Bob’s annotations of graphic aids included great detail, pictures were often redrawn, and captions annotated. Bob was also the most actively involved with the text, evidenced by his attempts to answer questions at the end of chapters and solve punnett squares in the text margins. Tim’s and Jane’s attention to graphic
aids, on the other hand, was more passive, consisting simply of stars, underlines, or one-word labels. Overall, students paid more attention to the whole text as the semester progressed. Graphic aids, summary statements, and chapter summaries were usually marked with underlines and stars, and sometimes annotated.

Attempts to discover what information students' annotations omit revealed another trend in textmarking. Bob and Tim reported that they skipped over familiar material or material considered unimportant. Although both initially considered material not covered during Biology 1001 lectures unimportant, Bob began annotating all material after failing his first exam. Tim, however, continued to annotate very little.

Jane, unlike the other three students, who consistently annotated material throughout a chapter, annotated only the first few pages of chapters in the first set. Later, however, she consistently annotated chapters from beginning to end.

In sum, Bob and Jane increased their efforts over the semester, resulting in a greater quantity and moderately improved quality of textmarking. On the other hand, Tim's and Carla's efforts diminished. The quantity of textmarking decreased markedly, and the quality improved minimally.
Reasons for Textmarking Adjustment

Although reasons for textmarking adjustment varied across students, interesting patterns emerged. Bob, Tim, and Jane cited knowledge of material as a factor in deciding what material to annotate. Bob and Tim initially annotated only unfamiliar material, or material that was referred to during lectures. Neither felt the need to annotate familiar or easily understood material; therefore, they initially ignored much information. As previously stated, Bob attended to all text information after finding out his failing exam grade, but Tim continued to annotate very little.

On the other hand, Jane tended to annotate more familiar or interesting material because she was better able to understand and put text information in her own words. Thus, her annotations increased for material dealing with the human reproductive system, which was familiar and interesting to her. She also found it easier to annotate history in her developmental reading class because it was a subject of interest to her.

Performance on the first Biology 1001 exam was also mentioned as a factor influencing efforts at textmarking. Both Bob and Jane reported increasing their efforts after learning of their failing exam grades.

Expectation of test material also directed students to annotate specific information. All students, with the
exception of Carla, reported paying greater attention to graphic aids dealing with stages of cell reproduction because of the emphasis placed on this subject during lectures. The content of the first Biology 1001 exam influenced Bob's annotations in particular. Because of the inclusion of so many questions requiring knowledge of details, Bob began annotating "every little thing."

Jane and Tim noted text difficulty and poor ability to use the strategy as reasons for not meeting the first annotation requirements. Both complained that the text included too much information and too many details. Jane further mentioned that the text had too many difficult vocabulary words, and that she simply could not annotate material that she could not understand. Tim also stated that it was too hard to put the text material in his own words. Jane explained that she could not use the strategy very well because she could not distinguish important from trivial information when dealing with unfamiliar content and difficult text. Although Tim did not mention having a similar problem, document analysis revealed that he also had difficulty deciding what information was important enough to annotate.

Bob stated that he learned how to paraphrase by watching his developmental reading instructor model the procedure. No other student made mention of the influence of feedback from their developmental reading instructor or
the researcher on their textmarking. It is not clear, therefore, what role the factor of feedback played in students' textmarking.

In sum, many factors were given to explain students' adjustment of textmarking. Factors which appeared to have the strongest effect, however, were prior knowledge and/or interest of material and expectations of test material. Other factors, such as ability to use the strategy and feedback, appeared to be of lesser influence.

Perceptions of Strategy Utility

Perceptions of textmarking utility were relatively consistent across the four students. All stated that annotating helped them concentrate and comprehend better while reading. Bob and Tim believed annotation helped in test preparation, and Jane believed annotation would help with test preparation only if the content was well understood. Jane further explained that memorizing annotations would not be sufficient and that understanding the text was necessary to answer test questions that required application. Jane did not believe that annotating helped her on her exam because she did not understand the content. Carla was the only student who stated that annotating would not affect test performance.

All students reported that the main disadvantage of annotation was the fact that it was extremely time consuming. Only Jane noted that annotation was efficient
when used for studying. She stated, "It helps me with studying. I went over it [history] and it was faster than re-reading."

Students' statements about the utility of textmarking were generally consistent with their use of the strategy. Only Tim's statements were inconsistent with his efforts. Although he reported that annotation was a useful strategy for comprehension and test preparation, his use of the strategy was minimal. On the other hand, Bob's and Jane's statements about the usefulness of annotation were reflected in their increased efforts and Carla's negative statements about annotation were reflected in her decreased efforts.

**Spontaneous Transfer**

Consistency was particularly noted in the area of transfer. None of the students reported transferring textmarking to other courses during the semester, and each reported similar reasons for failure to do so. Although all students explained that the strategy was not needed, their reasons for this judgment were different. Bob and Tim stated that the courses in which they were enrolled were not appropriate for annotation. Bob was enrolled in calculus, chemistry, and experimental statistics, and Tim was enrolled in agriculture and math. Jane and Carla both stated that they were able to make good grades without
annotating. Jane was enrolled in English, speech, and math, and Carla was enrolled in music and psychology.

All students also stated that they would annotate in other courses if appropriate. Their responses hinted at tenuous intentions, however. Tim, Jane, and Carla all stated that they might annotate in the future. Carla further qualified her response with "I won't write much." Only Bob reported that he would specifically annotate in courses that required substantial reading.
CHAPTER FOUR
DISCUSSION

The purpose of the present study was to examine directed and spontaneous transfer of college developmental reading students' textmarking strategy use. Translatability (Goetz & LeCompte, 1984) of results should be considered in light of the following limitations. First, although the four participants appeared to be representative of Louisiana State University developmental reading students (e.g., similar standardized test scores, similar ages), because of their individual attributes, translatability to other developmental reading students should be undertaken with caution. Also, translatability to other developmental reading programs may be limited to those based on a strategic learning approach rather than a discrete skills approach.

A possible threat to the external validity of this study was the use of only four students as participants. It may be argued that an analysis of such a few cases that were not randomly chosen from the target population leads to bias because of the unique characteristics of the cases chosen. For the purposes of this study, however, for an in-depth understanding of the processes involved in learning and transferring of strategies to emerge, it was necessary to limit the number of participants (Borg & Gall, 1989) because of the large amount of data involved.
Another limitation, inherent in qualitative methodology, was the use of self-report data (Garner, 1982) obtained from student journals and interviews. The eagerness of the participants to please the interviewer, or the tendency of the interviewer to seek out answers that supported her preconceived notions, known as response effect, may have contributed to bias of the data. To combat this possibility, the researcher kept a journal of personal impressions and responses to students during interview sessions, and carefully examined transcripts for leading questions. A possible instance of response effect may have been indicated in the participant, Tim. The researcher was aware of this possibility early in the study, however, and interpreted results in light of this limitation. The researcher defends the use of self-report measures on the grounds that such methods are likely to yield the more complete, detailed information required to answer the research questions.

Finally, using only one content area to examine annotation transfer limits translatability. Because this study investigated transfer of annotation to the content area of biology, conclusions about other content areas should not be drawn.

Given the limitations of this study, patterns that emerged from the research questions lead to several conclusions. Examination of the quantity, quality,
and adjustments of students' textmarking, as well as students' perceptions of textmarking utility and reasons for the lack of transfer revealed the following: (a) Although efforts varied, students generally exhibited strong resistance to annotation; (b) students either annotated too much or too little information; (c) students had difficulty distinguishing important from trivial information, organizing information, and paraphrasing, and they initially ignored graphic aids; (d) although students gave varied reasons for adjusting textmarking, their existing knowledge of content material and test expectations appeared to be the strongest factors; (e) perceptions of textmarking utility varied little across students; (f) students' statements of textmarking utility were consistent with their use of the strategy, with the exception of one student; and (g) students gave the same reasons for lack of textmarking transfer to outside courses. A complete discussion of these results is presented below.

Quantity and Adjustment of Textmarking

Although the quantity of annotations for the four students varied and changed over time, strong resistance to annotation was exhibited. Even though all students kept up with annotation assignments in their developmental reading class, they did not keep up with annotation assignments in Biology 1001. Several reasons may account for students'
decisions to annotate in developmental reading and not in Biology 1001. First, motivation to annotate in developmental reading was perhaps stronger because completion of assignments was a part of the requirements to exit from the course. Research examining the effects of performance goals (e.g., Dweck & Elliott, 1983; Nicholls, 1984) on motivation to achieve may explain this behavior. This research has suggested that students are motivated to achieve to gain favorable judgments of their competence (e.g., exams).

The amount of information required to be annotated was also much less in developmental reading than in Biology 1001; only four chapters were assigned for developmental reading, as opposed to 28 chapters for Biology 1001. Students also received extra credit in developmental reading for annotating in Biology 1001 but no penalty if they did not meet the requirements of research participation.

Second, only two students, Bob and Tim, initially believed that the strategy would actually help them on the test. Jane and Carla "hated" annotation and did not think it would help them on the exam. As the semester progressed, however, Bob and Jane increased their efforts in the belief that annotation would help them on their second biology exam. On the other hand, Tim and Carla
appeared to have given up and decreased their efforts considerably.

Third, all students reported that annotating for Biology 1001 was more difficult than annotating the history, biology, and psychology chapters in developmental reading. Students considered the Biology 1001 text extremely difficult because it had too much information and too many details and unfamiliar vocabulary words. Tim and Jane complained that it was difficult to distinguish important from trivial information and paraphrase material because of these factors. The pattern of Jane's initial annotations of Biology 1001 revealed her frustration over text difficulty. She annotated the first two to four pages of the chapter, underlined without annotating the next one or two pages, and then failed to mark the remainder of the chapter. Jane stated, "...I'll be doing it [annotating] and all of a sudden it's like I can't do this anymore. I did like beginnings of certain chapters....when I got frustrated I just read the thing."

An examination of the Biology 1001 textbook generally supports students' description of the text. The text is dense with details and replete with content-specific vocabulary. Although a glossary of the text's main definitions is provided, it is located at the end of the text, making it inconvenient for the reader to refer to definitions. The text's physical characteristics also may
have given it a "formidable" quality. In addition to being dense with details and vocabulary, the 850-page text is heavy and cumbersome, which makes it awkward to manipulate. Overall, it appears that students' initial reluctance to annotate may have been due, in part, to the intimidating nature of the textbook.

The overall resistance to annotation is consistent with Nist and Kirby's (1989) findings that students annotated little or not at all. Even though students in the present study were trained in annotation and explicitly asked to apply the strategy to Biology 1001, they annotated few of the required assignments. Students did, however, annotate considerably more than the students in Nist and Kirby's (1989) study, who were probably not trained in annotation, and who, for the most part, only highlighted text. These findings suggest that training students in annotation and prompting them to use the strategy may increase their use of the strategy, but only minimally.

Students' resistance to annotation is also consistent with research findings that students tend to use more passive strategies when reading. Several researchers (e.g., Anderson & Armbruster, 1984; Mealey, Frazier, & Duchein, 1990; Snyder & Pressley, 1988) found that college students typically memorize, reread, and "look over" when reading and studying text. Similar findings were indicated in Wandersee's (1988) analysis of how college students
approach reading an unfamiliar textbook chapter for comprehension. This study revealed that fewer than 50% of the 133 students in the sample used active strategies that involved construction of organizational tools such as outlines, concept maps, or diagrams as they read and studied a textbook chapter.

Schallert, Alexander, and Goetz' (1988) analysis of the ways students use textbooks revealed similar trends among undergraduate students enrolled in an education methods course. Overall findings indicated that, of seven students enrolled in college science courses, only one read and took notes, four read and highlighted, one read only portions of the text, and one did not even look at the text. Again, the indication is that students tend to use passive or no strategies.

Neglecting to annotate may also be explained in light of the concept of strategy utility. Jane and Carla, who did not initially perceive annotation to be useful for test preparation, annotated minimally, while Bob and Tim, who believed that annotation would enhance test performance, annotated three and five chapters, respectively. These findings are supported by research indicating that perceived strategy utility positively affected strategy transfer (Brown, Bransford, Ferrara, & Campione, 1983; Duffy et al., 1984). Even though strategy utility was
included in the training of all four students, Jane and Carla were apparently unconvinced of annotation's benefits.

Some support for students' claims of text difficulty, also cited by participants as a reason for not annotating, may be found in a recent report from the American Association for the Advancement of Science (1989) concerning current science textbooks. This report contended that current science textbooks "...emphasize the learning of answers more than the exploration of questions, memory at the expense of critical thought, bits and pieces of information instead of understandings in context, recitation over argument..." (Science for All Americans, p. 14). The large amount of reading required and density of details in the Biology 1001 text may have posed problems for developmental reading students, already at a disadvantage because of reading comprehension problems.

Students were twice required to read as many as nine chapters during a three-week period. Not only did students fail to annotate, but some failed to even read the required chapters. Tim, Jane, and Carla admitted not keeping up with the reading, and it is not clear whether Bob actually read all assigned chapters.

This resistance to reading text and strategy use is supported by recent research Kletzien (1991) indicating that strategy use declined for poor comprehenders as texts became more difficult. In the Kletzien (1991) study, a
comparison of good and poor comprehenders revealed that on easy passages, both groups used the same type and number of strategies, but as passage difficulty increased, poor comprehenders used fewer types of strategies and used strategies less often than good comprehenders. These findings support those of the present study, which appeared to indicate that text difficulty frustrated students to the point of preventing their reading the text as well as using textmarking strategies.

In summary, results of the present study revealing students' resistance to annotation support previous research findings regarding passive strategy use and science textbook difficulty. Students tended to use passive strategies and were extremely reluctant to read or annotate material that was difficult to understand.

Quality and Adjustment of Textmarking

Document analysis revealed common trends across students in annotation quality. Particularly noticeable was the tendency to overannotate or underannotate: Three students annotated too much, and one student annotated too little. These results support Simpson and Nist's (1990) findings that most novice annotators fell into one of three categories: (a) students who annotate too much; (b) students who do not annotate enough; and (c) students who cannot precisely state key ideas. Bob, Jane, and Carla fell into the first category. Similar to the students in
Simpson and Nist's (1990) study, Bob and Jane had problems paraphrasing and often wrote verbatim phrases and sentences in the margins. Bob explained that he tried to paraphrase when he could but that it helped him to "write every little thing" and write in complete sentences. Jane reported that she could not paraphrase because she could neither understand nor define unfamiliar vocabulary from the context. For these reasons, her annotations consisted of extraneous information copied verbatim. Students' problems paraphrasing support earlier research (e.g., Brown & Day, 1983) which revealed paraphrasing to be one of the most difficult aspects of summarizing. Carla was the only student who appeared to have little difficulty paraphrasing. Although she copied little material verbatim, she did include too many details.

Tom fell into the second category (Simpson & Nist, 1990). Tom failed to provide supporting details and examples and paraphrased very little. Notes in the margin often appeared to be random phrases copied verbatim from the text. Simpson and Nist pointed out that such students may be passive readers who do not actively interact with expository text and, thus, miss many key ideas. This explanation may account for Tom's passive reliance on the use of symbols such as stars and arrows rather than more demanding activities such as paraphrasing and organizing information.
Results of document analysis also indicated that students initially had problems distinguishing important from trivial information and organizing information. It appeared that this difficulty contributed to students' failure to "see the big picture" or see the relation between key concepts and supporting details and examples. The first document analyses revealed a relatively low main idea agreement (66%-69%) for Bob, Tim, and Jennifer. Although Carla's main idea agreement was 97% for the first document analysis of the Biology 1001 material, the amount of information was comparatively little (14 pages). Carla's scores on the first three annotation assignments for developmental reading (60%, 80%, 80%) perhaps more accurately reflect her ability to identify key concepts. Bob, Jane, and Carla's inclusion of too many details and the failure of all students to use headings or enumerate revealed a lack of understanding of the different levels of information found in text. Because students could not see the way information was related, they had difficulty organizing it and separating supporting information from main concepts. This problem was compounded by the failure to paraphrase information.

Simpson and Nist (1990) pointed out that students who annotate in this manner often try to memorize information in preparation for exams. Students who memorize a list of unorganized facts copied verbatim from the text are often
surprised when confronted with exam questions which reword and paraphrase concepts. The students in the present study all reported that their Biology 1001 exams had unexpected information "worded in a tricky way." Tim noted that the multiple-choice questions were extremely confusing when they included such combined options as both "b and c" or "all of the above." Apparently, questions required much more than retention of isolated facts. Jane also reported that it was necessary to understand and apply text information in order to answer these questions. She explained that "memorizing did no good" because she did not understand the concepts involved in the exam questions.

The students' poor exam grades (all made "Fs" except Bob who made a "D") seemed to reflect problems understanding and relating text information. These difficulties were also apparent in their annotations which often included details without the main idea and poorly organized information. It is not certain, however, how much of the material on the exams actually came from the text. Bob and Jane's instructor reported that 100% of her exam came from the text, Tim's instructor reported that 14% of his exam came from the text, and Carla's instructor merely reported that it was "important to read the text." Judging by these reports, it seemed likely that at least Bob and Jane's exams were based largely on the text. None
of the students sufficiently understood or remembered information required to answer exam questions successfully, however.

One of the most notable consistencies across students was the initial inattention to graphic aids. The first document analyses of Biology 1001 revealed that students routinely ignored graphic aids which included pictures, diagrams, and charts. Graphic aids constituted from roughly 25% to 33% of the text and thus represented a substantial amount of information. This inattention to graphic aids was consistent with Nist and Kirby’s (1989) findings that the graphic aids in college students’ used textbooks were generally unmarked.

Bob, the only student who gave a reason for ignoring graphic aids, stated that he ignored them because they were not mentioned in lecture or that it was not necessary because he already knew the material. Other reasons for the inattention to graphic aids may be found in Hegarty, Carpenter, and Just’s (1991) suggestion that the usefulness of graphic aids depends on skills of the reader and the complexity of the topic. For example, a diagram may be most helpful when the reader has the knowledge necessary to extract the important information from the diagram and if the topic is sufficiently complex that the reader cannot visualize spatial representations of the information without a diagram. Students’ annotations and reports
revealed that they probably did not have the knowledge necessary to extract important information from graphic aids. Also, it is almost certain that text complexity contributed to students' neglect to mark graphic aids. Complex concepts such as genetic coding, DNA replication, and RNA synthesis represented only a few of the graphic aids found in the Biology 1001 textbook. Students' failure to attend to graphic aids was not surprising under these circumstances.

Reasons for Textmarking Adjustment

Reasons for adjustments in textmarking included prior knowledge, poor performance on exams, expectation of exam content, poor ability to use the strategy, and feedback from developmental instructors and the researcher. The first three factors appeared to have greater influence on students' textmarking than the last two factors.

Prior knowledge. Although Bob, Tim, and Jane reported that knowledge of the material affected what information they annotated, Bob and Tim initially annotated only unfamiliar material and Jane initially annotated more familiar material. Bob and Tim reported that it was not necessary to annotate material that they already knew and understood. These results are related to findings in Mayer's (1984, 1987) recent literature reviews which revealed that organizational strategies tended to be most effective when the reader was unfamiliar with the material
to be learned. Although the focus of annotation is not primarily organization, such as the case with mapping, for example, organization of material is a part of the strategy. It is likely that Bob and Tim perceived their understanding of familiar information to be sufficient without further noting or organizing it.

Jane, on the other hand, annotated more interesting and familiar material than unfamiliar material. At the beginning of the semester, Jane annotated only 10 pages and explained that because she had little background knowledge of science, she could not understand the material well enough to annotate it. Jane annotated 40 pages for the second document analysis and reported that it was much easier to annotate this material because she already understood the concepts involved and the material was interesting. For example, she cited the chapters on human reproduction as easier to annotate because she did not have to struggle to understand it. She also reported that it was much easier to annotate the history chapter for developmental reading because she was particularly interested in WWII.

Jane's greater attention to interesting material is supported, in part, by Wade, Schraw, Buxton, and Hayes' (1991) research indicating that readers spend relatively large amounts of time on interesting material that is not necessarily important, material known as "seductive
details" (Garner, Gillingham, & White, 1989). Jane paid more attention (i.e., annotated) to both important and unimportant, but interesting, material. Consistent with previous findings, (Wade et al., 1991), the greater attention to this material did not appear to facilitate performance on the Biology 1001 exam, as indicated by Jane's failing grade. Her poor performance may be a result of the failure to focus on important information. Even though Jane found information on the human body interesting, she also indicated that she was familiar with this information. It is possible that both familiarity and interest distracted her from distinguishing important from trivial information. Her failure to learn information in spite of greater attention to text material may be explained by research indicating that interest factors interfere with the learning of important information when it is associated with less important ideas (Hidi, 1990).

The reasons for Jane's adjustment of textmarking may also be explained by research examining the effects of prior knowledge on text comprehension. Bransford's (1979) classic experiments revealed the positive effect of "cognitive prerequisites for comprehension" (p. 129), or prior knowledge. Other research consistently linked prior knowledge with comprehension. Findings indicated that readers comprehended (Afflerbach, 1986; Balajthy &
Weisberg, 1989; Weisberg & Balajthy, 1989) and summarized (Pratt, Luzcz, McKenzie-Keating, & Manning, 1982; Weisberg & Balajthy, 1989) higher topic familiarity passages better than low topic familiarity passages. Although Jane was able to summarize familiar information better, her performance on the exam did not appear to be affected by this improvement. It is possible that even though Jane paid more attention to familiar information, she still had difficulty understanding it because of the high number of unfamiliar terms. Overall, because Jane had little or no prior knowledge of most of the material presented in her text, she did not understand it and, thus, did not annotate it.

In summary, prior knowledge appeared to influence Bob, Tim, and Jane, but in different ways. Bob and Tim did not believe it was necessary to annotate familiar and understood information. On the other hand, Jane did not feel that she could annotate unfamiliar and difficult material because she could not comprehend it.

Exam performance and expectations of exam material. Bob and Jane both reported "having to do better" as a reason for annotating more after learning of their poor grades ("D," "F") on the first Biology 1001 exam. Their increased efforts in annotating may be explained by Clifford's (1984) theory of constructive failure. According to this theory, failure is likely to produce
constructive efforts when students have high expectations for control. Bob and Jane appeared to believe that they could perform better on the next exam by reading, annotating, and studying more. Bob stated that he decided to "annotate every little thing" in order to be better prepared for the next exam, and he expected to make a higher grade. Jane, too, reported that she felt that if she tried harder, she could raise her grade.

The theory of constructive failure may also explain Tim and Carla's decreased efforts in annotation. Both students made failing grades and, rather than try harder, they appeared to give up. Statements made by Tim and Carla indicate that they believed circumstances were beyond their control. Tim reported that distractions (e.g., other students), difficulty understanding the text, and poor ability to use the strategy prevented him from annotating. He made no mention of trying harder to perform better on the second exam. Carla also appeared to feel that she was not in control of her academic life. During the two meetings with the researcher Carla seemed to be extremely depressed and reported that her father forced her to take 18 hours this semester, expecting her to make a 4.0 GPA like her older siblings. She indicated that she was a good student but could not be a "perfect" student. Although it is not clear, it is possible that Carla's efforts decreased because she felt unable to live up to her father's
demanding expectations. That Carla's lack of effort may be due to her depressed state is supported by Ellis, Thomas, and Rodriguez' (1984) findings which suggested that a depressed mood reduces the amount of task-relevant processing during study.

In addition to the students' performance on the first Biology 1001 exam, expectations of exam material seemed to influence the way they adjusted textmarking. Bob, Tim, and Jane reported paying greater attention to graphic aids dealing with stages of cell reproduction because of the emphasis placed on this topic during lectures. Bob reported "annotating every little thing" because of the inclusion of so many exam questions requiring knowledge of details. These findings are consistent with results of studies on the relation between knowledge of the criterion task and studying outcomes (e.g., Anderson, 1980; Anderson & Biddle, 1975; Glynn, 1978). The underlying assumption about this relation is that when the criterion task is made explicit to the students before they read the text, students will learn more from studying than when the criterion task is vague. In a review of research on the effects of criterion task knowledge on test performance, Anderson and Armbruster (1984) concluded that, in general, the more specific the knowledge about the criterion event, the greater the effectiveness of studying. In the present study, it appeared that students had only vague ideas of
exam content. When they were cognizant of material on which they would be tested (e.g., stages of cell reproduction), however, they specifically attended to this topic in the text. It also seems reasonable to assume that a lack of knowledge of exam content significantly contributed to their poor performance. All students reported not expecting the questions they encountered on the exams.

Poor ability to use the strategy. All students initially had problems distinguishing important from trivial information and organizing information, key abilities in annotating. However, only Tim and Jane reported not keeping up with initial annotation assignments for Biology 1001 because of difficulty in using the strategy. Both complained of not being able to distinguish important from trivial information and to paraphrase material because the text had "too much information" and "real hard vocabulary." Although text difficulty appears to have been a strong factor in the students' neglect to annotate, it is difficult to separate this influence from that of ability. Tim and Jane's placement in developmental reading implied existing difficulties in reading comprehension. It seems plausible that an interaction of text difficulty and ability to comprehend contributed to the students' initial failure to annotate.
This explanation is supported by research (Gambrell & Heathington, 1981; Goetz, Palmer, & Haensly, 1983) which indicated that the effectiveness of strategies appears to be related to awareness of text structure and the reading process. Findings that students' difficulties with text comprehension and organization of material support research indicating that poorer comprehenders were less likely to be sensitive to passage structure than good comprehenders (Meyer, Brandt, & Bluth, 1980). In addition, other research (Fischer & Mandl, 1984) revealed that poor readers react affectively to comprehension difficulties. That is, poor readers were likely to view comprehension problems as confirmation of failure expectations rather than cues to use appropriate strategies.

As the semester progressed, document analyses revealed that all students' ability to find key ideas and organize information improved. Improvement was more notable, however, in Bob's and Jane's performance than in Tim's and Carla's performance. Bob's and Jane's improvement in strategy use was likely due, in part, to practice effects and feedback from the developmental reading instructor and researcher. On the other hand, Tim's efforts decreased, thus preventing any benefits from strategy practice.

Jane, in particular, reported that she was getting "a little better at annotating." However, she never directly attributed her increased efforts at annotating to
improvement in strategy use. Rather, she explained that she was better able to annotate later assignments because she was familiar with the material. It is difficult to separate the influences of ability to use the strategy and knowledge of material. It seems reasonable to assume that the combination of these factors affected Jane's efforts at annotation. Findings that several factors (e.g., text difficulty, prior knowledge) appeared to influence ability to find main ideas and organize information are consistent with research by Reynolds, Wade, Trathen, and Lapan (1989). These researchers suggested that ability to select important information is a result of the interaction between external variables (text and task) and internal variables (the reader's background knowledge, interest). The combination of the density of the Biology 1001 material, the expectations of material covered on the multiple-choice exam, and students' varied background knowledge in science combined to determine text element importance for individual students. Thus, Bob, Tim, Jane, and Carla had different reasons for identifying certain information as important.

The ability to paraphrase, another key component of annotating, did not appear to improve over the semester. Paraphrasing has been considered by some researchers (Brown, 1981; Brown & Smiley, 1978, van Dijk & Kintsch, 1977) to be developed later than finding main ideas and
organizing information. For example, five rules for summarizing texts emerged from research by van Dijk and Kintsch (1977): (a) deletion of unimportant information; (b) deletion of redundant information; (c) generalization of lists, (i.e., substitution of a category name for instances of a category); (d) selection of a topic sentence (i.e., near verbatim use of a topic sentence from the text; and (e) invention (i.e., construction or paraphrasing). Based on these rules, Brown and Day (1983) conducted a series of experiments examining developmental trends in paraphrasing involving students ranging from first graders to junior- and four-year college students. Findings indicated that these rules were developmentally progressive. That is, older, more mature readers employed the fourth and fifth rules to a greater extent than younger students. In particular, junior college students tended to summarize texts primarily by deleting or copying near-verbatim the words actually present in the text. The most difficult rule, invention, was found to be late developing and rarely employed by junior college students, who performed on a level comparable to that of seventh graders. Even four-year college students used the invention rule only on half of appropriate occasions.

In short, these findings are consistent with those of the present study. The ability to select and organize important information improved over time, but the ability
to paraphrase did not, suggesting that paraphrasing is perhaps a more difficult aspect of annotation.

Feedback. According to students' spontaneous reports, feedback had minimal influence on textmarking adjustment. Only Bob mentioned improving strategy use as a result of feedback from his developmental reading instructor. Bob specifically stated that he learned how to paraphrase by watching Tom model the procedure.

It is possible that feedback from the researcher concerning the use of graphic aids also affected a change in textmarking. Students received specific recommendations via oral and written feedback from the researcher to annotate graphic aids. During interviews, all students reported that they understood and would attempt to follow these recommendations. The second and later document analyses revealed a marked improvement in annotation of graphic aids over the semester. However, students also reported attending to graphic aids because they were referred to during Biology 1001 lectures. Thus, it is not clear to what extent feedback may have affected annotation of graphic aids.

Perceptions of Textmarking Utility

All students viewed textmarking as useful for initial reading and studying and/or exam preparation. They also reported that annotating enhanced concentration and comprehension during reading. Bob and Tim stated that
annotation helped in exam preparation, and Jane stated that annotation would help in exam preparation only if the content was well understood. Only Carla reported that annotating would not affect test performance.

These findings support both the encoding (DiVesta & Gray, 1972) and external storage (Miller, Galanter, & Pribram, 1960) hypotheses. Annotating appeared to place cognitive demands on the students and promoted deeper levels of processing. Bob, Tim, and Jane specifically stated that it made them think about what they were reading.

With the exception of Carla, students also used annotations for review and exam preparation. However, Jane noted that using annotations for exam preparation would only be helpful if annotations were understood, rather than simply memorized. She reported that although she studied her annotations, they did not help her on the exam because the questions required application of concepts she did not understand. Jane’s case suggests that the external storage hypothesis may only account for improved test performance when annotations are of high quality, which would indicate a relatively deep level of text processing during reading, or encoding. It is reasonable to assume that test performance would only be enhanced if the learner is studying material that is covered on the test and understood. Thus, annotations should consist of important
information that is organized and paraphrased. Jane's problems comprehending and paraphrasing information made it difficult for her to annotate and likely contributed to her poor performance on Biology 1001 exams.

It is interesting to note that only Jane seemed to be aware of the importance of studying "good" annotations. Neither Bob nor Tim qualified his statements concerning the value of annotations for test preparation. It is possible, however, that the same problems that contributed to Jane's ability to produce annotations of high quality (i.e., comprehending and paraphrasing) affected the quality of Bob's and Tim's annotations and contributed to their poor exam performance.

Overall, students reported that annotation served the dual function of allowing for the isolation of key ideas at the time of initial reading and yielding artifacts for later review. These findings are supported by Nist (1987), who cited these two reasons for the popularity of annotation among her developmental reading students. It appears that students find annotation appealing because it enhances comprehension and provides material for exam preparation.

In addition to the usefulness of textmarking, all students reported that the disadvantage of annotation was the fact that it was extremely time consuming. Only Jane stated that annotation was time-efficient when used for
studying. The latter finding is supported by Simpson and Nist's study (1990) which revealed that annotating was more time-efficient than preview-questioning.

In general, students' statements about the utility of textmarking were consistent with their use of the strategy. Bob's and Jane's statements about the usefulness of annotation were reflected in their increased efforts and Carla's generally negative statements ("it's a waste of time") about annotation were reflected in her decreased effort.

Only Tim's statements were inconsistent with his efforts. Although he reported that annotation was a useful strategy for comprehension and test preparation, his use of the strategy was minimal. A possible explanation for the discrepancy between Tim's statements and actions was his desire to please the researcher. On several occasions, the researcher had reason to doubt the sincerity of Tim's positive remarks about annotation and statements. Promises to show up for meetings were rarely kept, and excuses for failure to do so seemed unbelievable. The researcher's repeated attempts at rescheduling met with failure. On one occasion, the researcher telephoned Tim who responded, "Tim's not here right now... Oh, it's you, Deidra. I didn't know it was you." During this conversation, Tim promised to meet another time with the researcher but asked, "Do you think I could have a little more time to
annotate so it would help you more?" Tim's plea for more time seemed to indicate a misunderstanding of the purpose of the research as well as an attempt to please the researcher. On earlier occasions, Tim apologized for not having annotated and once stated, "I hope you're not mad because I didn't annotate much."

Because of these statements, the sincerity of many of Tim's statements was dubious. Also, the fact that Tim's efforts at annotation were inconsistent with his statements makes unclear his perceptions of textmarking utility. In short, it appears that some of the information obtained from Tim may be distorted by response effect, in this case the eagerness of the participant to please the interviewer.

Spontaneous Transfer

None of the students reported transferring textmarking to other courses during the semester and reasons for the lack of transfer varied little. Although all students stated that textmarking was not needed to succeed in their courses, they gave different reasons for this judgment. Bob and Tim explained that it was not necessary to annotate in their particular courses (calculus, chemistry, experimental statistics, math, and agriculture). On the other hand, Jane and Carla stated that they made good grades without annotating. Semester grade records did not support all students' reports of good grades. Although
Bob’s and Jane’s GPAs were 2.727 and 2.333, respectively, Tim’s and Carla’s GPAs were .375 and .461, respectively.

In addition, all students stated that they would annotate in other courses when appropriate. However, responses indicated that, of the four, only Bob seemed to be serious about future intentions to use annotation. Tim, Jane, and Carla said they might annotate, and Bob stated that he would specifically annotate in courses that required substantial reading.

The statement that some subjects were not appropriate for annotation (e.g., math, chemistry) may be a logical conclusion for students who were not trained to annotate in these particular content areas. In the present study, the developmental reading students were trained to annotate history, biology, and psychology texts. Simpson and Nist’s (1990) findings that annotation must be adjusted according to the task and content may explain, in part, students’ failure to annotate in other content areas. Earlier transfer research also revealed that transfer was more likely when training included specific examples of the transfer task (e.g., Gick, 1985; Holyoak & Koh, 1987). It is possible that students did not perceive sufficient similarity between their initial learning situations and the transfer situation (i.e., their outside content courses).
In light of previous strategy utility research (e.g., Duffy et al., 1984; Pressley, Levin, & Ghatala, 1984), it appears that students' perceptions of annotation usefulness should have resulted in transfer. However, present findings indicated that only Carla's lack of transfer would have been predicted from her negative statements about the usefulness of annotation. Although the other students reported that annotation was a useful strategy, none transferred the strategy to outside courses. Apparently, students' reported feelings about the usefulness of annotation were not strong enough to motivate its transfer.

Similarly, direct explanation research, which showed that students were more likely to transfer strategies when they had detailed information about how and when to use them (e.g., Duffy et al., 1984; Roehler et al., 1986), was not supported in the present study. Even though direct explanation was emphasized in the developmental reading course, and students believed that annotation was a useful strategy, they did not spontaneously transfer strategy use. This inconsistency between beliefs and actions may be explained by research (e.g., Alvermann & Ratekin, 1982; Bednar, 1987) indicating that students consistently relied on strategies with which they felt comfortable (rereading) and did not spontaneously try other strategies (annotation) that they knew were effective.
Another possible conclusion is that the most obvious explanation for the lack of transfer was students' poor performance in Biology 1001. Clifford's (1984) research showed that strategy maintenance was contingent on learners attributing their successes and failures to the use of appropriate and inappropriate strategies, respectively. Even though students reported that annotation was useful, it is possible that they did not believe annotation helped them in their biology course (all students failed or dropped out) and that their failure to perform successfully influenced their decisions concerning annotating in other courses. Perhaps if students had successfully performed in Biology 1001, they would have been more likely to transfer the strategy to other areas. This explanation, however, must consider the fact that students did not read and annotate the required material for Biology 1001. Because students annotated relatively little of the required material, it cannot be stated that annotation was ineffective for this course. For this reason, it is unclear whether students connected their failure in Biology 1001 to their lack of transfer. This explanation may be unlikely in light of students' failure to report any connection between performance in Biology 1001 and annotation use in other courses.
Conclusions and Implications

Several conclusions may be drawn from the results of this study. First, it may be unreasonable to expect some developmental students to grasp the use of annotation during one semester. The complexities involved in summarizing, paraphrasing, and organizing information may require more time for direct instruction and strategy practice.

Second, annotation alone is clearly not enough to compensate for a lack of knowledge of specific content or text structures. Even though students were encouraged by their developmental reading instructors to use a variety of appropriate strategies in their content areas, only one student in the current study reported using another strategy (mapping) in Biology 1001. If the students in the current study had used other strategies along with annotation, better performance on exams may have resulted. Although students reported that annotation increased interaction with text during reading, this greater attention to text was not enough to insure comprehension of passages containing numerous unfamiliar terms.

Third, the biology text material used for training purposes in the developmental reading course may not have been sufficiently similar to the texts encountered in introductory biology courses to promote transfer. All students reported that the text for Biology 1001 was
considerably more difficult than the biology excerpts used for strategy training in developmental reading.

Finally, it must be pointed out that this study did not address the effectiveness of annotation. Rather, it examined the difficulties college developmental reading students faced as they attempted to grasp and apply annotation and the various factors that motivated their efforts. Because the four participants used the strategy minimally, no conclusions should be drawn about annotation efficacy.

Findings presented here have several implications for developmental reading programs based on a strategic learning approach. To provide students with reading and study strategies and promote transfer of these strategies, the two areas of training within developmental reading programs and the relation between the developmental reading program and other departments should be addressed.

Training. Training should emphasize an even stronger rationale for textmarking use to motivate the students (e.g., Duffy et al., 1987). Such training is best accomplished through direct explanation, including strategy utility or informed instruction (e.g., Brown et al., 1983).

To increase the quality of annotations, training in specific strategy components may need to be stressed. For example, students may need more training in identifying key concepts, organizing information, and paraphrasing using
natural text. Given Brown and Day's (1983) findings that summarization of text appeared to be a developmental process, students may benefit from instruction addressing specific deficits (Brown, Campione, & Day, 1981; Day, 1980).

Training in text structure awareness should also be emphasized. The present study's findings, supported by research (e.g., Meyer, Brandt, & Bluth, 1980) suggesting that poorer readers are less aware of text structure, indicate the need for training students to recognize different text structures. Given the failure to transfer textmarking across content areas, students should also be made aware of the different text structures across content areas.

To better prepare students to use and apply strategies to a wide variety of content areas, exposure to several different content texts is needed. Materials used in the strategic learning course may include the actual texts students read in their other content courses.

Finally, it must be acknowledged that training requires sufficient time for acquisition of strategies and motivation to apply them. As researchers have pointed out, exactly how much time is "sufficient" is difficult to establish (e.g., Pressley, 1991). One semester is perhaps not enough time for college students to replace years of passive reading habits with more active, strategic ones.
As Duffy and Roehler (1989) pointed out, "Learners, particularly unmotivated learners, need both time to successively restructure their instructional experiences and a rich context in which to build a meaningful conceptual mosaic for why strategies are useful" (p. 139).

**Integrated strategy instruction.** To address students' problems applying strategies when they lack background knowledge of specific content and text structures, strategy instruction should be integrated with college-level content instruction. Although current practices utilize this approach (incorporating materials extracted from introductory college texts), a broader application that would allow for strategy use in actual college courses would seem to be of greater benefit. Course requirements may include application of strategies to other courses in which the students are concurrently enrolled. Although the current developmental reading program at Louisiana State University includes these requirements, perhaps a greater emphasis on this aspect is needed.

Langer and Neal (1987) described such an arrangement that has met with success. These researchers developed an adjunct study skills model (Strategies for Learning) which paired instructors for study skills courses with supplemental specialists. The role of the instructor, a member of the university learning center staff, was to teach strategies for learning (e.g., applying a textbook
information processing system, recognizing how ideas are organized, constructing graphic organizers), train and supervise supplemental specialists, and assist them in applying strategies for learning to students' content courses. Supplemental specialists were upper division or graduate students who had successfully completed the content courses or their equivalent and were recommended by the content course instructors. After receiving training in specific learning skills taught in the strategies course, these students conducted supplemental sessions in which the learning strategies were modeled and applied to specific content areas. Evaluation data, learning strategy students' course grades, and comments by content course instructors indicated that this program was highly beneficial to students enrolled in the study strategies course. In addition to a significant positive correlation between final course grades received in the strategies course and the content course, data revealed gains in academic self-confidence and study habits.

As Schallert et al. (1988) noted, strategy training should be integrated into the instructional system if learners are to acquire the habit of being strategic. It is not likely that students enrolled in study strategy courses will naturally transfer strategies to other domains if learning and study strategy training are isolated from the rest of the instructional system. Learning strategy
course instructors could possibly assist in promoting transfer by communicating with those involved in students' regular content area classes. In short, if learning strategy course and content area instructors could work cooperatively to identify aspects of texts and courses that give students problems, then strategy transfer would perhaps be more probable. Given the findings of the present study and those of earlier research, suggestions for future research are given below.

**Future Research**

Further research on the processes of college students' textmarking should be conducted to determine what best convinces students of a strategy's effectiveness and motivates its use. In particular, research should further examine reasons students adjust textmarking. More information is needed on the relation among prior knowledge, strategy acquisition, and strategy transfer.

More research is also needed in the general area of strategy transfer. Because students preferred certain strategies (e.g., mapping), information regarding students' selection of strategies for transfer is needed. Perhaps different results would have been obtained in the current study if students had been allowed to choose any strategy for transfer. Although they were not forbidden to use strategies other than textmarking, they were not explicitly asked to do so. Future research should examine how a
flexible strategy user might transfer strategies to other content courses.

Because the findings of this study revealed a lack of strategy transfer across content areas, this area should also be addressed in future research. With the exception of Carla, who was enrolled in a psychology course, students in this study were enrolled in courses other than the ones in which they were trained in strategy use. Research is needed to clarify the role of strategy use in specific content areas. If the lack of transfer was due to students' failure to see sufficient similarity between strategy use in the developmental reading course and its application to outside courses in which they were not trained in strategy use, then training should specifically address this issue.

Finally, more information is needed on what best promotes strategy transfer during and after training. Learning strategies courses which employ integrated strategy instruction (e.g., Langer & Neal, 1987) would seem to be the best vehicle for research examining strategy transfer during training. To examine long-term transfer, the present study could be replicated but extended over the course of several semesters. Although the tracking of developmental reading students has yielded information on performance (GPA), little or no research exists on long-term processes of strategy transfer.
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APPENDIX A

DEFINITIONS OF TERMS
DEFINITIONS OF TERMS

For the purpose of this study, the following terms are defined:

**annotation** - the process of writing brief summaries of text material in the margins including the following:
(a) paraphrasing, (b) enumerating multiple ideas (e.g., causes, effects, characteristics) in an organized fashion, (c) noting examples of concepts in the margin, (d) putting key information on graphic aids when appropriate, (e) jotting down possible test questions, (f) noting puzzling or confusing ideas with a question mark in the margin, and (g) selectively underlining key phrases in conjunction with annotations (Simpson & Nist, 1990).

**developmental reading program** - program which provides students unprepared to cope with college reading demands (indicated by low standardized reading scores) study and learning skills/strategies (Bray, 1984). Developmental reading programs are generally based on one of two approaches:

a) **traditional skills approach** - reading is taught as a series of isolated skills (e.g., finding the main idea of a paragraph); materials are usually brief passages unrelated to college text (Nist, 1985).

b) **strategic learning approach** (content-based approach) - reading instruction emphasizes self regulated learning and transfer; the self-regulation
processes of planning, monitoring, and evaluation (Brown, Bransford, Ferrara, & Campione, 1982) are emphasized through direct instruction and teaching strategies that promote active reading of college texts and efficient preparation for exams (e.g., annotating, mapping, predicting test questions, self-questioning) (Nist & Simpson, 1987).

direct explanation - detailed explanation about the effectiveness and importance of strategies including five critical elements: (a) description of the strategies so that they are meaningful to students, (b) students' understanding of why strategies should be learned, (c) teachers' explanation of how to use strategies step-by-step, (d) students' understanding of the circumstances under which strategies should be used, and (e) students' evaluation of their use of strategies so that they can monitor and improve their own strategic reading (Roehler & Duffy, 1984).

direct instruction - instruction which includes the following: (a) focusing students' attention, (b) giving a general overview of what is to be done, (c) going through procedures step-by-step, (d) modeling the process via think alouds, (g) providing opportunities for practice and feedback, and (h) redemonstrating procedures if necessary (Nist & Kirby, 1986).
encoding hypothesis - the concept that learning appears to be enhanced when a strategy focuses on and includes active processing of relevant information in the text (DiVesta & Gray, 1972).

external storage hypothesis - the concept that strategies are useful because they yield artifacts which may be reviewed for exam preparation (Miller, Galanter, & Prim, 1960).

informed instruction - instruction that specifically includes information about the utility of the strategy being taught (Brown, Bransford, Ferrara, & Campione, 1983).

levels of processing theory - the concept that information which is processed at deeper levels through elaboration is ultimately remembered better (Craik & Lockhart, 1972).

metacognition - the knowledge a learner has about his or her cognitive skills in different situations, which is used to regulate problem-solving or learning (Bender, 1986).


active strategy - strategy which requires a deeper level of processing (Craik & Tulving, 1978), (i.e., notetaking, underlining, annotation) (Nist, 1987; Wade, Trathen, & Schraw, 1990).
**passive strategy** - strategy which requires a relatively shallow level of processing (Craik & Tulving, 1978) (i.e., rereading, "looking over"). (Nist, 1987; Wade, Trathen, & Schraw, 1990).

**strategy transfer** - a process that occurs when prior-learned knowledge and skills influence the way in which new knowledge and skills are learned and performed (Cormier & Hagman, 1987).

- **directed transfer** - application of a learned strategy to a new situation as a result of explicit direction to do so.
- **spontaneous transfer** - voluntary application of a learned strategy to a new situation.

**strategy utility** - the understanding that a strategy benefits a particular aspect of performance (Pressley, Snyder, & Cariglia-Bull, 1987).

**textmarking** - marking text in some manner (i.e., underlining, highlighting, annotating).
APPENDIX B

REVIEW OF LITERATURE
REVIEW OF LITERATURE

This review of the literature first presents a brief description of college developmental reading programs and research examining college students' use of active and passive study strategies. A discussion of the textmarking research follows, specifically examining underlining and annotation. The review concludes with a discussion of strategy transfer. Some of the studies cited in the transfer section involved elementary school children, and no studies were found that specifically addressed transfer of textmarking strategies among college students. However, results of studies discussed involving transfer of skills and problem solving by younger learners do shed light on the general area of transfer.

College Developmental Reading Programs

At the postsecondary level, students face a critical problem in learning and remembering vast amounts of information they are required to read. As they make the transition from high school to college, they must be able to comprehend and recall more difficult text in order to perform well on exams. Reading and studying content material involve such complex activities as identifying and selectively attending to relevant information, monitoring comprehension, and taking needed corrective action (Baker & Brown, 1984; Brown, 1980).
Since the 1960s, many postsecondary institutions have been required by open-admissions policies to offer developmental programs to meet the needs of increasingly large numbers of students unprepared to cope with college learning demands (Bray, 1984; Carpenter, 1985). Boylan (1986) estimated that nearly 25% of college freshmen are enrolled nationwide in developmental reading or study skills courses. These students typically have low college-entrance and standardized reading test scores and lesser-developed study and learning strategies. Developmental reading and study skills programs attempt to provide training in reading and study strategies needed for such students.

Some of these programs stress students' acquisition of active reading and study strategies, while others place less emphasis on such an approach. This difference in curricular emphasis arises, in part, from the research examining active and passive strategy effectiveness.

Active and Passive Strategies

The research concerning college students' use of study strategies has been approached from two broad perspectives. One view holds that for successful learning and remembering to occur, students must make use of active strategies that yield artifacts for later review, such as annotating, notetaking, and underlining (Nist & Simpson, 1987; Weinstein, 1987). In contrast, other views suggest that
little empirical evidence supports the idea that active study techniques are any more effective than the more passive methods of reading-only or repetitive reading (Anderson & Armbruster, 1984; Reynolds & Shirey, 1988). These perspectives are explored below.

Active Strategies

When distinguishing the "good strategy" user from the "poor strategy" user, several researchers see the use of active strategies as a primary indicator of effective strategy use. Good strategy use is also included in a description of expert readers by Baker and Brown (1984); expert readers use rapid decoding and have large vocabularies, phonemic awareness, knowledge of text features, and many different strategies to facilitate understanding and retention. Non-strategic readers are described as focusing on decoding single words, failing to adjust their reading for different texts or purposes, seldom monitoring their comprehension, and having problems organizing and relating textual information.

Pressley, Snyder, and Cariglia-Bull (1987) described the good strategy user as having a repertoire of strategies, including goal-specific strategies that facilitate memory, comprehension, and problem-solving goals, monitoring strategies that keep track of cognition and performance, and higher order sequencing strategies that organize goal-specific and monitoring strategies to
accomplish complex goals. Pressley et al. (1987) further pointed out that good strategy users know when and where to apply strategic procedures; that is, they have conditional knowledge of strategy use (Paris, Lipson, & Wixson, 1983). Proficient readers are described by other researchers as those who selectively take notes, underline, summarize, elaborate text, and generate and answer questions about text material (Cook & Mayer, 1983; Forrest-Pressley & Gillies, 1983).

College developmental reading programs based on a strategic learning approach attempt to develop students' acquisition of such active reading and study strategies. The primary goal of these programs is to help college students become proficient readers by training them to be active strategy users. Thus, training often focuses on such strategies as textmarking, which requires selection and organization of important information, summarization, and elaboration.

The idea of an active student role in learning is also noted in the research of cognitive-instructional psychologists interested in the cognitive and metacognitive processes underlying knowledge and skills development (Belmont, Butterfield & Ferretti, 1982; Bransford, 1979; Brown, Bransford, Ferrara, & Campione, 1983). In addition, researchers interested in effective schooling and classroom learning situations (Doyle, 1977; Humphrey, 1984; Marshall
& Weinstein, 1984; Winne & Marx, 1982) and the development of innovative practices that promote independence and motivation to learn (Marshall, 1981) support the concept of an active student role in learning.

Paris, Wasik, and Turner (1991) pointed out that active, strategic reading is the main characteristic of expert readers because it is integrated into students' cognitive development and is essential for success in school. Six benefits of strategic reading are given. First, strategic reading allows for elaboration, organization, and evaluation of text information. Second, childhood development of cognitive strategies to enhance attention, memory, communication, and learning coincides with the acquisition of reading strategies. Third, readers control strategies, using them as personal cognitive tools selectively and flexibly. Fourth, because readers need to have both the knowledge and disposition to use strategies, metacognition and motivation play important roles in strategic reading. Fifth, teachers can employ direct instruction in strategies that foster reading and thinking. Finally, learning throughout the curriculum can be enhanced by strategic reading.

Within the past decade, based upon this growing body of research regarding the effectiveness of active strategy use, some college developmental reading programs have begun
to revise their curricula from one that views reading as a
set of discrete skills to one that sees reading as
requiring specific, active strategies to enhance students' independent learning from text (Nist & Simpson, 1987; Weinstein, 1987). Earlier research by Dansereau et al., (1979) indicated that training undergraduates to use specific reading strategies involving paraphrasing, construction of idea networks and defining the main ideas and forming relationships between those main ideas improved performance significantly on both short answer and multiple-choice comprehension tests. More recent research findings (e.g., Nist, Simpson, & Olejik, 1985; Nist, Simpson, Olejnik, & Mealey, in press) also have shown a moderate, positive correlation between active strategy use and test performance among undergraduates.

College reading programs based on an active, strategic learning approach introduce many reading and learning strategies to students. One such strategy is text annotation, the focus of the present research. Two main reasons explain why an active strategy like annotating is effective (Nist, 1987): First, good textmarking places cognitive demands on the student and promotes deeper levels of processing. DiVesta & Gray (1972) explained this concept in terms of the "encoding hypothesis." That is, learning appears to be enhanced when the strategy focuses on and includes active processing of relevant information
in the text. For example, the very act of using a strategy such as annotation seems to facilitate comprehension of text during reading. Second, good textmarking gives students a self-testing device from which to study as they prepare for exams. The hypothesis which accounts for this second idea is the "external storage hypothesis" (Miller, Galanter, & Pribram, 1960). When textmarked material is used for review and exam preparation, it serves as an external storage mechanism. Nist (1987) concluded that annotating is popular among students because it serves the dual function of allowing for the isolation of key ideas at the time of initial reading and yielding artifacts for later review.

Nist and Simpson (1988) gave several reasons to support college students' active involvement with text via annotation and other strategies. First, because students cannot possibly learn everything they read, they must be able to identify and put into their own words key concepts and supporting details. Second, college students must have ready strategies for putting text information into a form that is easily retrievable because they are tested over large amounts of information, often having only two or three exams in the course of a semester. Third, students must interact with text through elaboration and recitation so that information may have greater opportunity to reach long term memory. In short, to meet the demands of
learning and remembering great amounts of information they are required to read, college students need a repertoire of active strategies from which to select for different tasks. **Passive Strategies**

Students' learning strategy repertoires tend to be limited, despite the commonly acknowledged need for college students to actively process text in order to comprehend and recall information that will be covered in exams. College freshmen typically memorize, reread, and "look over" when reading and studying text (Anderson & Armbruster, 1984; Doyle, 1983; Mealey, Frazier, & Duchein, 1990; Simpson & Nist, 1990; Snyder & Pressley, 1988). Rather than stimulate active learning, such activities tend to encourage passivity and require less student involvement with text (Simpson & Nist, 1990). According to some researchers, however, passive methods are no less effective than active methods. Wade and Trathen (1989) found that students' use of specific study techniques such as taking notes, underlining, and highlighting was not causally related to their learning from text. In a review of experimental research of the effectiveness of underlining, Hartley, Bartlett & Branthwaite (1980) found that, out of 22 studies, 14 studies indicated that underlining had a neutral effect on test performance, and one study indicated a negative effect. Similarly, several studies that compared the effectiveness of different study strategies,
such as notetaking and underlining, revealed no difference in performance on immediate or delayed tests among the various strategies (Anderson, 1980). Just and Carpenter (1987) explained that these findings may be a result of most experiments' failure to evaluate how well a certain strategy was executed. For example, the effectiveness of a strategy like notetaking depends on the quality of the notes.

Conclusions

Inconsistent findings concerning the use and effectiveness of active versus passive study techniques may be a result of the extreme variance in these research studies with regard to procedure, subjects, and materials, thus precluding a basis for comparison (Hartley, Bartlett, & Branthwaite, 1980). Generalizability of the results of this research is also questionable because most of these studies failed to replicate natural studying conditions, provide sufficient training in strategies, and allow adequate time for the practice of learned strategies.

Studies addressing these considerations have yielded more consistent findings with regard to the use of the specific active strategy of annotation. Generally, both descriptive (Mealey, Frazier, & Duchein, 1990; Nist, 1987) and empirical research (Harris, 1990; Hynd, Simpson, & Chase, 1990; Nist & Simpson, 1988; Nist, Simpson, & Olejnik, 1985) support the use of textmarking strategies
when students are motivated, well trained, and have opportunities for practice, feedback, and review.

Textmarking

Marking text in some manner (i.e., highlighting, underlining, annotating), has long been a common practice among college students and is generally a spontaneous practice for beginning college freshman, who, for the most part, were forbidden to mark in textbooks during high school (Nist & Kirby, 1989). Textmarking may be considered a new strategy to such students who lack training as well as practice in textmarking strategies. Although some research has been conducted on the effectiveness of textmarking strategies, scant research exists on college students' spontaneous use of textmarking. Therefore, little is known about what kinds of information students mark and why they mark it.

In a recent exploratory study addressing the qualitative aspect of textmarking, Nist and Kirby (1989) analyzed the textmarking patterns of college students. Thirty used college textbooks, 10 each in American history, political science, and sociology, were examined for the types of information marked and the patterns of markings. Results showed that (a) students highlighted more than they underlined, (b) students tended to mark too little rather than too much, (c) most markings were random ideas that were not useful for preparation for exams, (d) students
tended to mark less, and less efficiently, as they progressed through the text, (e) annotations were restricted to directives such as "learn this," and (f) students failed to mark essays or typographical aids such as charts, graphs, and diagrams. Although little was known about the background of the students or instructors who used these texts, results do begin to illustrate the textmarking patterns employed by college students. It is likely that the students who marked these texts were not trained; however, if they were trained in textmarking, they failed to mark text independently or effectively with any degree of consistency.

In light of these results, textmarking research, focusing on both underlining and annotation, is examined. Experimental studies that allowed for a minimum of or no training as well as more naturalistic studies which allowed more intensive training are considered. Findings from descriptive research are also discussed.

Underlining

Of all the active response study strategies, underlining is the most widely used (Anderson & Armbruster, 1984; Annis & Davis, 1978; Glynn, 1978), and its popularity is confirmed by its frequent appearance throughout used texts (Fowler & Barker, 1974; Nist & Kirby, 1989). However, the majority of research shows underlining to be no more effective than other study strategies. Most of the
extant underlining research focuses on two main areas: (a) general effectiveness of underlining and (b) differential effectiveness of subject-and experimenter-generated underlining.

General effectiveness of underlining. Central to most underlining research is the von Restorff effect, a finding that the isolation of an item against a homogeneous background increases recall of that item (Wallace, 1965). A review of laboratory studies by Wallace (1965) showed that this isolation effect is a reliable phenomenon.

Despite the von Restorff effect's reliability, findings from research comparing underlining with other strategies are less consistent. A review of the underlining research by Hartley, Bartlett, and Branthwaite (1980) revealed that underlining research involving college students or adults found neutral effects in 10 out of 15 studies in which subjects generated the underlining and eight out of 15 involving experimenter-generated underlining. Positive effects were found for student-generated underlining in five studies and a negative effect for experimenter-generated underlining in one study (Rickards & Denner, 1979).

It is difficult to establish clear-cut findings from these studies for several reasons. First, insufficient information was provided about encoding and retrieval-processing. Little or no information on what the subjects
underlined and the specific requirements of the criterion test was given. Further limitations of these studies noted by Hartley et al. (1980) include the failure of most of the studies to investigate long-term retention following underlining and the restriction of learning assessment of recall to multiple-choice questions, constructed response items, or both. Only eight of the studies reviewed reported long-term retention data, with delays varying from six days to five weeks. The lack and variability of retention data leave many questions about the strength of underlining effects. In addition, only two studies used free recall to assess retention. Thus, it is not clear what information students would have recalled had they been asked to respond freely. The failure to find significant differences may be a result of the use of insensitive measures rather than proof of the ineffectiveness of underlining.

Another limitation of these studies pertains to efficiency. None of these studies provided findings favoring underlining when the time factor was considered. Because stringent time restrictions such as those required in experimental settings are not placed on the typical student, this issue is perhaps a moot point. Students generally have the freedom to spend their time as they wish. Therefore, it is reasonable to assume that underlining is helpful for recalling cued items and that,
if it is student-generated, it may take longer than if it is experimenter-generated.

Furthermore, virtually all of these studies were conducted in laboratory settings which did not allow for training, practice, or review of underlinings before testing. If underlining could be studied in real classroom situations where students are under pressure to perform, learners might be motivated to try harder. Research conducted under these conditions may reveal more positive effects for underlining.

More recently, two empirical studies on underlining indicated neutral effects (Snyder, 1984; Wade, Trathen, & Schraw, 1990). These studies are particularly noted because their research designs are more sound than those of the previous underlining research. Subjects in both studies were students enrolled in college developmental or learning skills courses and materials were representative of college level texts with respect to length and content. Snyder’s (1984) study was unique in that students were trained in underlining, allowed to practice, and given feedback before being tested. However, training, practice, and feedback were minimal; sessions lasted one hour and were conducted twice weekly for three weeks. Results of this study indicated that underlining was no more or less effective than the SQ3R strategy and was less effective than outlining. This study is limited, however, in that
the study techniques and environment did not reflect actual
study activities and conditions of students who are
preparing for an exam. Studying was teacher-rather than
student-directed, and subjects were not given a choice as
to how they were to study the material. Under realistic
conditions, students make the decisions concerning if,
when, and how to study.

Wade et al. (1990) also failed to find a significant
difference between underlining and other strategies in an
analysis of spontaneous study strategies. The conditions
of this study closely approximated that of the classroom;
students were allowed to select their own study strategies.
However, it is difficult to draw any conclusions about the
effectiveness of underlining because no training of any
sort was given.

**Differential effectiveness of subject and experimenter generated underlining.** Although the von
Restorff effect has been offered as a primary explanation
for the positive effect of underlining on recall, research
has shown that other factors, such as whether the student
underlines the information, or the information is
preunderlined, are involved. Generally, subject-generated
underlining has been shown to facilitate recall more than
experimenter-generated underlining (Fowler & Barker, 1974;
Rickards & August, 1975). These studies used designs
comparing groups who produced their own text cues, groups
who read cued text, and groups who used uncued text. In
the study by Rickards and August (1975), college students
who had underlined the passage recalled significantly more
idea units and spent a great deal more time on the task
than subjects in the other treatment groups. Fowler and
Barker (1974) found no overall difference between
treatments in performance of college students who
highlighted on a delayed multiple-choice test. However,
subjects who highlighted the text scored higher than
subjects who received a highlighted text on items
corresponding to highlighted materials, but not on items
corresponding to unhighlighted material. In addition, for
active highlighters, given that the corresponding
information had been highlighted, the chance of correctly
responding to an item was significantly greater than the
chance of correctly responding if the corresponding
information had not been highlighted.

Many researchers (e.g., Anderson & Armbruster, 1984;
Craik & Tulving, 1975) attributed such positive effects on
recall to the levels of processing theory which states that
information which is processed at deeper levels through
elaboration is remembered better. That is, the major
benefit of underlining is not the result of the mere cueing
of information, because text with provided underlining cues
does not necessarily aid recall. Instead, the major
facilitative effect of underlining occurs when the student
generates the underlining, likely because of the amount and depth of processing required to make choices about what to underline. As previously pointed out in the discussion of Hartley et al.'s (1980) review of underlining research, increased studying time and greater recall may indicate a more thorough processing of text than would otherwise occur. However, as Nist and Hogrebe (1987) pointed out, this explanation is valid only if students are actively underlining as an encoding device (DiVesta & Gray, 1972). If underlining is used only as a concentration technique, without regard to what information is important, student-generated textmarking would seem to be of little value. Textmarking would only be beneficial for test preparation when relevant information is marked.

This idea is illustrated in a study by Smart and Bruning (1973) which found that relevant underlining produced better recall than irrelevant underlining, and preunderlined passages produced better recall than student underlined passages. Although experimenter-generated underlining was found to be more effective than student-generated underlining, relevancy of underlined material appeared to be the factor affecting recall, rather than the person doing the underlining. It is likely that experimenter underlining contained more relevant information than student underlining. Thus, findings
neither shed light on nor refute the levels of processing theory.

Contradictory findings with regard to subject- versus experimenter-generated underlining are likely due to the training factor. Findings that supported experimenter-generated underlinings may simply be attributed to the subjects' lack of ability to discriminate between important and unimportant content. In many of these studies, students were not trained in underlining. That training is critical is supported by Rickard and August's (1975) findings that a few subjects underline everything or nothing when the amount of underlining is not controlled.

If it is assumed that the popularity of underlining is tied to the expectation of enhanced test performance, then underlining must also be seen as a mechanism for storage and retrieval of information (DiVesta & Gray, 1972). According to Glynn (1978), some form of search and selection process is involved. In classroom settings, student underlining is best thought of as two interrelated mechanisms - one of selection of important information and one of storing information for later review. Unfortunately, the conditions under which much of the research on underlining was conducted did not allow students to review the textmarkings. Because it appears that, in real classroom settings, students underline for the specific purpose of using that information to prepare
for tests, research allowing review of underlinings would shed more light on this strategy.

Conclusions. In summary, the process of text underlining is extremely complex and, thus, difficult to explore. Inconsistent findings concerning the use and effectiveness of underlining are a result of the variant procedures, subjects, and materials employed in research. However, in an examination of the limitations of this research, common elements appear. Nearly all of the studies failed to replicate natural studying conditions. Much of the research was conducted in laboratory settings in which the subjects knew they were participating in an experiment. It is doubtful that these students were sufficiently motivated to use the strategies they were taught. In many cases, training in the investigated strategy was nonexistent or insufficient, adequate time was not allowed for practice, passages were not representative of college level materials in length or type, and time constraints were imposed during the study process.

Because students use underlining more often than any other strategy, additional underlining research is warranted. Future studies should consider the limitations of previous research and attempt to examine effects in more natural conditions. Studies should be conducted in class settings, materials should be drawn from actual college texts, and passages should be as lengthy as those
encountered in college courses. Investigations of underlining effectiveness must provide for intensive training, guided practice, feedback, and review before testing. Finally, in addition to improved research on underlining effectiveness, future studies should examine what information students underline and why they do so. A greater understanding of the processes involved in underlining is needed to better train students in a strategy they already use. In short, research should capitalize on college students' directed and spontaneous underlining.

Annotation

According to Nist and Hogrebe (1987), text annotation consists of making marginal notes which cover key concepts. More specifically, annotation includes a) writing brief summaries by paraphrasing, b) enumerating multiple ideas (i.e., causes, effects, reasons, characteristics) in an organized fashion, c) putting key information on graphs and charts within the text when appropriate, d) jotting down possible questions, noting puzzling or confusing ideas in the noting possible test items, and e) using a symbol system for important information, such as an "ex." for example, or "tq." for test question (Nist & Simpson, 1988). Annotations are similar to and serve the same purposes as marginal glosses (Singer & Donlan, 1985), which are written on paper separate from the text. Little empirical research
exists concerning the effectiveness of either annotation or marginal glossing. Textmarking research has focused on underlining or highlighting, using subject- or experimenter-generated markings. Unlike underlining research, however, annotation studies reveal more consistent findings, and the more soundly designed studies indicate that annotation is an effective strategy under optimal conditions. Following is a discussion of the empirical research showing no or positive effects for annotation as well as the findings of descriptive research in this area.

Empirical research showing no effect for annotation.

Early annotation research found the strategy to be no more or less effective than other techniques (Arnold, 1942; Howe & Singer, 1975; Poppleton & Austwick, 1964). These researchers noted several possible reasons for their results: Subjects may not have processed relevant information; they may have been taking the wrong kind of notes (i.e., verbatim rather than paraphrased); or the activity may not have been related to the criterion task (Anderson & Armbruster, 1984). Most of these limitations are directly related to the training factor. It is possible that different results would have been obtained if the subjects had undergone intensive training in annotation.
More recently, one annotation study incorporating only minimal training was conducted by Harris (1990). Subjects were 67 students enrolled in four study skills classes, assigned, intact, to two treatment and two control conditions. One treatment group received annotation training, and the other received training in underlining significant ideas. Both treatment groups wrote immediate recalls after reading science and history passages. One control group did not receive strategy training but, like the treatment groups, wrote immediate recalls after reading science and history passages. The other control group read both passages without writing immediate recalls. All groups were given multiple choice pretests and posttests over the passage information and wrote delayed recalls four weeks after the initial readings.

Findings indicated significantly greater recall for both treatment groups and the control group which wrote immediate recalls, over the control group which did not write immediate recalls. However, students trained in annotation fared no better than the control group in delayed recall. Scores for the control group which did write immediate recalls were the highest of the four groups for both immediate and delayed recall. Results also indicated no significant difference in immediate recall between annotation and underlining groups. However, delayed retelling scores for the science passage were
significantly higher for the annotation group than the underlining group.

These results suggest that writing in connection with reading has a greater effect than reading alone on comprehension and retention. Findings concerning annotation and underlining are less clear. The only significant effect for annotation was greater delayed recall of the science passage over the underlining group. The difference in recall may be a result of the greater depth of processing required of annotation. However, this explanation does not account for the greater performance of the control group over annotation. It is difficult to draw conclusions about the effectiveness of annotation or underlining from these results because of two weaknesses. First, training in annotation and underlining occurred over three days, a time span insufficient for practice and feedback. Second, the science and history passages were each only 1000 words in length. It is possible that subjects found the short passages easy to memorize without annotating or underlining.

In another study showing no effect for annotation, Wade et al. (1990) analyzed spontaneous study strategies employed by 67 undergraduate students enrolled in either an introductory education or a learning skills course. The researchers collected verbal reports from the students as they studied a lengthy expository text (15 double-spaced
pages) and used cluster analysis to develop categories of spontaneous study strategies. Six clusters of studiers were identified: The good strategy user, the information organizer, the flexible reader, the text noter, the mental integrator, and the memorizer. The text noter was described as one who highlighted, underlined, copied key words, paraphrased in notes, outlined, or diagrammed (The student who annotates would best fit into this category.)

Students were asked questions about the passage after reading. Results of the immediate recall test indicated no significant difference between the six types of studiers in the amount of information recalled. However, because no training in strategies was provided, conclusions about the effectiveness of annotation should not be drawn.

**Empirical research showing positive effects for annotation.** Little empirical annotation research has been conducted. Only seven studies, two of which have been previously discussed and showed no effect, were found. The other five studies, however, support the effectiveness of annotation.

Findings from two studies involving intact classes of college developmental reading students showed a positive relation between annotation and test performance. In the first study, Nist, Simpson, and Olejnik (1985) found that, of five major study variables (annotating/underlining, recitation strategies, vocabulary, planning for tests, and
lecture note format and content), annotating/underlining was consistently more highly correlated with test performance than any other variable. In addition, when the six variables were entered into a step-wise regression model, annotating/underlining was the only significant variable.

In the second, related study, college developmental reading students, when given a choice of strategies for test preparation, opted for more elaborative strategies such as annotation and executive control (a strategy which combines planning, monitoring, and evaluating learning) (Nist, Simpson, Olejnik, & Mealey, in press). Although both of these strategies were significantly positively correlated with test performance, executive control, which allowed for the use of varied, appropriate strategies, was more highly correlated with test performance than annotation. Because executive control may include the use of annotation, however, these results appear to support the moderate relation between annotation and test performance.

Additional support for annotation was found in a study which showed that text material which had been underlined and annotated by the experimenters had a strong influence on directing the students' attention to specific parts of the text (Nist & Hogrebe, 1985). Subjects were 67 college developmental freshmen, equivalent on high school grade point average and Scholastic Achievement Test-verbal score
variables, who were assigned to one of five groups: (a) high relevant experimenter-generated underlining; (b) high relevant experimenter-generated underlining and annotating; (c) low relevant experimenter-generated underlining; (d) low relevant experimenter-generated underlining and annotating; or (e) control situation in which students generated their own text marking. The passage used for this experiment was a 2,200-word excerpt from an introductory, college-level text. Students were given 40 minutes to read and interact with the material in preparation for a 24-item multiple-choice test. The following day, all subjects were allowed to review their materials for ten minutes before taking the test.

Although annotation did not increase text performance over underlining alone, results did show that subjects in the high-relevant condition answered more high-relevant questions correctly and low-relevant subjects answered more low-relevant questions correctly. This finding supports the use of annotation but offers no insight as to how student-generated annotation might improve comprehension and recall. A study in which students are trained how to underline and annotate would clarify the role of this strategy.

A fourth empirical study compared the effects of annotation and journal writing on test performance with regards to narrative text (Hynd, Simpson, & Chase, 1990).
Forty-six college developmental reading students received intensive training in annotating narrative text and journal writing, using 4,000-word excerpts from novels representative of those commonly required in college English courses. However, students' motivation level was low, and data analysis revealed that students' annotations were of low quantity and poor quality. The number of annotations and sections marked was relatively low, and more literal level than inferential level annotations were written. These findings are not surprising in view of the fact that the students were under pressure to do well on the upcoming final exam, which was not related to the experiment.

In spite of students' low motivation and low competency in annotation, annotation tended to be more effective for multiple-choice items than essays. Although this study supports the use of annotation for objective tests on narrative text, it appears that a much stronger case could have been made if the students had been motivated and trained under more naturalistic conditions, and were not distracted by other academically demanding events (i.e., final exam). It is also unclear whether the amount of time spent studying or the use of annotation alone created the effect because students in the annotation group reported that they studied longer than students in the journal writing group.
In a final empirical study, the effects of textbook annotation and preview questioning techniques were compared (Simpson & Nist, 1990). In this research, subjects were 60 students enrolled in four college developmental reading classes. Two classes were randomly assigned to annotation treatment, and two classes were randomly assigned to preview-question treatment. There were 15 students in each of the four classes, or 30 students in each group. Each group of students received intensive training, including motivation activities, strategy explanation and rationale, strategy talk-through, guided practice activities with student questions and verbal feedback, and independent practice with written feedback. Training took place over a period of three weeks. The materials used were short passages (500-1,000 words) for guided practice, and lengthier passages (3,000-word excerpts) for data analyses. The passages were drawn from history, sociology, and psychology texts, content areas typically encountered by college students during their freshman year. Researchers gathered all excerpts and study materials to determine whether the students in the two groups used annotation or preview-questions as instructed. At the end of three weeks, the subjects took a 20-item multiple-choice test, 60% of which was comprised of memory level questions and 40% higher level questions that required synthesis or application of concepts to new contexts. Students were
also asked to keep records of their studying time and reported this information on the answer sheet.

Results of this study indicated that the annotation group, which maintained test scores that fell in the B/C range, performed statistically better than the preview-question group, which had scores that fell in the C/D range. The annotation group was also more efficient in learning as indicated by the significantly lesser amount of time this group spent in studying the information than the preview-question group. These results lead to the conclusion that students receiving intensive training in annotation will perform more efficiently and effectively than students who receive no training.

One limitation of this study was the relatively short interval between annotating the excerpts and test administration. Students were given less than a week to annotate each excerpt and two days to prepare for each test. Over a period of three weeks, the students annotated and were tested on all three excerpts. The short time allowed for interaction with text and short interval between annotation and testing does not simulate conditions encountered in college courses. Students are often tested on material covered over a six- to seven-week time span. However, the short interval between annotation and testing may have been necessary to control for the interference of other variables. Students may have used other strategies
such as outlining or rereading if given several weeks to prepare for the test. These results are interesting in light of the previous study, in which students reported spending more time studying than the comparison group. Further research is needed to clarify the role of the amount of time spent studying in strategy effectiveness.

This particular study represents the most methodologically sound research conducted on annotation to date. The use of lengthy passages extracted from typical college level textbooks and subjects who were motivated to perform because they were enrolled in an existing college developmental course increases generalizability of findings. The natural classroom setting of this study allowed for the intensive training and explanation of rationale for strategy use valuable in any attempt to investigate the effectiveness of a study strategy.

**Descriptive research.** In addition to empirical research, several descriptive studies support annotation. Eanet and Manzo (1976) encouraged the use of annotation as outlined in their REAP strategy, which includes reading, encoding, annotating, and pondering. Their support for annotation was based on data gathered from anecdotal and personal experiences with the procedure. More recently, Nist (1987) noted that learning strategy students report that, of all the strategies taught in the developmental reading course, annotating and underlining had the most
transfer to outside courses, appeal, and practical application. Mealey, Frazier, and Duchein (1990) also reported that annotation is a preferred strategy of college developmental reading students, who reported that they would use the strategy in other courses.

Conclusions. On the whole, research supports annotation as an effective strategy, given that students are well-trained, have opportunity for practice, feedback, and review, and are motivated. These conditions are ideally met in the classroom situation where students are motivated to learn and use strategies effectively in order to exit from the course.

Studies which did not find annotation effective had one serious limitation in common: Subjects were provided insufficient or no training. Good training, which includes rationale for strategy use as well as direct explanation of the strategy and provides opportunity for practice, feedback, and review, is essential in any investigation of the effectiveness of a study strategy. The training factor was largely ignored in earlier research (e.g., Arnold, 1942; Howe & Singer, 1975; Poppleton & Austwick, 1964) and only included minimally (Harris, 1990), or not at all (Wade et al., 1990) in more recent research.

On the other hand, studies finding a positive effect for annotation were, for the most part, conducted in situations which allowed for intensive training. Their
main limitation was the failure to replicate natural studying conditions: Nist and Hogrebe's study (1985) investigated experimenter-generated annotations; Simpson and Nist (1990) did not allow for a sufficient time interval between annotating and testing; and Hynd, Simpson, and Chase (1990) allowed for a distracting situation for the subjects. In real classroom situations, students mark their own text, have more time to study marked material, and are generally motivated to study in order to perform well on an exam. Interpretation of findings from research not including these conditions must consider threats to external validity (i.e., representativeness of research situation) as well as internal validity (i.e., effects of history). In spite of the limitations of these studies, positive effects for annotation were found. Studies which control for these weaknesses are needed, however, to provide more information about the effectiveness of student-generated annotations and the roles of motivation and time spent annotating and reviewing annotations. Given that annotation is an effective strategy, future research should also investigate if and how students will transfer the strategy when trained.

Unlike the findings of underlining research, the majority of annotation research has revealed positive effects. Although the reasons for this are not clear, it is possible that greater effects for annotation are related
to the depth of processing theory. Annotation, which involves marking text and writing summaries, requires greater depth of processing than merely underlining. As other researchers pointed out (Anderson & Armbruster, 1984; Nist & Simpson, 1987), it may not necessarily be the strategy itself but rather the specific elements of the strategy (i.e., elaboration and active recitation) that cause improved performance.

Future research should focus on examining whether students will actually transfer annotation to content areas outside of the required study strategy, given that students can be trained to use annotation effectively. Although no research on the transfer of textmarking was found, Nist and Simpson (1987) reported that students who exited from their developmental reading program over the past five years consistently demonstrated success in their regular college coursework, as evidenced by grade point average in content area courses in which they were tracked. Research providing information as to what best encourages and promotes transfer of effective annotation is needed.

Transfer

Transfer of learning has long been a topic of theoretical and practical interest to those involved in instructional psychology, motor learning, industrial settings, military training, and education. Much research has been conducted in these specific areas, particularly in
psychology. The following review, however, focuses on research examining classroom instruction and the transfer of study strategies. Specifically, research examining strategy transfer among adults and the effects of direct explanation with an emphasis on the component of strategy utility is discussed.

**Strategy Transfer Among Adults**

Although much research has examined short- and long-term retention of factual knowledge, few studies have dealt with older students' transfer of strategies that facilitate comprehension and retention. In a study on vocabulary acquisition (Pressley & Dennis-Rounds, 1980), results indicated that spontaneous transfer of the keyword strategy was more likely in older adults than children. Both 18-year-old and 12-year-old subjects were randomly assigned to four groups, a complete-instruction, general-instruction, and no-instruction group, and a control group. Experimental conditions subjects were instructed to learn a list of cities paired with their products via a mnemonic keyword strategy, and control subjects were simply instructed to learn the pairs. In experimental groups, subjects were completely instructed in use of the keyword method. In the complete-instruction condition, detailed instructions on applying the keyword strategy to the learning of Latin words were given. In the general-instruction condition, subjects were told to use a
technique similar to the one they used to learn the cities and what they were known for. In the no-instruction and control conditions, subjects were instructed to try to remember what each Latin word meant. All subjects were then given a list of Latin nouns and their translations to learn.

Results indicated that spontaneous transfer of the keyword strategy was demonstrated by 18-year-olds in contrast to 12-year-olds who transferred the keyword strategy to new situations only when instructed to use a technique similar to the one used in the initial learning situation. In addition, across both age levels, subjects in the complete-instruction condition performed better than subjects in the other three conditions. These results suggest that spontaneous strategy use may be more likely among older students than younger students and support direct instruction in strategy training.

These findings have direct implications for learning strategy courses. First, given the finding that spontaneous transfer was more likely in older learners, it seems likely that college students would transfer learned strategies to outside courses. Also, the finding that the complete-instruction condition had the greatest influence on transfer supports the greater probability of transfer when explicit instruction, feedback, and practice of strategies is incorporated in training. To examine what
best promotes transfer, future research should examine why and how strategies are used when strategy instruction includes these components.

Directed and spontaneous transfer among college students was also examined by Gick and Holyoak (1980). In this study, the researchers provided subjects with a story analogy, describing a problem and its solution and then observed how subjects used the analogy in solving a subsequent target problem. Because the purpose of the study was to examine the process by which subjects used analogies between remote domains to generate solutions to problems, the initial story analogy involved the medical domain, and a series of stories far removed from the medical domain, involving military problems and solutions, were used. Results indicated that 75% of subjects who first read the story about a medical problem and its solution tended to construct analogous solutions to a military problem, provided they were given a hint to use the story to solve the problem. When the problem presented in the military story was substantially disanalogous to the medical problem, however, transfer frequency decreased. Frequency of analogous solutions also decreased markedly when no hint to consider the original story was offered; only 30% of students generated analogous solutions. These results, unlike those obtained in the study by Pressley and Dennis-Rounds (1980), indicate that transfer of learned
strategies in novel situations is more likely to occur when students are prompted and when the novel task is analogous to the original one.

These findings are supported by other research which suggests that uninformed transfer (transfer of knowledge without a hint from the experimenter to inform the subject of its relevance) was invariably poor (Gick & Holyoak, 1983; Reed, Ernst, & Banerji, 1974). In these studies, a single training problem was presented, either as a problem to be solved by the subject or in the form of a story, followed by a superficially different but analogous transfer problem. These studies and the previous study by Gick and Holyoak (1980) strongly suggest that transfer is best promoted when students are directed to use the learned strategy in situations similar to the original training task. These findings further indicate that college students enrolled in learning strategy courses should be encouraged to transfer learned strategies to outside content courses. Thus, future research should investigate the area of directed transfer of learning strategies.

Other research by Gick and Holyoak (1983) has shown that fairly high levels of spontaneous transfer can be obtained under certain conditions. A high frequency of spontaneous transfer was found among undergraduates when circumstances allowed for training conditions that established generalized rules directly applicable to the
transfer task, along with at least two specific examples. Subjects were asked to solve a radiation problem after comparing two situations involving a military problem and a fire fighting problem. The researchers explained that the use of two source analogues fostered abstraction of a generalized schema for problem solving and, thus, contributed to spontaneous transfer. These results further support direct instruction in learning strategies courses, including the provision for application of strategies to specific examples. Transfer of textmarking, for example, should be greater when initial training conditions include material from textbooks similar to those encountered in college courses.

Gick (1985) and Holyoak and Koh (1987) found that another type of situation conducive to transfer involves the retrieval process. Even when only one prior example was provided, it was likely to be retrieved and applied if subjects perceived it to be highly similar to the transfer problem. In the first study, Gick (1985) included identical diagrams in both the initial problem-solving session and the subsequent transfer problem and obtained considerable uninformed transfer. In the second study, Holyoak and Koh (1987) used a story analogue and a problem situation which had common elements. Over 80% spontaneous transfer occurred after an interval of several days between presentation of the story and the transfer problem. Such a
high rate of spontaneous transfer appeared to be the effects of the salient common elements of both the story analogue and the transfer situation.

These results, like those of the previously discussed research, emphasize the need for students to see the similarity between initial training and subsequent transfer situations. More specifically, developmental reading students must relate the use of strategies in their content area courses to strategy use in the initial condition in the learning strategies course. This is best accomplished when materials from college content courses are used in initial training.

Additional transfer research was conducted by Bender (1986) who examined the effects of vocalization of reasoning, a self-monitoring technique, on the transfer of problem-solving. Subjects included 96 undergraduates assigned to one of four groups composed of vocalizing or nonvocalizing pairs or individuals. Individual and group monitoring in the learning session were promoted through vocalization of reasoning and working with a partner. Subjects solved four complete concept learning problems in the initial learning session and 48 hours later in the delayed transfer session. Results indicated that individual self-monitoring during initial problem solving was found to improve transfer of problem-solving skills. These results suggest that inducing self-monitoring during
learning may lead to a maintenance of the improved performance in later problem solving. Such findings support the need for learning strategy courses to include training in metacognition.

In summary, strategy transfer research has been conducted under a variety of conditions. Several factors have been found to enhance strategy transfer in adults: a) direct instruction in strategy use, b) encouragement to transfer strategy use, c) perception of similarity of the transfer situation to the initial training situation, and d) training in self-monitoring.

Direct explanation, which provides very explicit and detailed information about how and under what conditions specific strategies should be used, includes all of these factors. The following discussion focuses on research examining the effects of direct explanation on strategy transfer. Studies involving both children and adults are included.

Direct Explanation

Direct explanation usually includes concrete examples, modeling, guided practice, feedback, and "informed instruction" (Brown et al., 1983). Pressley et al. (1987) contended that if broad generalization of a procedure leading to transfer is to occur, specific strategy knowledge is necessary. This idea is consistent with the metacognitive theoretical point that knowledge of how,
when, and why to use a strategy is required for
generalization or development of a schema for strategies
(e.g., Brown et al., 1983; Pressley, Borkowski, &
O'Sullivan, 1984).

Experimental research by Roehler et al. (1986) showed
that direct explanations in the classroom had general
effects on elementary students' cognitions and
performances. In this study, ten third-grade teachers who
were taught to make direct explanations during the
instruction of reading processes and strategies were
compared with ten third-grade teachers who were taught
general classroom management skills. The teachers and
their students were monitored over the course of a school
year. At the end of the year, students taught by direct
explanation teachers were more aware of lesson content and
of the strategic nature of reading than were students
taught by teachers in the management-training condition,
and students in the former group outperformed the second
group on several reading tasks, including standardized
reading achievement tests. These results are consistent
with earlier findings by Duffy et al. (1984).

Findings of the direct explanation research discussed
here are consistent with findings of the previously
discussed transfer research, which revealed direct
instruction (Winograd & Hare, 1988), a particular aspect of
direct explanation, to be a strong factor influencing
strategy transfer. Students are more likely to transfer strategies when they have detailed information about how and when to use them. Research has also revealed that transfer is more likely when students are aware of the purpose and benefits of the strategy and perceive strategies to be effective (e.g., Duffy et. al, 1984). This aspect of direct explanation is known as the concept of strategy utility.

Strategy utility or informed instruction (Brown et al., 1983) has been found to positively affect strategy transfer. A great deal of research supports the idea that subjects who understand a strategy's benefits to a particular aspect of performance will be motivated to use that strategy. In several studies, strategy use increased when utility information was included as part of strategy instruction (e.g., Black & Rollins, 1982; Lawson & Fuelop, 1980; Ringel & Springer, 1980). In more recent studies, memory strategies were shown to be maintained and generalized when children evaluated them as important and appropriate (Fabricius & Hagen, 1984; O'Sullivan & Pressley, 1984; Paris, Newman, & McVey, 1982). Schunk and Rice (1987) also found that children were more likely to adopt strategies for finding the main idea when they understood the utility of the strategy and their own ability to use it. In addition, studies involving adults show positive effects of utility instruction on strategy
transfer (Lewis & Anderson, 1985; Pressley, Levin, & Ghatala, 1984; Pressley, Ross, Levin, & Ghatala, 1984). In sum, it seems essential that learners recognize that their performance is better when they use a strategy than when they do not and attribute their improvement in performance to the use of the strategy.

Conclusions

Relatively few studies have been conducted on strategy transfer among college students, but the extant research does provide direction for future investigations. Overall, it appears that spontaneous transfer is more likely to occur when training conditions include generalized rules directly applicable to the transfer task, specific examples of the transfer task, and adequate similarity between the initial training condition and the transfer condition. Further, findings indicate the need for strategy training to emphasize direct explanation, including strategy utility and the development of self-monitoring skills.

Although research in strategy transfer has provided valuable insight into this area, most studies failed to investigate transfer of effects from experimental settings to natural settings. However, retention and transfer of learning are major goals of learning strategy courses. Bigge (1976) pointed out that a theory of learning which influences teaching approaches is really a theory of transfer of learning. If students simply use strategies
during their learning strategies courses and fail to use them in other similar situations, then training in strategies is of little value.

The need for transfer research is further noted by Pressley, Lysynchuk, D'ailly, Smith, and Cake (1989), who evaluated the methodological adequacy of 32 experimental studies of reading comprehension strategies. Findings revealed that one of the main weaknesses of these studies was the failure to examine long-term effects of transfer of strategy instruction. Only three of the 37 studies examined assessed transfer of newly learned reading comprehension strategies to school subjects or materials other than those encountered during training. The authors contended that this research is directly influencing reading instruction and strongly suggested that future studies include more process measures. Other researchers earlier pointed out that conclusions about instructional effects can be made with greater confidence when the kind of processing that occurs in each condition is documented (e.g., Belmont & Butterfield, 1977).

In conclusion, few studies have examined strategy transfer in natural settings or the processes involved in strategy use and transfer. This study, therefore, investigated college developmental readers' transfer of annotation under the following conditions: (a) the natural setting of a college developmental reading class in which
students must perform successfully in order to exit from
the course, (b) students' concurrent enrollment in a
regular college-level course, (c) the use of lengthy,
college-level, expository text, (d) provision for explicit
training in strategy use, including direct explanation and
utility instruction, and (e) provision for semester-long
practice and feedback.
REFERENCES


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APPENDIX C
DATA SHEET
DATA SHEET

FULL NAME_________________________PREFERRED NAME____________________

STUDENT ID NUMBER_________________________AGE_____________________

LOCAL/CAMPUS ADDRESS______________________________________________

AND PHONE NUMBER

______________________________________________________________

HIGH SCHOOL_____________________________________________________

HIGH SCHOOL GPA________ACT COMPOSITE_________________________

HAVE YOU EVER TAKEN EDCI 0010 OR 0011 BEFORE? YES NO

IF SO, WHEN AND WITH WHOM?_____________________________________

DO YOU HAVE A JOB? YES NO

IF SO, WHAT IS YOUR SCHEDULE?

MON_______TUE______WED______THU______FRI______SAT______SUN_____

DO YOU HAVE ANY OTHER EXTRACURRICULAR OBLIGATIONS? YES NO

IF SO, WHAT?_____________________________________________________

PLEASE LIST YOUR SPRING SEMESTER SCHEDULE BELOW:

COURSE     DAYS     TIME     INSTRUCTOR


APPENDIX D

DESCRIPTION OF STUDY
DESCRIPTION OF STUDY

To students enrolled in Biology 1001:

Please respond to the following questions:

1) Name:

2) Local address/phone number:

3) In what section number of Biology 1001 are you enrolled?

4) What time does it meet?

5) Who is your instructor?

6) What textbook are you using?

7) Is your copy new or used?

8) Have you bought it yet?

As you may have heard, Biology 1001 has the reputation on campus of being one of the most difficult courses for students.

This semester, we are conducting a research project on annotation and study strategies. Only some students meet the criteria for participating in this project, and you are one of the lucky chosen! In order to participate, you must be willing to do two things: (1) give a little time every two to three weeks this semester to meet with us for short discussions about your work in both developmental reading and Biology 1001; and (2) annotate your biology textbook and use study strategies for studying and test preparation in that class.

In return, we will give you feedback on your annotations and strategies which should help your grade in biology. In addition, your cooperation and participation will earn you extra credit in developmental reading.

Are you willing to participate in this project?

Thank you,

Donna Mealey
Deidra Frazier
Tim Host
APPENDIX E

COURSE EVALUATION FORM
COURSE EVALUATION FORM

Please do not write on this form. On the scantron sheet, record the following information: course and section number, semester and year, and instructor's name. Then respond to the questions listed below, using the following scale:

1-poor  2-below average  3-average  4-good  5-very good

1. Objectives for the course were appropriately communicated.

2. Concepts and topics were adequately explained.

3. In-class and outside activities helped to achieve the course objectives.

4. Class time was efficiently used for instruction.

5. Teaching materials and aids were pertinent and effectively used.

6. Assignments and tests reflected the course content.

7. The basis for the course grade reflected a good balance among tests, papers, etc.

8. The instructor was well-prepared with current information.

9. The instructor was enthusiastic about the subject.

10. The instructor was cordial, courteous, and showed a sense of humor.

11. The instructor encouraged students to ask questions and participate in discussion.

12. The instructor was receptive to student ideas and opinions.

13. The instructor was willing to provide outside help and guidance.

14. Considering content, instruction, and assignments, give an overall course rating.

15. Please rate the teaching ability of this instructor.

Please write comments on the blank paper provided. Thank you!
APPENDIX F

INSTRUCTIONS TO PANEL OF EXPERTS
INSTRUCTIONS TO PANEL OF EXPERTS

Directions for annotating Biology 1001

Include the following in your annotations:

1) Write brief summaries in the text margins using your own words.

2) Enumerate multiple ideas (i.e., causes, effects, characteristics)

3) Note examples of concepts in the margin by writing "ex."

4) Note puzzling or confusing ideas with a question mark in the margin.

5) Do not neglect to annotate graphic aids.

6) Do not underline information without annotating it.
APPENDIX G

ANNOTATION CHECKLIST
ANNOTATION CHECKLIST

___ Your annotations are excellent. Keep up the good work.

___ You have missed many key ideas. I have starred them for you. Please go back and annotate them.

___ You need to put your annotations in your own words--do not copy from the book.

___ You need to be briefer in your annotations. Be telegraphic.

___ You have ignored the graphic aids. Annotate them.

___ You need to note the specific examples--they could reappear on the exam.

___ You need to enumerate the specific facts, characteristics, causes, events, etc., in the margin.

___ Your annotations need to focus more on key ideas and less on details.

___ You are annotating too much--it will take you forever to do a chapter!

___ You are underlining too much--work more on writing your summaries in the margin.

___ You need to develop some symbols of your own and use them.

___ You need to develop a method for organizing your annotations.

___ Please annotate these sections or pages again.

  p._____ p._____
  p._____ p._____  

___ Please see me during my office hours for special assistance on this chapter and your annotations.

Comments:
APPENDIX H

INTERVIEWS - DEVELOPMENTAL READING INSTRUCTORS

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INTERVIEWS - DEVELOPMENTAL READING INSTRUCTORS

Interview Number 1
1. What kind of student is _______?
2. How is he/she doing with his/her annotations?
3. What did he/she make on the first exam?
4. Do you expect him/her to exit from the course?

Interview Numbers 2 and 3
1. How is ______ doing in developmental reading?
2. Is he/she making progress?
3. How is he/she doing with annotations?
4. Has he/she changed with regards to attitude or performance in developmental reading?
5. What are his/her grades on annotation homework assignments and exams for developmental reading?
6. Do you still expect this student to exit from this course?

Interview Number 4
1. How has _______ performed in developmental reading?
2. What are his/her grades on annotation homework assignments and exams for developmental reading?
3. Has he/she changed over the semester? How?
4. Has he/she mastered strategy use? annotation? What problems do you think he/she had? How has he/she changed? Why?
5. Do you think ______ is or will transfer strategy use to other courses? What makes you think this?
6. Did _______ exit from the course? If no, why not?
APPENDIX I

INTERVIEW - BIOLOGY 1001 INSTRUCTORS
INTERVIEW - BIOLOGY 1001 INSTRUCTORS

1. Are the textbooks for Biology 1001 the same across sections?
   text course objectives?
   assignments?
   reading requirements?
   exams?

2. About what percentage of the exams will be based on the text?
   On what is the remaining percentage based?
   What is the format of your exams?

3. Do you make references to the text during class lectures?

4. Do your lecture notes repeat, reinforce, or build upon the text?

5. How important do you feel reading the text is in order to pass the course?

6. Did you recommend that your students buy the study guide that goes along with the text?

7. Do you ever suggest study strategies that might help students succeed in the course?
   If so, what strategies do you suggest? Why?
APPENDIX J

INSTRUCTIONS TO PARTICIPANTS
INSTRUCTIONS TO PARTICIPANTS

1. Annotate all of your reading assignments for Biology 1001, beginning Jan. 31. (You do not have to go back and annotate material read prior to our first meeting).

2. Annotate everything in black ink.

3. Date all annotations.

4. Record how much time it took you to read and annotate each section. Write the time in your text.

Our next meeting will be _________________ in 305 Peabody.

Bring the following to this meeting:

1. Your biology textbook.

2. Any homework assignments you had in your developmental reading class pertaining to annotation.

3. Any notes, materials, or study aids that you are using in your biology class.

*** If you cannot meet with us at this time, please call so that we can reschedule.

Deidra Frazier 388-6807 (office)  Donna Mealey 388-2325
774-3536 (home)

-----------------------------------------------
Tear off this portion and give to your instructor.

*** Approximately what pages of the textbook do you plan to have read and annotated by our next meeting?

This information is important. We will be annotating the same material that you annotate and want to have this material annotated in advance.

Circle one  YES -- I can meet at this time.

NO -- I will call to reschedule.
APPENDIX K
JOURNAL ASSIGNMENTS
Journal Assignment Number 1

Write a journal which focuses on how you view yourself as a learner. More specifically, discuss:

1) your attitude (i.e., how important is learning to you? What do you see yourself doing in 5 years and how do you plan to reach your goal(s)? Is college worthwhile for you? Why or why not?)

2) your motivation (i.e., are you willing to work hard? Are you self-disciplined? Are you self-motivated or do you need someone to push you?)

3) your ability to manage time (i.e., do you stay current in assignments?)

4) your anxiety level (i.e., do you worry about grades? Do you freeze on tests?)

5) your concentration (i.e., can you focus on academic tasks?)

6) your ability to apply what you already know to a new situation or to new information.

7) your ability to pick out important information from text

8) your ability to use study techniques and prepare for tests (i.e., what are your studying strengths and weaknesses? How do you prepare for tests? What techniques do you use?)
Journal Assignment Number 2

Now that you have taken your first exam in EDCI 0011, describe the experience. More specifically, address the following:

How did you prepare for the exam? What strategies did you use? Why? Which ones were helpful? Less helpful? Why? How many hours did you put in for reading and annotating, strategy construction, and study and rehearsal? Were these hours massed or distributed? Did you work alone or with a partner or group? Where did you study? Were there any distractions?

What is your opinion of the test in terms of ease/difficulty, length, types of questions? When you finished the test, what grade did you predict you would earn?

What grade did you earn? What types of questions did you miss? Why? Will you change your study plan and approach for the next test? If so, how? If not, why not?

Journal Assignment Number 3

Midterm Evaluation Journal

Now that you are halfway through the semester, take a good look at yourself as a learner. In essay format, please respond to the following in terms of EDCI 0011 AND any other courses you are taking this semester:

Overall, are you happy with the way things are going for you, academically? Discuss your attitude, motivation, ability to concentrate, and anxiety (if appropriate), as well as time management, study and test preparation strategies, and writing ability in all of your courses. What have you learned, both positive and negative, about yourself as a student?
Journal Assignment Number 4

Now that the semester is almost over, please evaluate yourself as a learner. More specifically, see if you have changed in the following areas since the beginning of the semester:

-- Your attitude toward learning (has it changed this semester? How important is learning to you? Is college worthwhile for you? Why or why not?). What about your motivation (has it changed? specifically, self-discipline)?

-- Your ability to manage time for schoolwork (any better or worse at this?). How is your concentration while reading/studying? (has it improved, stayed the same, or gone down hill since the beginning of the semester?) What is your anxiety level? (has it increased/decreased/stayed the same? Think about grades, tests, finishing school)

-- Your ability to apply what you already know to a new situation or to new information

-- Your ability to pick out important information from text—especially address the following:

Do you feel that annotation is a good strategy to use? Why or why not? Do you feel that annotation helps you comprehend while reading? Do you feel that annotation helps you recall information for exams? How do you use your annotations when studying? Did you have any difficulty annotating assigned chapters? What kinds of difficulties? Did you improve over the semester? Did you find that annotating was different for different subject areas (history, biology, psychology)? Did you adjust the way you annotated for these different areas? If so, how? Did you annotate texts for OTHER courses? Why—for extra credit in EDCI 0011? other reasons? If not, why not? Do you plan to use annotations as a strategy in the future? In all subjects or just particular ones? Which ones?

-- Your ability to use study techniques (besides annotating) and prepare for tests (how have you changed in this area? Do the strategies help you? Do you think you can do them on your own? WILL you do them on your own? What strategies did you like the most? least? Did you use any of the strategies in OTHER courses this semester—why or why not?
VITA

Deidra W. Frazier received her Bachelor of Science in Psychology in 1974, her Master of Arts in Education in 1989, and her Doctor of Philosophy in 1991 from Louisiana State University. Her major was Reading Education.

In addition, she taught in elementary grades for five years and secondary grades for seven years. She is currently an instructor at Louisiana State University where she teaches reading education courses.
Candidate: DEIDRA WILLIAMS FRAZIER

Major Field: EDUCATION

Title of Dissertation: DIRECTED AND SPONTANEOUS TRANSFER OF COLLEGE DEVELOPMENTAL READING STUDENTS' TEXTMARKING STRATEGIES

Approved:

[Signature]
Major Professor and Chairman

[Signature]
Dean of the Graduate School

EXAMINING COMMITTEE:

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Date of Examination:

JUNE 28, 1991