Learning from Text: Reflections on the Past and Suggestions for the Future

SUSAN R. GOLDMAN
Vanderbilt University

3 0081 027 620 198
VANDERBILT UNIVERSITY

A great deal of progress has been made toward understanding the cognitive processes involved in learning from text. The findings suggest ways to improve learning by enhancing the coherence of texts and the strategies learners use when reading to learn. For the most part, the cognitive research has focused on an individual interacting with a single text, consistent with many traditional educational settings. However, current economic and social trends have revitalized educational reform efforts that emphasize active knowledge construction by the learner and the development of critical thinking, problem solving, and collaborative learning skills. Classrooms organized to support these kinds of learning activities raise a number of new issues for discourse processing research and redirect several current areas of research. A primary goal of this article is to illustrate and discuss these issues.

Over the 20 year history of the journal *Discourse Processes* a great deal of progress has been made toward understanding the cognitive processes involved in learning from text. For the most part, these processes have been studied from the standpoint of an individual interacting with a single text. Such studies contribute to theories of representation, memory, and learning. The findings suggest ways to improve learning by enhancing the coherence of texts and the strategies learners use when reading to learn. This body of work is highly relevant to traditional classroom settings in which students individually read and complete fact-finding or fact-learning tasks.

At the same time, classrooms are organized social settings. Sociolinguistic research reported in this journal, and elsewhere, has revealed important mecha-

Direct all correspondence to: Susan R. Goldman, Vanderbilt University, Box 45 Peabody, Nashville, TN 37203 <GoldmanS@ctrvax.vanderbilt.edu>.

Discourse Processes, 23, 357–398 (1997)
ISSN 0163-853X

©1997 Ablex Publishing Corporation
All rights of reproduction in any form reserved.

nisms of conversational interaction. This research has provided detailed analyses of how teachers and students adopt, adapt, and use language to accomplish a variety of goals in classrooms (Cazden, 1988; Green & Harker, 1988; Green & Wallat, 1981). A consistent finding is that teacher talk dominates interactions in traditional classrooms (Cazden, 1986).

Thus, extant cognitive discourse processing and sociolinguistic research address important learning phenomena in traditional classrooms. However, economic and social developments indicate that traditional classrooms are not preparing students with the literacy and learning skills needed for success in the 21st century (Berryman, 1993; Wise, 1996). Businesses are reorganizing management and operations to emphasize team work and collaboration (Senge, 1990). Economic projections are that much of the workforce will change careers, as well as jobs, several times over their lifetimes (Graham, 1997; Murnane & Levy, 1996a). The challenges posed by these trends in the business world increase the importance of literacy and learning-to-learn skills.

Perhaps the most profound societal change is technological. Ubiquitous electronic systems for information storage and retrieval, coupled with the increasing availability of the Internet, are redefining literacy requirements for the 21st century. Conversations can now take place "on-line," sometimes synchronously and sometimes asynchronously (Goldman, 1996; Scardamalia, Bereiter, McLean, Swallow & Woodruff, 1989). Increasingly, successful information search and retrieval involves coordinating multiple sources of information that often have pointers to other texts and graphics. Navigation through such multiply linked texts and graphics can be quite complex. Recent edited books by Rouet, Levonen, Dillon, and Spiro (1996) and by van Oostendorp and de Mul (1996) contain discussions of the kinds of literacy and learning issues that are emerging in these electronic contexts. These issues reflect major shifts in the literacy skills that are needed for students to be successful learners.

The foregoing trends have revitalized educational reform efforts that emphasize active knowledge construction by the learner and the development of critical thinking, problem solving, and collaborative learning skills (cf. Bransford, Goldman & Vye, 1991; Resnick & Klopher, 1989). Classrooms organized to support these kinds of learning activities raise a number of new issues for discourse processing research and redirect several current areas of research. A primary goal of this article is to illustrate and discuss these issues.

I became aware of the importance of these new issues through my involvement in some formative experiences over the past several years. In 1993 with funding from the James S. McDonnell Foundation, I became part of a collaborative project called Schools for Thought (SFT) after a book by the same name, authored by John Bruer (1993). The initial group of collaborators on this project included Carl Bereiter, John Bransford, Ann Brown, Joseph Campione, Mary Lamon, Marlene

Scardamalia, and myself. The design principles of SFT are heavily influenced by constructivist and social constructivist views of learning (Bransford, 1979; A. Brown & Campione, 1994, 1996; J. Brown, Collins & Duguid, 1989; Cobb, 1994; Cobb, Yackel & Wood, 1992; Cognition & Technology Group at Vanderbilt, 1990; Collins, Brown & Larkin, 1980; Scardamalia & Bereiter, 1991a).

SFT is a member of a family of educational reforms that are consistent in spirit with Dewey's (1913, 1933) ideas of progressive education, but they benefit from work since then on cognitive and social principles of learning. In these kinds of classrooms, children are confronted with learning-from-text "problems" of a different magnitude than I had been studying in more laboratory-like settings. These include, for example, information search processes across multiple sources, synthesizing information across multiple texts, learning material sufficiently to be able to explain it to one's peers who have not read the material, and interacting in small groups about the meaning of text and solutions to problems.

Observations occurring in the context of another project reinforced the importance of investigating the use of many texts by groups of students. A group of us at the Learning Technology Center (Barron, Schwartz, Vye, Bransford, Moore, Petrosino & CTGV, 1996; Barron, Vye, Zech, Schwartz, Bransford, Goldman, Pellegrino, Morris, Garrison & Kantor, 1995; Barron, Vye, Goldman, Pellegrino & the Cognition and Technology Group at Vanderbilt (CTGV), 1995) have been working on the Scientific and Mathematical Arenas for Refining Thinking (SMART) project to develop alternative assessment models in science and mathematics. Our focus has been on classroom-based, formative assessment. Two aspects of the work on SMART are particularly relevant in the present context. First, the SMART model involves two major phases: a problem-based phase followed by a project-based phase. During the problem-based phase, students work on relatively well-specified but complex problems that help students learn the skills needed to conduct related project-based activities (Barron et al., 1996). Second, the implementation of the model involves students reading and evaluating the information presented in a number of texts so they can choose appropriate tools for completing their problem solutions and projects. An example of students working with catalogs is provided below (third section). In brief, we have observed that the coordination of information present in multiple texts is a significant challenge for many 11 and 12 year olds. Constructing reasoned, evidence-based explanations for their selections is equally challenging.

I began to think about ways to investigate the processes involved in learning from text in SFT and SMART contexts. It was clear that the research was best conducted in the classroom contexts where the learning was occurring. As I pursue this research agenda, I find myself rethinking some of the classic findings in the field of discourse processing and generating new issues for investigation.

Both cognitive and sociolinguistic perspectives are informing my research approach.

The remainder of this article is organized into three sections. The first section consists of a brief sketch of major research findings in cognitive discourse processing research on learning from text. For the most part I focus on expository materials. A number of excellent and recent handbook chapters and review articles provide elaboration and additional discussion of research on comprehension and learning from text (Gernsbacher, 1994; Graesser, Gernsbacher & Goldman, 1997; Hiebert & Raphael, 1996; Pressley & Afflerbach, 1995). The second section describes the general characteristics of classrooms based on constructivist principles of learning and that support critical thinking, problem solving, and collaborative learning. The third section illustrates some of the new and reframed issues regarding learning from text that emerge in the kinds of classrooms described in the second section. I suggest that both cognitive and sociolinguistic perspectives are needed to adequately address a number of these issues.

COGNITIVE RESEARCH ON LEARNING FROM TEXT

Over the last two decades, cognitive research on learning from text has established that readers use a variety of strategies in the meaning construction process. In addition to findings that appear to be true in most reading situations and for most readers, it has also been established that there are intra- and interindividual differences in strategy use. This section of the article provides a brief review of the major findings from research on strategies for learning from text and constraints set by text, task, and learner characteristics.

Strategies for Learning

Research over the past two decades has revealed a wide range of strategies that adults and children use to comprehend what they read. Strategies have been inferred from reading behavior by examining the order in which segments of text are read and the amount of time that is spent processing particular segments. Information on strategy use has also been obtained through self-report and think-aloud methodologies. Pressley and Afflerbach (1995) were able to compile an impressive catalog of the wide range of comprehension, monitoring, and evaluation processes that researchers have found in think-aloud protocols of reading, usually in studies of highly skilled adult readers. For example, strategies observed by Goldman and Saul (1990) in the reading behavior of college students included single-sentence rereading, selective rereading of paragraph initial sentences, reviewing initial and final parts of passages, and skipping ahead in the passage. Goldman and Saul (1990) also collected think-aloud protocols

that provided evidence that readers' strategy use was guided, in part, by surface text cues (e.g., enumeration markers and paragraph indentations) and self-assessment of coherence and comprehension (Goldman, Saul & Coté, 1995; Goldman & Saul, 1990).

Not surprisingly, there are substantial individual differences in strategy use among readers. Individual differences in approaches are related to the quality of learning. For example, researchers using think-aloud methods have demonstrated that adults and children who explain and elaborate what they are reading and who have flexible approaches to solving comprehension problems remember text and solve problems better than those who do not (Chi, deLeeuw, Chiu & LaVancher, 1994; Goldman, Coté & Saul, 1994; Goldman & Murray, 1992; Goldman & Saul, 1990; Goldman et al., 1995; Graesser, Singer & Trabasso, 1994; Trabasso & Magliano, 1996). In one study, we (Goldman & Saul, 1990) found that college students rarely exhibited stereotypic strategies. The greater the variety of strategies individuals readers used, the better their recall performance (Goldman & Saul, 1990). The least effective learners were those who failed to exhibit a range of strategic reading behavior.

Evidence from think-aloud studies of elementary school children, some as young as 8 years old, indicate the presence of particular types of inferences and elaborations. They also indicate that young readers evaluate their reading and respond to difficulties with a wide variety of strategic behaviors (Alvermann, 1984; Alvermann & Phelps, 1983; Baumann, Seifert-Kessell & Jones, 1992; Garner, 1987; Garner & Reis, 1981; Hare & Smith, 1982; Kletzien, 1991; Langer, 1986; Meyers, Lytle, Palladino, Devenpeck & Green, 1990; Phillips, 1988; Scardamalia & Bereiter, 1984; Trabasso & Magliano, 1996; Trabasso, Suh, Payton & Jain, 1995). Much of this work has examined narrative, story material rather than expository text.

It is less clear how ubiquitous active processing is for expository text. Chan, Burtis, Scardamalia, and Bereiter (1992) had elementary-school children think aloud as they read two short informational texts, one on the topic of dinosaurs and the other on the topic of germs and illness. Chan et al. (1992) found that the degree of constructive activity that children exhibited accounted for 20% of the variance in learning outcomes, with children who engaged in higher levels of constructive activity learning the most. Higher levels of constructive activity involved integrating the text information with prior knowledge, thereby going beyond the text to build a representation or mental model of the referential situation.

Similarly, our research on learning from informational text by youngsters between the ages of 9 and 13 suggests that more effective learners engage in more explanation-based processing than less effective learners, consistent with the findings of Chi et al. (1994) (Coté & Goldman, in press; Coté, Goldman & Saul,

1997). Explanation-based processing of informational text is processing that attempts to construct relationships among ideas presented in text. Sometimes these explanations are causally based. They may also reflect other types of logical relationships, such as if-then, analogical, or case-based reasoning (e.g., *That's like when I eat a lot of sugar and have so much energy I can't sit still*). Prior knowledge often enters into the process of constructing explanations.

Links between strategy use and improved comprehension have also been demonstrated in strategy training studies. Summarizing 20 years of strategy training research, Pressley and McCormick (1995) pointed out that in early strategy instruction work, elementary-school students were trained to use single strategies, such as summarization, mental imagery, or story grammar structure. Training produced better performance among the trained students compared to nontrained students. Subsequent strategy training efforts examined the efficacy of training a system of strategies, in recognition of the importance of being able to flexibly coordinate learning activities, depending on the learning situation. Studies by Palincsar and Brown (1984), Paris and Oka (1986), Yuill and Oakhill (1988), Collins (1991), Bereiter and Bird (1985), and Duffy, Roehler, Sivan, Rackliffe, Book, Meloth, Vavrus, Wesselman, Putnam and Bassiri (1987) are illustrative of this approach. A hallmark of these intervention studies was the explicit modeling and explanation of the strategies. This included information on how to carry out a strategy and the role of the strategy in thinking (Pressley & McCormick, 1995, chap. 14).

Engaging in strategic learning activities implies an awareness of text structure and how to use it to aid comprehension. It also involves an appreciation for the differential processing demands of different kinds of tasks. The success of various strategic learning activities is, of course, constrained by insufficient prior knowledge in the domain, working memory limitations, interest, or motivation. Each of these topics is discussed in turn.

Text Structure

Modern origins of work on text structure can be found in the mid-1970s, when a number of systems were devised to represent the structure of ideas in text (Frederiksen, 1975; W. Kintsch, 1974; W. Kintsch & van Dijk, 1978; B. Meyer, 1975; Schank, 1972). The ideas were often represented as propositions. Although the specific details of propositional notation differed somewhat across systems, a proposition is a theoretical unit that contains a *predicate* (e.g., a verb or adjective) and associated *arguments* (e.g., nouns, embedded propositions). Arguments have a functional role such as agent, object, or location (Graesser et al., 1997). Consider the text illustrated in Table 1. The first sentence contains several ideas. The main predicate is the verb *roams*. It defines the main idea of the sentence,

bald eagles roam areas. Three additional propositions elaborate or qualify elements of the main predicate: (1) *the bald eagles are young*, (2) *the areas roamed are vast*, and (3) *the areas are located in North America*.

TABLE 1
The Bald Eagle: Its Ideal Habitat

The young bald eagle roams vast areas of North America. But when the eagle matures, at about five years of age, its restless spirit is tamed. When mature, the bird displays the characteristic white or "bald" head feathers, the bright yellow beak, and pale yellow eyes of the adult bald eagle. Scientists believe that these physical changes let members of the opposite sex know that the eagle is ready to mate. When the bald eagle meets its mate, they make a lifetime commitment to each other. After a brief courtship, the couple settles down to nest and raise a family.

It is important that somehow the bald eagle partners come to a decision about where to nest. The bald eagle always returns to a site within 75 to 100 miles of its first flight. But if the two eagles did not take their first flight from the same location (and mates rarely come from the same area), how do they decide where they will build the nest? Scientists do not have an answer to this question, but they do know that the couple will choose either the female or male's original nesting area. The couple do not compromise by selecting a site in the middle or in an entirely new location.

Since a mating pair of eagles do not always choose the male site or the female site to nest, scientists think that the habitat is the main consideration in choosing the nesting site. Several parts of the habitat need to be thought about.

As the human population grows and more and more land is developed, locations that were suitable five years before may no longer be attractive to the couple. Bald eagles have good reasons to avoid humans and populated areas. Humans can frighten eagle parents away from the nest and leave their eggs or young unprotected. Or well-meaning humans may try to assist young eagles by feeding or caring for them. Instead of helping, this behavior actually causes the birds to imprint on humans. This leaves the birds incapable of surviving in the wild. Imprinted birds are also unlikely to mate with other bald eagles.

In addition to avoiding human contact, bald eagles have other habitat requirements. Because the bald eagle's diet is over 70% fish, its nest must be located within sight of a large body of water. For young eaglets to learn to survive in the wild, the area must have perch and roost trees. Almost 90% of the bald eagle's day is spent perched or sitting in trees where they can spot prey. Scientists believe that this helps the bald eagle save energy by lowering its food requirements. Roosting sites where bald eagles sleep protect them from bad weather.

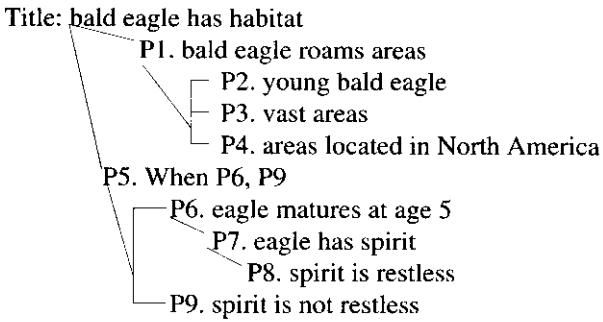
The nest the eagle parents build is furnished with soft scrap materials for the babies' comfort. But because young eaglets grow so rapidly, from 3 oz. to 10-15 pounds in two months, the nest must be quite large. Eagle nests are known for their great size. One eagle nest weighed 2,000 pounds! This means that eagles must select strong trees for their nest. In addition, juvenile eaglets need room to flap their wings and exercise. At two months of age, the young eaglets have wingspans from 7 to 8 feet wide! The nest must be big enough for the eaglets to spread their wings.

The nest must be located high up in the trees. This not only protects young eagles, but also allows them an easier take off on their first flights. A well-designed nest sits near an open area for the eaglets to fly through. It also has shorter trees or branches nearby for nervous baby eaglets to rest when they start to fly. All of these requirements should make it easy for the male and female bald eagle to agree on their nesting site.

Note: This text was written by Kay Burgess under the auspices of a grant from the Andrew Mellon and Russell Sage Foundations to the Learning Technology Center.

The ideas themselves were hierarchically organized on the basis of semantic relationships among them. The title and first several sentences of a passage usually establish concepts that are subsequently repeated throughout the passage as more information about them is provided.The subsequent incoming information "attaches" to these concepts creating a subordinate or supporting relation. In this manner, sentences that have many subsequent sentences connected to them take on more superordinate, thematic status in the passage (Goldman, Varma & Coté, 1996; W. Kintsch, 1974; W. Kintsch & van Dijk, 1978; Meyer, 1975). For the passage illustrated in Table 1, the title information introduces two concepts, *bald eagles* and *habitats*. The first two sentences of the passage provide information about the roaming behavior of bald eagles and how it changes with age. Figure 1 illustrates a hierarchical representation of this information. Propositions 2, 3 and 4 are subordinate to proposition 1 because they modify information in proposition 1.

Empirical studies using recall and summarization as measures have established a robust "levels" effect for expository text: ideas high in the hierarchy are recalled better and are more frequently included in summaries than are subordinate ideas. Furthermore, superordinate ideas are rated as more important and read for longer amounts of time than ideas lower in the hierarchy (Britton, Meyer, Hodge & Glynn, 1980; Cirilo & Foss,1980; Kieras, 1981; W. Kintsch & Keenan, 1973; W. Kintsch, Kozminsky, Streby, McKoon & Keenan, 1975; Manelis, 1980; Meyer, 1975, 1977; Meyer, Brandt & Bluth, 1980; Meyer & Rice, 1982; Varnhagen, 1991). Note that for narrative text, the levels effect is often superceded by the causal relations that hold among story elements (Gold-



Note: Propositions are inicated by P's. For ease of communication, the gist of each proposition is conveyed in phrases rather in propositional notation. The indentation and lines indicate the hierarchical subordination.

Figure 1. Hierarchical representation of the title and first two sentences of the passage illustrated in Table 1

bald eagles roam areas. Three additional propositions elaborate or qualify elements of the main predicate: (1) *the bald eagles are young*, (2) *the areas roamed are vast*, and (3) *the areas are located in North America*.

TABLE 1
The Bald Eagle: Its Ideal Habitat

The young bald eagle roams vast areas of North America. But when the eagle matures, at about five years of age, its restless spirit is tamed. When mature, the bird displays the characteristic white or "bald" head feathers, the bright yellow beak, and pale yellow eyes of the adult bald eagle. Scientists believe that these physical changes let members of the opposite sex know that the eagle is ready to mate. When the bald eagle meets its mate, they make a lifetime commitment to each other. After a brief courtship, the couple settles down to nest and raise a family.

It is important that somehow the bald eagle partners come to a decision about where to nest. The bald eagle always returns to a site within 75 to 100 miles of its first flight. But if the two eagles did not take their first flight from the same location (and mates rarely come from the same area), how do they decide where they will build the nest? Scientists do not have an answer to this question, but they do know that the couple will choose either the female or male's original nesting area. The couple do not compromise by selecting a site in the middle or in an entirely new location.

Since a mating pair of eagles do not always choose the male site or the female site to nest, scientists think that the habitat is the main consideration in choosing the nesting site. Several parts of the habitat need to be thought about.

As the human population grows and more and more land is developed, locations that were suitable five years before may no longer be attractive to the couple. Bald eagles have good reasons to avoid humans and populated areas. Humans can frighten eagle parents away from the nest and leave their eggs or young unprotected. Or well-meaning humans may try to assist young eagles by feeding or caring for them. Instead of helping, this behavior actually causes the birds to imprint on humans. This leaves the birds incapable of surviving in the wild. Imprinted birds are also unlikely to mate with other bald eagles.

In addition to avoiding human contact, bald eagles have other habitat requirements. Because the bald eagle's diet is over 70% fish, its nest must be located within sight of a large body of water. For young eaglets to learn to survive in the wild, the area must have perch and roost trees. Almost 90% of the bald eagle's day is spent perched or sitting in trees where they can spot prey. Scientists believe that this helps the bald eagle save energy by lowering its food requirements. Roosting sites where bald eagles sleep protect them from bad weather.

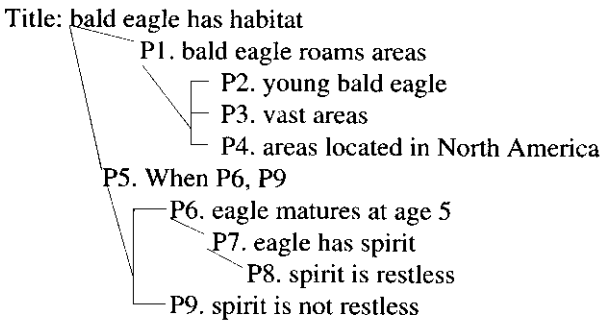
The nest the eagle parents build is furnished with soft scrap materials for the babies' comfort. But because young eaglets grow so rapidly, from 3 oz. to 10-15 pounds in two months, the nest must be quite large. Eagle nests are known for their great size. One eagle nest weighed 2,000 pounds! This means that eagles must select strong trees for their nest. In addition, juvenile eaglets need room to flap their wings and exercise. At two months of age, the young eaglets have wingspans from 7 to 8 feet wide! The nest must be big enough for the eaglets to spread their wings.

The nest must be located high up in the trees. This not only protects young eagles, but also allows them an easier take off on their first flights. A well-designed nest sits near an open area for the eaglets to fly through. It also has shorter trees or branches nearby for nervous baby eaglets to rest when they start to fly. All of these requirements should make it easy for the male and female bald eagle to agree on their nesting site.

Note: This text was written by Kay Burgess under the auspices of a grant from the Andrew Mellon and Russell Sage Foundations to the Learning Technology Center.

The ideas themselves were hierarchically organized on the basis of semantic relationships among them. The title and first several sentences of a passage usually establish concepts that are subsequently repeated throughout the passage as more information about them is provided.The subsequent incoming information "attaches" to these concepts creating a subordinate or supporting relation. In this manner, sentences that have many subsequent sentences connected to them take on more superordinate, thematic status in the passage (Goldman, Varma & Coté, 1996; W. Kintsch, 1974; W. Kintsch & van Dijk, 1978; Meyer, 1975). For the passage illustrated in Table 1, the title information introduces two concepts, *bald eagles* and *habitats*. The first two sentences of the passage provide information about the roaming behavior of bald eagles and how it changes with age. Figure 1 illustrates a hierarchical representation of this information. Propositions 2, 3 and 4 are subordinate to proposition 1 because they modify information in proposition 1.

Empirical studies using recall and summarization as measures have established a robust "levels" effect for expository text: ideas high in the hierarchy are recalled better and are more frequently included in summaries than are subordinate ideas. Furthermore, superordinate ideas are rated as more important and read for longer amounts of time than ideas lower in the hierarchy (Britton, Meyer, Hodge & Glynn, 1980; Cirilo & Foss,1980; Kieras, 1981; W. Kintsch & Keenan, 1973; W. Kintsch, Kozminsky, Streby, McKoon & Keenan, 1975; Manelis, 1980; Meyer, 1975, 1977; Meyer, Brandt & Bluth, 1980; Meyer & Rice, 1982; Varnhagen, 1991). Note that for narrative text, the levels effect is often superceded by the causal relations that hold among story elements (Gold-



Note: Propositions are inicated by P's. For ease of communication, the gist of each proposition is conveyed in phrases rather in propositional notation. The indentation and lines indicate the hierarchical subordination.

Figure 1. Hierarchical representation of the title and first two sentences of the passage illustrated in Table 1

man & Varnhagen, 1986; Trabasso & Sperry, 1985; Trabasso & van den Broek, 1985).

Relationships among ideas and the organization of the text may be signalled by various types of rhetorical devices in the surface text (Meyer, 1975; Givón, 1993; Goldman & Murray, 1992; Lorch, 1989). The rhetorical devices help readers make author-intended connections among the ideas. For example, inclusion of rhetorical devices (e.g., *In summary, The first thing to remember*) and placement of graphic cues such as paragraph indentations can help readers recognize and create representations among the ideas (Golding & Fowler, 1992; Goldman & Murray, 1992; Goldman et al., 1995; Lorch, 1989; Lorch & Chen, 1986; Meyer, 1975, 1977; Meyer et al., 1980). In one study Goldman and Saul (1990) found that college-aged students used enumeration markers to monitor their comprehension. For example, upon encountering the enumerator second at the beginning of a sentence, a number of the students checked to make sure they knew what had been first. For the most part, studies of rhetorical signals have involved college-aged populations. Investigations conducted with elementary-aged populations indicate that younger learners have a developing awareness of text structure variables and how to use that knowledge to benefit their learning (McGee, 1982; Richgels, McGee, Lomax & Sheard, 1987). We have found that 8 and 9 year olds use rhetorical devices and graphic cues as signals to text structure less frequently than older students and adults (Saul, Coté & Goldman, 1993).

The influence of text structure in determining main points can be understood by engaging in a little thought experiment. Suppose that you were asked to pick out the main ideas of the text illustrated in Table 1. What would they be?

A reasonable set of main points that you might select are in the following description:

> The young eagle needs a larger habitat than the mature one. A mature pair of eagles picks a place to nest—either his home or hers. Habitat influences the choice of nesting place in several ways. Eagles have to avoid areas where there is too much chance of human contact. They need an adequate supply of fish. They locate their nests in high places in trees.

Selecting these ideas as main points reflects the influence of organizational and structural properties of the text. For example, if the first two paragraphs hadn't mentioned young bald eagles and the process of site selection, you would have been less likely to include these as main points. The fact that this information occurred early in the text made it more superordinate in the structural hierachy. A specific sentence in the text previewed what the remaining text would deal with, i.e., *Several parts of the habitat need to be thought about.* You expected that the next part of the text would describe some of these parts, so a general sentence to

that effect is included in the main point summary. You probably used paragraph indentations to help decide when a new aspect of habitat was being discussed. You constructed a single sentence that captures the gist of the variables mentioned in each of the remaining paragraphs. This summary constitutes what might be called a generic set of main points and is not atypical of the type of performance that would be observed in an experimental situation. It is frequently assumed that a summarization task is based on a representation of the text that is constructed during reading (Goldman, 1996; E. Kintsch, 1990; W. Kintsch , Britton, Fletcher, Kintsch, Mannes & Nathan, 1993).

Researchers in the early 1980s recognized a distinction between creating a representation of the text itself, and integrating the information in the text with prior knowledge, thereby constructing a representation of the referential situation described by the text. The latter was referred to as mental model (Johnson-Laird, 1983) or situation model (van Dijk & Kintsch, 1983). The distinction between the text representation and the situation model is similar conceptually to Perfetti's (1989) distinction between the *meaning* and the *interpretation* of a single sentence. In order to conclude that learning has occurred, evidence of a situation model representation is needed (W. Kintsch et al., 1993; McNamara, E. Kintsch, Songer & Kintsch, 1996; McNamara & Kintsch, 1996). Assessment of learning thus involves going beyond reproductive or recognitory measures of recall. Readers need to demonstrate that they have formed a coherent model of the situation described in the text. This can be demonstrated in a variety of ways, such as applying the information to a new situation, providing verbal explanations or drawings that illustrate how something works (Chi et al., 1994), successfully carrying out a procedure (Mills, Diehl, Birkmire & Mou, 1995), and so forth. With the exception of studies by Chi et al. (1994) and McNamara et al. (1996) who worked with adolescent 13 to 14 year olds, research on situation model construction by children is only beginning to emerge (Chan et al., 1992; Coté et al., 1997).

Task and Purpose

It has long been recognized that readers' purpose or goal in reading is an important determiner of the kind of representation constructed (Baker & Brown, 1984; Gibson & Levin, 1975; Just & Carpenter, 1980; W. Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983). Indeed, a number of researchers suggest that readers' expectations about their task determine the knowledge and strategies that are brought to bear during the comprehension process (Baker & Brown, 1984; Goldman & Saul, 1990; Goldman & Varma, 1995; Goldman et al., 1996; W. Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983). For example, if reading for a casual discussion, a reader might focus only on the big ideas in the passage.

However, if reading for an essay exam, heavier emphasis might be placed on understanding the structure of the argument put forth in the passage.

Empirically, researchers have typically defined readers' goals with respect to the task instructions provided in an experimental situation. For example, readers might be instructed to read a passage that they will subsequently be asked to recall. Alternatively, they might be asked to write a summary of the passage following reading. Other tasks frequently used are problem solving, executing a procedure, answering multiple choice questions, and writing answers to essay questions. Research shows that specific task contexts influence what aspects of the textual information will be emphasized (Anderson & Pichert, 1978; d'Ydewalle & Rosselle, 1978; Graesser, Higgenbotham, Robertson & Smith, 1978; Graesser, Hoffman & Clark, 1980; E. Kintsch, 1990; Mills et al. 1995; Schmalhofer & Glavanov, 1986; Zwaan, Magliano & Graesser, 1995). For example, Zwaan et al. (1995) instructed half of their participants to read for pleasure and the other half to read for memory. The participants who were reading for pleasure were sensitive to discontinuities in the temporal and causal structure of the short stories whereas the participants in the memory condition were not.

Constraints on Strategic Learning Activity

Prior Knowledge. Both the "levels effect" and the effects of structural awareness on comprehension and learning depend on readers having two kinds of knowledge. First, they need whatever prior content the author assumes. For example, in *The Bald Eagle* passage provided in Table 1, the term *habitat* is not explicitly defined. Readers need to know that physical location information is one aspect of habitat. Readers need to recognize that habitat does not mean ideal mate, although from the first paragraph that inference is reasonable. Second, readers need discourse knowledge such as how to interpret rhetorical devices to construct the author-intended relationships among the ideas. If readers lack prior content knowledge in the domain, ideas presented in the text may seem disconnected even though connections among the ideas seem "obvious" to domain experts (Beck & Dole, 1992; Bransford & Johnson, 1973; Britton & Gülgöz, 1991; E. Kintsch, 1990; McNamara et al., 1996; Voss, 1984). Few of us would be likely to make the inference that habitat means ideal mate.

Readers may also need to rely on genre-specific, global organizational schemes to generate the "hierarchical" connections. For example, causal relations play an important role in stories (Trabasso & van den Broek, 1985), whereas claim-warrant-evidence relations are important in arguments (Chambliss, 1995). Studies that have taught children to be more aware of narrative text structure have increased their narrative comprehension and composition skills (Fitzgerald &

Teasley, 1986; Varnhagen & Goldman, 1986). McGee (1982) found that students with greater awareness of problem/solution text structure had better organized recalls of problem/solution passages they had read. However, awareness of expository text-structures does not play a simple predictive role in learning. Rather, learners need to know how to flexibly use the structure to enhance their learning (Olhausen & Roller, 1988; Vidal-Abarca, 1992).

Working Memory Span. Working memory span has been shown to differentiate more successful from less successful readers (Daneman & Carpenter, 1980; Goldman, Hogaboam, Bell & Perfetti, 1980; Perfetti, 1994; Perfetti & Goldman, 1976; Perfetti & Lesgold, 1977; Swanson, 1992). The ability to hold lengthy sections of text in consciousness and still execute a variety of strategic learning activities may set real limits on the nature of the representation that can be constructed. (See Carpenter, Miyake & Just, 1994, and Perfetti, 1994, for recent reviews.) Indeed, some work with adults indicates that processing time is allocated differently on second readings of a text compared to first readings (Haenggi & Perfetti, 1992; Millis & Simon, 1994; Zwaan et al., 1995). Differential allocation is thought to reflect constraints set by working memory resources. On a first reading, readers may have to choose between establishing local coherence as compared to global coherence. Having established local connections on a first reading, on subsequent readings, readers can allocate working memory resources to global coherence and aspects of the situation model that were not developed on the first reading. For example, Millis and Simon (1994) found that readers of scientific texts first allocated their available resources to extracting propositions from the text. On a second reading, more resources were allocated to making inferences among text propositions. Similarly, Zwaan et al. (1995) provided data indicating that readers monitored different dimensions of situation models of short stories on first as compared to second readings.

Computer simulation models of text comprehension frequently include a parameter for working memory span (Goldman & Varma, 1995; Goldman et al., 1996; Just & Carpenter, 1992; W. Kintsch, 1988; W. Kintsch & van Dijk, 1978; van Dijk & Kintsch, 1983). The working memory span parameter reflects the assumption that the whole text cannot be processed at once. Rather, working memory resources set limits on the amount of information that can be active simultaneously in working memory. Limits are specified differently depending on the particular model but it is generally assumed that the text is processed in cycles. On each cycle, approximately one new sentence is processed, although this may vary depending on the complexity of the text. The new input of each cycle is processed in the context of other information that is still active in working memory. Some models specify a number of propositions that are kept active for subsequent processing cycles (W. Kintsch & van Dijk, 1978). Other models do not specify a

specific number but rely on assumptions about the distribution of working memory resources. The distribution of resources is dependent on the connections among elements in working memory and whether the demand for working memory resources exceeds the available resources (Goldman & Varma, 1995). When demands exceed available resources, information loses activation in proportion to its strength. When particular information falls below a threshold value, it ceases to participate in processing.

The assumption of working memory constraints has been questioned recently by Ericsson and Kintsch (1995). They proposed that the memory performance of experts could be accounted for by a model of memory that included a long term working memory component. Expert readers relied on retrieval structures that reside in long term working memory, holding only a few cues to these structures in working memory. The "cue plus retrieval structure" proposal reduced the importance of working memory constraints because much less information had to be held active simultaneously in working memory. Ericsson and Kintsch (1995) showed that their long term working memory proposal accounted for several types of expert memory performance quite nicely. However, we are not all experts. Developing expertise may still depend on constraints imposed by working memory resources and moment to moment demands on them.

Interest. Researchers distinguish between two types of interest, harkening back to a distinction introduced by Dewey (1913). Personal interest is a relatively stable disposition associated with a particular content or topic area (e.g., an interest in football, tennis, or science). Situational-interest is more transient and subject to immediate contextual variables (e.g., specific facts presented in a text). Personal interest in a topic or domain positively impacts academic learning in that domain (Alexander, Kulikowich & Jetton, 1994). Indeed, in a recent comprehensive study of learning from expository text Schiefele and Krapp (1996) found that topic interest was positively related to depth of learning, including recall of main ideas and coherence of recall. These effects of the interest variable were independent of prior knowledge and intelligence, neither of which significantly predicted main idea recall or coherence of recall. Prior knowledge did predict amount of new ideas recalled, regardless of importance. However, Schiefele and Krapp (1996) note that the overall level of prior knowledge was relatively low by design and there was a relatively homogeneous range of intelligence scores.

On the other hand, situational or text-based interest, is more transient and specific to the information in the text. Situational interest can have a negative impact on the performance of children and adults as illustrated by the work on "seductive" details in text (Garner & Gillingham, 1992; Garner, Gillingham & White, 1989; Wade, 1992; Wade & Adams, 1990; Wade, Scraw, Buxton & Hayes, 1993). Seductive details are facts that readers judge to be highly inter-

esting but not very important information. For example, Wade et al. (1993) presented a passage about the life of Horatio Nelson, a highly successful naval officer. Ratings of interest and importance were obtained for each sentence. High interest but low importance information concerned the scandals of Nelson's personal life and the details of his injuries (e.g., "Sir William did not seem to mind his wife's affair in the least, and remained close friends with Nelson"). None of the information in the high interest/low importance category was related to the historical events and concepts that were rated as important. In contrast, low interest/high importance information consisted of important factual details. Wade et al. (1993) found that readers' recall of highly interesting facts with low importance was superior to their recall of high importance facts with low interest.

In addition, students' perceptions of the importance or meaningfulness of information in a text has been found to be strongly related to interest and reading enjoyment. For example, Wade, Buxton, and Kelly (1993) found that unless students perceived the information to be relevant to their interests and topics they valued, the text was judged as uninteresting. Readers' judgments of importance are themselves influenced by topic interest and prior knowledge (Alexander, Kulikowich & Schulze, 1994). Readers with more subject matter knowledge find it easier to distinguish important from less important information and they are less seduced by interesting but unimportant details (Garner, Alexander, Gillingham, Kulikowich & Brown, 1991). Furthermore, importance judgments made by higher knowledge individuals are more aligned with importance as determined by the structure of the text (Alexander, Jetton, Kulikowich & Woehler, 1994). Of course it is unclear whether interest begets more reading which begets more prior knowledge, which in turn begets importance judgments closer to those of domain experts/authors. It may be possible to clarify relationships among knowledge, importance, and interest by looking at situations in which readers are engaged in important, interesting tasks and are reading texts that are relevant to those tasks. Such situations exist in SFT and SMART classrooms.

Summary

In this section, I have provided a brief review of some of the major findings of research on strategies for learning from text. Although readers may be aware of a variety of strategies for comprehending and learning from text, actual use of these strategies is modulated by readers' awareness of text characteristics and task demands, prior knowledge about discourse and text-relevant content domains, working memory resources, and interest. For the most part, the empirical research that leads to these conclusions has been grounded in individualistic models of cognitive activity and has assessed individual per-

formance and learning. As well, the time frame of learning has been relatively short term. Research conducted under these assumptions and conditions is relatively consistent with dominant modes of learning in the majority of formal school settings.

However, the past decade has seen increasing calls for making thinking skills and collaborative activity central goals of schooling. Classroom environments that attempt to accomplish these new goals introduce different contexts for learning from text. Investigations of learning issues that arise in these new contexts depend on cognitive discourse processing perspectives in conjunction with sociolinguistic perspectives. In the next section, I describe the design principles of classroom learning environments that support thinking and collaborative activity. In such classrooms, opportunities for engaging in rich discourse and learning from text differ from those found in traditional classrooms. In the third section of this article, subtitled New Directions in Research on Learning from Text, I discuss the implications of these differences.

LEARNING ENVIRONMENTS THAT SUPPORT THINKING AND COLLABORATIVE ACTIVITY

Individualistic cognitive models of learning from text are consistent with the dominant and traditional model of education. The emphasis is on individuals learning from content-area textbooks and "telling" what they know, sometimes in free response formats (e.g., free recall, essays) but more frequently in short answer or multiple choice formats. However, the results of these learning activities are often unimpressive. Cognitive research indicates that learning of this type often results in knowledge that does not transfer to new situations (cf. Detterman & Sternberg, 1993). That is, learners fail to access previously learned information in new situations where it might be useful, a situation Whitehead referred to as the inert knowledge problem (1929).

In addition to the lack of transfer, traditional models of education are falling short in producing the kinds of learning and literacy skills that are needed for an informed and skilled citizenry in the 21st century (Berryman, 1993; Murnane & Levy, 1996a, 1996b; U.S. Department of Labor, 1992; Wise, 1996). Indeed, there have been numerous calls for a redefinition of basic skills to include critical thinking and problem solving (Resnick & Klopfer, 1989). There have been calls to have students be prepared for the team-oriented, collaborative work groups that they are likely to find in the business world (Murnane & Levy, 1996b). As a result, there has been renewed interest in creating classroom learning environments that support students' developing the needed skills and competencies. These environments provide exciting new opportunities to investigate discourse processing demands and strategies for learning from text.

Design Principles

The design of learning environments that support thinking and collaborative activity is based on a great deal of cognitive and social research, a description of which is well beyond the scope of this article. Instead, we summarize five central principles, citing key references to the research supporting those ideas. As Collins (1996) points out, these principles reflect a shift in the dominant view of learning from transmission models to constructivist and social constructivist models.

1. Deep knowledge in a content area and conditions for acquiring it are important for effective thinking, problem solving, and learning (Bereiter & Scardamalia, 1993; Bransford, Franks, Vye & Sherwood, 1989; Bransford, Sherwood, Vye & Rieser, 1986; A. Brown & Campione, 1994, 1996; A. Brown & Palincsar, 1989; Chi et al., 1994; Chi, Glaser & Farr, 1991; CTGV, 1994; Glaser, 1991; Scardamalia, Bereiter & Lamon, 1994).
2. Fluent enabling skills (e.g., reading, spelling, and computing) are fundamental to knowledge acquisition (Anderson, 1982; Bransford, Hasselbring, Barron, Kulewicz, Littlefield & Goin, 1988; Goldman & Pellegrino, 1987; LaBerge & Samuels, 1974).
3. Authentic, meaningful problems are highly motivating to students (Barron et al., 1995; Bereiter & Scardamalia, 1989; CTGV, 1990, 1997; Collins, Hawkins & Carver, 1991).
4. Feedback, and opportunities to revise one's work based on that feedback, enhance students' learning (Barron et al., 1995; A. Brown & Campione, 1996; Palincsar & Brown, 1984; Scardamalia & Bereiter, 1991b).
5. Social structures that encourage learning are those that help students feel valued and respected (McCombs, 1991, 1996; McCombs & Whisler, 1989).

Educational reform efforts that attempt to move classrooms in directions consistent with these cognitive and social principles have several characteristics. They emphasize group or collaborative work; curriculum units that build deep understanding; assessment that informs instruction throughout rather than just evaluating it at the end; and communication and community within the classroom and outside the classroom. The emphasis on collaborative work supports both cognitive and social effects because the organization of curriculum units makes collaboration necessary. Different groups of students develop expertise in different aspects of the unit's content, in accord with a distributed expertise model (A. Brown, Ash, Rutherford, Nakagawa, Gordon & Campione, 1993; A. Brown & Campione, 1994, 1996). To accomplish the learning goals of the unit, students need to learn from their peers. To do so, they engage in social interactions that are

often mediated by dialogue and text materials (Wertsch & Bivens, 1992). In brief, conceptual understanding is promoted through "mutually shared cognition" (Roschelle, 1992), and individuals are valued and respected for what they bring to the group.

Curriculum units are frequently organized around themes or projects that are meaningful to students so that interest can be sustained over the lengthy time periods that are required to develop deep understanding (A. Brown & Campione, 1994, 1996; Lamon, Secules, Petrosino, Hackett, Bransford & Goldman, 1996). Students' activities include opportunities to plan and organize their own research and problem solving. They work collaboratively to achieve important project goals (e.g., conducting an environmental summit on endangered habitats). An instructional design feature is to begin with a problem-setting phase that introduces the project and promotes students' interest in the topic, often using a variety of media to stimulate children's wonderment and questioning. Teachers guide the categorization of students' questions into subtopics that serve as the focus for different research groups. The subtopics are structured to be interdependent in the sense that each group is researching independent aspects of the larger topic, but needs to know what the other groups are finding out about their subtopics. Thus, from the beginning of the research activity, topic interest is fostered, students know they will be sharing their research findings with others, and they understand how their research fits into the overall project. The task is meaningful for the youngsters and reading is a tool for getting needed information.

Developing deep understanding of the content requires that learners go well beyond the traditional textbooks from which they typically "learn." Not only do students read different material but they read with different purposes. They have specific goals that have meaning in the larger social context of the project on which the whole group is working. They read to find specific information and this may call for strategies that are quite different than reading a textbook to take a teacher-prepared test on the material. Students make increased use of multiple texts for knowledge acquisition. They need to select, evaluate, and synthesize information from these multiple sources, plus communicate with one another about the information. Doing so requires all of the skills, strategies, knowledge of genre and text conventions, and so forth discussed earlier. Understanding how these processes and variables operate in contextualized practice is an exciting new challenge for research on discourse and learning from text. Some of the interesting questions to pursue are provided in the next section.

In these kinds of classroooms, intentional learning and knowledge building (A. Brown & Campione, 1990; Scardamalia & Bereiter, 1991a) are goals of reading and writing. Students read and write to transform their understanding and knowledge (cf. Goldman, 1995; Scardamalia & Bereiter, 1991a). Reading and writing are instrumental to finding solutions to problems. The instructional organization

of the classroom provides multiple opportunities to go beyond reading to "tell what you know" (see Goldman, 1995). When one of the goals of reading is to address significant issues and problems, children need to reason about what they read and determine whether it is relevant to the topic they are researching. It does not matter if you can "tell what you read" if that information is irrelevant. They also need to reason *across* texts. That is, the task is to find the relevant information from multiple sources, synthesize it, and make a coherent argument with it. Hence, the distinction drawn between writing as "knowledge telling" versus writing as "knowledge transforming" (Bereiter & Scardamalia, 1987; Scardamalia & Bereiter, 1991b) applies equally to learning from text.

National assessments, such as the National Assessment of Educational Progress (1983, 1988), and numerous research studies on reading, often report that children do not frequently engage in critical and elaborative reading, the kind of reading that builds accessible and coherent knowledge. These national assessments, as well as much of the research on students' learning strategies, may be assessing the reading strategies that students have found to be adaptive to their instructional settings.That is, the traditional social and instructional contexts in which children are reading to learn may be responsible for "reading on the surface" (e.g., failing to detect inconsistencies or logical gaps).

Reading to tell what the text said (no more, no less) satisfies many of the demands of traditional classrooms. Written tests that demand little beyond recognition of the correct answer, filling in the deleted words from sentences taken almost exactly from textbooks, and true/false tests that alter only a few words taken directly from the text do not require deep, meaningful processing on the part of the learner. Furthermore, performance on tests such as these may actually suffer if the learner "translates" the material or integrates it with prior knowledge. Transformed information is actually harder to "match" so a student faced with such tasks is actually better off with a strong representation that is faithful to the surface level of the text. Thus, many of the findings about children's reading may be traced to the instructional contexts in which the students have been working. Their behavior is highly adaptive to the task demands and cultural norms in their classrooms (Goldman, 1996). It is little wonder that readers perform similarly for the researchers who give them these "familiar" tasks.

NEW DIRECTIONS FOR RESEARCH ON LEARNING FROM TEXT

Classrooms designed to support thinking and collaborative activity suggest new and different questions regarding variables such as task, purpose, and interest. Project-based activities that occur in these classrooms pose new questions about strategies for learning from text, including cognitive capacity to deal with multi-

ple sources of information. In the following discussion, we consider some examples that help us reconsider the significance of importance and interest, prior knowledge, and multiple text use.

Importance and Interest

When the curriculum is organized around project-based activities that use a distributed expertise model, different students need to find answers to different questions (A. Brown et al., 1993; Lamon et al., 1996). This instructional model makes importance and main idea identification fluid and situationally determined by readers' goals. That is, different information in the same text will be important to different groups. As a result, the impact of text structure variables on importance will be mediated by the context of the instructional task. Learning goals will be redefined over the course of the project because of the feedback students get from their peers, teachers, and others in the environment. In response to the feedback, students may go back and revisit specific print materials. Importance on revisiting will depend primarily on the readers' goals during a particular reading of the text. Consequently, over the time course of working on a particular project the "important" information in a text will change as the reader's understanding develops and new questions arise. Thus, reading for learning is inherently framed by the task and readers' purposes.

Reconsider the summary of the text about the bald eagle and its habitat provided in Table 1. Recall that under the generic instructions to generate a summary, various aspects of the text structure influenced the points selected as main points. Rather than the "standard" experimental situation you were in earlier, suppose now that you were doing research for purposes of creating a plan for the recovery of eagles. Imagine that your class had earlier generated several topics that would need to be researched to construct the plan. Your group is looking into the requirements for an eagle's nest. Other groups are looking into the mating habits of mature bald eagles, the properties of habitats that are required for the survival of baby eaglets, and so forth. Given the specific focus of each research group, summaries of the important ideas in the text in Table 1 would be different from one another. They would also be different from the generic summary presented earlier. In contrast to the generic summary, a summary of important information for your eagle's nest research group would be details in the text about the nest, including what nests are made of and the size requirements given the weight and wing spans of baby eagles. Your group would probably also note the information that the nest needs a strong tree to hold it. Other research groups would select different information as important to their topics. For example, the group on mating habits would select the information on maturity and imprinting. The group working on properties of the habitat would be concerned about contact with humans,

and availability of trees for roosting and perching as well as holding the nest. Finally, the text shown in Table 1 would be one among a number of sources each of the groups might consult during their research.

This is a relatively simple demonstration of the context-sensitive nature of importance judgments. But the example makes the point that information "lower" in the structural hierarchy of a text can be raised in importance by the task and the specific goals of a reader. If readers' goals differ, judgments of importance for the same text will only partially overlap.

Although we know from previous laboratory research with adults that a change in perspective alters what people remember (Anderson & Pichert, 1978), there is little research on the kinds of shifts in importance described here, especially for school-aged youngsters. Importance needs to be looked at in the context of the task and learner's purpose rather than solely as a property of the text (see for discussion Alexander & Jetton, 1996). This is a shift in emphasis from author-determined or structural importance to situationally determined importance.

The concepts of main idea and importance need to be seen not as static, fixed properties of texts but as dynamic properties determined by readers' task goals and by their evolving understandings of tasks and texts. That is, the readers' understanding of the "main ideas" of a text may dynamically evolve as learning proceeds and they become more expert in the content domain. As discussed earlier, research on learning over time and multiple readings of texts suggests that college students do focus on different aspects of meaning during their initial readings as compared to subsequent readings (Haenggi & Perfetti, 1992; Magliano, Zwaan & Graesser, in press; Millis & Simon, 1994; Zwaan et al., 1995). We know little about whether middle school students' successive readings of a text will reflect the same processes manifested by college students. My suspicion is that without some sort of opportunity for feedback that allows them to evaluate what they know against task requirements, youngsters' successive readings of a text will be similar. Without the opportunity to test their knowledge and understanding against task demands, there is little reason to redefine one's objectives in reading. Such "tests" may take a variety of forms, including the questions asked by other youngsters or adults, writing a draft report, or putting together a "first pass" presentation. Furthermore, it is difficult to know how to set new learning goals, let alone the strategies to use to attain these goals (cf. CTGV, 1997). An initial test of the role of feedback on successive readings of a text is currently underway (Coté, 1997).

Similarly, the concept of situational interest also becomes more fluid and contextually determined. Particular students might find particular aspects of a text interesting from their research perspective, whereas other groups may find other information and texts interesting in light of their learning and research goals. Topic interest, however, is fostered across the research groups as a whole.

Project-based environments that utilize the distributed expertise model provide a new venue for studying relationships between importance, topic interest, situational interest, and prior knowledge. Observations in classrooms where projects of the type sketched above are being conducted indicate that many students are genuinely interested in their learning and in finding out how to learn the answers to their questions (Lamon et al., 1996; Secules, Cottom, Bray, Miller & CTGV, 1997). For the most part, students see the problems they are working on as meaningful and authentic. Yet they are discriminating in their evaluation of various printed materials. On the one hand, they are eager for material that will provide information relevant to their topic. At the same time, they are quite clear when a particular article is boring or uninteresting, even though they acknowledge that there is something relevant to their research topic. These environments seem rich in the possibilities for research that attempts to understand the fluid nature of importance, and its relationship to topic interest and situational interest as youngsters acquire increasing content expertise.

Integrating and Evaluating Information from Multiple Sources

Research on learning from multiple texts is far less prodigious than work on single texts. Most of it has been conducted with high school or college students and the emphasis has often been on identifying aspects of text that trigger connections to other texts (Hartman, 1995) or sociolinguistic aspects of intertextuality (Bloome & Egan-Robertson, 1993). The observational studies of older adolescent and adult readers have shown that they vary in the cognitive strategies they used in constructing meaning from multiple sources (Hartman, 1995; McGinley, 1992; Spivey & King, 1989). Hartman (1995) identified three orientations to linking multiple texts: logocentric, resistant, and intertextual. A logocentric orientation led to meaning circumscribed by the passage author. A resistant orientation led to meaning circumscribed by the reader. Only the intertextual orientation worked toward developing many understandings and constructing links among textual resources.

According to Hartman (1995), readers who adopted the intertextual orientation approached reading in terms of a "plurality of other texts" (p. 557), including those that were part of the particular study and those that had been read on other occasions. Interestingly, among the 8 readers Hartman investigated, reading proficiency was not predictive of whether an intertextual orientation was taken. Indeed, Hartman points out that often what is considered the "best" comprehension is that which does not stray too far from the the passage as "an autonomous and discrete entity."

Although it is clearly important to understand the meaning of a particular text, learning often requires an intertextual orientation. For example, Perfetti

and colleagues (Perfetti, Britt & Georgi, 1995) examined history learning. They found that reading multiple texts that were written from different historical perspectives led students to create models of the situation that were less tied to any specific text, more flexible, and more accessible under an increased variety of circumstances. They also found that as students learned more, they reasoned more complexly, and accommodated multiple options to a greater degree.

In follow-up work, awareness of differences among types of historical documents was examined. In one study (Rouet, Britt, Mason & Perfetti, 1996) four types of documents were examined: textbook excerpts, primary sources (treaties or correspondences), intermediate sources (written by participants in the events and arguing opposing views), and secondary sources. In order to look at the effect of the availability of primary source documents on students' document selection strategies, one group of subjects received a document set that did not include the primary source documents whereas a second group had all four types of documents. In both conditions, students were instructed to read the document set in order to write an opinion essay about a controversy dealing with the history of the Panama Canal. Although the order in which specific documents were selected tended to be idiosyncratic, there was a strong tendency for students to select primary, intermediate, and textbook excerpts before selecting secondary source documents. Subsequent evaluations of the documents indicated that students selected first those documents that they judged to be most trustworthy and useful (Britt, Rouet & Perfetti, 1996). Finally, analyses of the opinion essays indicated that students were sensitive to the different functional value of the types of documents for constructing an argument. For example, citations from primary documents were used in the essays whereas information from the textbook excerpts was not cited (Rouet et al., 1996).

Britt et al. (1996) presented their documents in hypertext environments (cf. Hynd, Stahl & McNish, 1996; Stahl, Hynd, Britton & McNish, 1996). Hypertext environments are inherently multiple text environments. As they become more ubiquitous, an important area of research will be readers' strategies for constructing meaning and maintaining coherence in hypertext as well as other multiple text situations. Recent work by Foltz (1996) suggests that similar coherence criteria drive processing in linear text and hypertext but work on the strategies learners use to satisfy coherence criteria is just beginning (See edited volumes by Rouet et al. 1996 and van Oostendorp & de Mul, 1996 for several interesting papers on hypertext processing.) One strategy for learning that is unique to hypertext environments is exploring a domain from multiple perspectives. Whether such exploration creates a learning advantage depends on expertise in the domain. For example, Spiro, Feltovich, Jacobson, and Coulson (1991) found that such "criss crossing the landscape" is beneficial at the *upper*

levels of expertise in a domain. Novices often benefit more from a linear, singular perspective, at least the first time they are introduced to particular concepts and ideas.

I am not aware of research reports of cognitive work on middle-school students' use of multiple texts for learning, whether in hypertext or nonhypertext environments. However, our observations in middle-school classrooms where students are engaged in project-based research activities suggest a large number of interesting questions beyond those associated with traditional work on comprehending content-area reading material (Beck & Dole, 1992; Beck & McKeown, 1992, 1994; Palincsar & Klenk, 1991; Tierney, Readence & Dishner, 1990). Certainly a prerequisite of learning from multiple texts is being able to read to learn from a single text. In this regard we do not wish to downplay the importance of individual or small-group strategies for improving comprehension (Palincsar & Brown, 1984; Palincsar & Klenk, 1991; Pressley, Schuder, SAIL Faculty & Administration, Bergman & El-Dinary, 1992).

Students in project-based classrooms tackle the research process by making use of traditional text resources as well as resources available on CD and over the Internet. The search processes in which they engage reveal a great deal about their knowledge and the way it is organized, as well as their strategies for finding information. In one fifth grade classroom, we observed a group of three students who were seeking information about how to clean up pollution in a river. There were several books on environmental pollution in the classroom. They looked in the index of one of the books for the word "pollution" but it was not listed because the whole book was about pollution. Without looking up any other words, they decided there was nothing in the book relevant to their topic. They did not generate a list of related words, check the table of contents, or in any way pursue the topic in that book. We have seen this happen more than once when students look up a single phrase in an index. But we have also seen students look up words they think might be related to their initial key word.

There are certainly interesting questions to be asked about the differences in knowledge representations that support the type of one-trial terminating search as compared to the multi-trial searches illustrated here. Do the youngsters' representations differ in terms of amount of information, its organization, or both? What kinds of retrieval cues do children generate that allow them to traverse connections between different concepts in the content domain? What types of metacognitive knowledge and strategies do successful searchers use, as compared to those who fail to find relevant information? What are the help-seeking behaviors that youngsters employ? Who do they ask? When? Answers to these questions demand both social and cognitive lenses on the learning process.

An individual student's search may be facilitated by others in the environment. The teacher, of course, does step in and help guide the process of finding information. Peers may also provide comments and suggestions but the circumstances under which they will offer such suggestions are far from clear. Webb and Palincsar (1996) provide an excellent review of variables that seem to affect whether groups work collaboratively or competitively, i.e., whether they help members of their team or ignore them. Thus, there is a substantial research agenda around understanding the kinds of prompts, questions, and other instructional techniques that foster flexible search and knowledge representation.

In addition to searching for relevant information, using multiple texts for learning involves several other important skills such as notetaking, organizing, and coordinating information, and detecting inconsistencies and redundancies across sources and otherwise integrating and evaluating information. Each of these skills involves complex mental activity that reveals much about the nature of knowledge organization and retrieval. Recently, a group of us at the Learning Technology Center received a grant from the U. S. Department of Education to study these activities in middle-school classrooms. We call it the *Whole Day, Whole Year* project because we are concerned about the development and evolution of students' learning strategies and achievement across content areas throughout the day and over the course of the entire school year. Although we are just beginning to study the complexities of these processes and activities and how students learn them, we can offer a few preliminary observations. These observations are based on our observation of the research process in several SFT classrooms.

When students find information that they think is relevant to their research topic, they typically take notes in their field journals. Teachers tell us that helping students understand the appropriate "level" at which to take notes is quite difficult. To many students, notes are "some of the words from the sentence but not the whole thing." Teachers are very careful to avoid plagiarism by insisting that students not copy whole sentences from sources. There is wide variability in how students interpret the "some but not all" definition of notes. In some cases, field journals consist of single words from which it is virtually impossible to regenerate the idea or fact represented by the note. There are also differences in the degree to which students put the text material into their own words as opposed to copying directly from the source. Research on text comprehension has shown that encouraging students to take notes sometimes improves comprehension and learning, but other times does not (see Pressley & McCormick, 1995, chap. 10). However, developing methods that foster good notetaking is a difficult problem, one that is related to both the readers' purpose and prior knowledge in the domain.

Organizing intelligible notes is another challenging activity. Being able to generate the appropriate higher order categories that will organize notes in a way that is relevant to the task is extremely difficult for many of the middle-school young-

sters we have observed. Sometimes, if they are given categories (e.g., in the case of eagles these might be diet, habitat needs, babies, and so forth), they are able to organize the information into those categories. But it is a nontrivial task for them to generate appropriate categories and then sort notes accurately. Some teachers provide outlines, or have students make outlines, to assist their organizational processes. When, why and how such assistance helps and what it takes for students to spontaneously engage in sensible information organization and coordination are challenging questions indeed.

A final phase of the research process involves integrating and evaluating the information, first individually and then in the context of the research group. This is a process that involves a number of complex cognitive activities. One is monitoring for consistency across information obtained from multiple sources. If information does conflict, the learner must decide which information to believe. In addition, students need to create products that are understandable by others who are not experts on the specific topic. Opportunities for feedback occur throughout the process, with sharing of information a central, planned-for activity in the classroom. How these activities contribute to learning and knowledge is largely an uncharted area.

Our preliminary studies of group interactions throughout the SFT research process suggest that careful cognitive and sociolinguistic research will be needed to understand knowledge construction situated in classroom contexts. Although we do see the operation of variables that laboratory-based research has indicated are important for reading to learn, their effects seem swamped by more macrovariables operating in the context. Illustrations of this come from the SMART project. SMART has been examining classroom-based, formative assessment in mathematics and science (Barron, Vye, Goldman et al., 1995; Barron, Vye, Zech et al., 1995). Formative assessment informs ongoing instructional decision making. It contrasts with summative assessment, which measures the end product of instruction. The example relevant in the present context is an instructional activity associated with a river quality project. In the course of the river quality project, students were working across two texts: a resource book about river quality testing and a catalogue of tools for sampling macroinvertebrates. The print information in the catalogue was typical of sales catalogues. It extolled the virtues of each tool but the negatives were not mentioned. To determine which tool was the best, students had to use their understanding of the relationships among water quality, macroinvertebrates, and procedures for sampling them. Information relevant to this task was provided in the resource book that our staff had specifically constructed for this project. In an initial pilot study, we focused on how small groups used the catalogue and resource book to deal with this task.

Table 2 provides a partial transcript of the interactions of three girls trying to decide on their tool (we will refer to them as A, H, and As). As indicated in seg-

ment 1, they began by reading the descriptions of each tool and offering opinions about each one, with little or no comparisons across tools. Tools were eliminated on the basis of their individual merit. This was fairly typical of other groups that we observed; students tended not to relate information in one part of the catalog to the other. They seemed to fixate on some perceptual feature or everyday aspect of the items. Returning to our focal group, the girls finally eliminated all but two tools when they realized that the catalogue might not be telling the truth (see the second segment of the transcript in Table 2). They decided to ask the teacher if the catalog could be lying. The teacher asked the girls whether they thought that was possible. When they agreed that it was, the teacher suggested that they consult their resource book to see if the tool they wanted to pick was a good one. The group found the section called "Using Macroinvertebrates to Test Water Quality" in the Table of Contents. They began to read the whole section when H realized there were six pages in that section and suggested "I think we should pick out the important pages." Their reading was guided by the section headings that appeared in bold face print, as segment 3 of the transcript illustrates. In contrast to this group, many of the other students rarely consulted the resource book.

This example group also provided a nice illustration of the effects of prior knowledge. In this case, however, their prior beliefs interfered with their understanding of the relationship of macroinvertebrates to pollution and water quality. Segment 4 of the transcript provides this interaction. The difference of opinion between two of the girls over whether macroinvertebrates are pollution or are affected by pollution did not get resolved. Rather student A went on to another section of the text while student H tried to continue the discussion. Student A diverted the discussion by locating a table in the resource book that listed the Steps for Determining the Water Quality Index. Although it didn't specify what tool to use, that section of the book did specify that you had to count different types of macroinvertebrates. Students A and H continued to disagree over the tool, with student H suggesting a previously rejected tool. At that point, time for working on the project was over for the day. The next day when they got back together on this project, the girls began again to evaluate the tools and the issue of whether macroinvertebrates are or are not pollution appeared to be forgotten.

One interesting aspect of this group's reading is that they skipped over part of the text that indicated the importance of sorting the macroinvertebrates into types. Having skipped over this information, they ended up selecting a tool that would provide a total count of macroinvertebrates, but would not permit them to sort the macroinvertebrates into types. This transcript is an excellent illustration of students attempting to coordinate information from two different text sources along with their prior beliefs. This process is only partially successful and the resulting representation(s) appears to have some inconsistencies and incoherence.

TABLE 2
Partial Transcript of Group Working with Catalog and Resource Book

Segment 1: Initial evaluation of tools based on catalogue information

As: I think we ought to get this laser counter because I read it and it says that it can count all the macroinvertebrates in the river and you won't get your hands that wet. And you just stick it in the water, and then it just counts all of them up and then...
H: Well, what if it breaks?
As: Yeah
H: Do you need batteries for it?
As: I think you do need batteries for it.
A: I think so.
As: I think you need a special kind of batteries so it won't stop working in the water.
H: I think we should get the Super Collector Cone because it, I didn't read the whole thing. But it says is has this net...
A: It doesn't say what size net it is like these two. It doesn't say what size net it has, like this one, it says five-tenths millimeters.
H: But it comes with the, um, what you call it?
A: The magnifying glass.
H: Yeah, the magnifying glass. Which you can see if it's a Crabfish.
A: OK
H: I don't think we need this crabfish trap. I don't think we need the crabfish one. But if you get the whatchamacallit, that (points to crayfish trap), how you gonna catch the crabs? With your hands?
A: Well, that's right.
A: (Reads about the macroinvertebrate eliminator capsules from the catalog) That kills the animals.
H: I know, and you need to catch the animals, not kill them.
A: We're gonna catch 'em and then. We're not gonna kill them, we're just gonna catch 'em, and then test the water and then just I don't know. (Reads out loud again-eliminator item) We don't want to kill them...

.....

Segment 2: Realizing they need to do some research beyond the catalog

As: So what we gonna get?
A: We're gonna get the Laser counter and the Super Collector Cone. OK, so first thing is ...
As: Then you got to explain why.

...

H: But, the bad part about it, is what if they ain't telling the truth, or what if they laugh at us and stuff. Then, we can ask for a refund and get our money back and sue them. ("They" refers to the catalog writers.)
A: You're crazy. What if they are lying to us? I never heard of anything like that before. Like that stuff, or I think there's something like that, but I never heard of it.
H: My main point about it is how does it work? How does this (Laser counter) work? Do you put it in the water or something?

....

(*continued*)

TABLE 2
(Continued)

Segment 3: Using bold face headings in the resource book to guide selective reading

A: Everyone there (at the section "Using Macroinvertebrates to Test Water Quality")? 42? Who wants to go first to read a paragraph?
As: I do. (reads "Using Macroinvertebrates to Test Water Quality" section-all take turns reading)
A: (Reading: ...Biologists could also use other animals as indicators...)
H: Whoa, whoa, whoa, whoa, whoa.
A: Whoa what?
H: We got 6 pages to read. To 48?

...

H: I think we should pick out the important pages.
A: This page and that page. "How do we test Macroinvertebrates" (bold faced heading) that's really, really important. Whoops! OK, (Reads the sentence "They are the right size to collect...biodiversity") Is that right?
H: Bi-o-di-versity (word appears in bold face), yeah.
(They continue reading out different sentences.)
A: ... I'm gonna read that, I'm right there (pointing to the bold face heading "How to test for macroinvertebrates")
As: (Reads: "Every river also changes throughout the year...")
H: (Reads: "The things you test for in a river...throughout out the year") I think we should read "Macroinvertebrates: Using them to test water quality" (bold face heading) Because we need to know whether macroinvertebrates are big, cause that could be, I mean...

.....

Segment 4: Prior Knowledge Clashes

H: I get it. The reason the macroinvertebrates live in one place in the river is cuz the other place is probably polluted. And they can't stand pollution. And they can die from it.
A: I think that pollution, they're so small, wait hold on.
As: Whatever she said.
A: OK, I think they make pollution. And when they stay in one place, that part of the river gets polluted. And then they go to another place, that is clean, and then they make that area polluted.
H: They make pollution?
As: They are pollution.
H: I think the people make pollution.
A: Because it says right here: "They tell us more about pollution than something like fish that can get away from pollution." Macroinvertebrates can't get away from pollution.
H: But, how do they make pollution?
A: I mean, not like make,
H: Like what? What?
A: ...but um, they it's something like they are pollution. Like, if this part of the river is polluted, then you know the macroinvertebrates are over there. It's like...
H: Like what?
A: ...they make pollution, but they don't make pollution. It's something, everything like that.
H: But, A... wait, OK, I want to know why are they dying?
A: They're not dying.
H: They're not?

Reading to learn from multiple sources provides a rich context for studying complex issues of learning and conceptual change, especially when students' thinking is made visible to the researcher through mechanisms that require collaboration and negotiation among youngsters (Barron, Vye, Zech et al., 1995; CTGV, 1997). Furthermore, other studies (Rowe, 1994; Short, 1992) have shown that curricular and instructional designs that explicitly encourage student use of multiple texts promote classroom conversations and student responses that involve deeper and broader knowledge and meaning construction. Building on current understanding of discourse processing, we need to address the psychological mechanisms by which such deeper and broader learning occurs.

CONCLUSION

There is a unique opportunity for discourse processing research to build on sociolinguistic and cognitive science research traditions in an effort to understand learning that is situated in contexts of practice. Rather than being peripheral to new discoveries in education and learning, focusing on these new inquiry-oriented environments is consistent with the call by a number of researchers to focus on the problems of practice. For example Hiebert and Raphael (1996) note that research in the '70s and '80s highlighted problems with readability formulas and led to changes in the kinds of materials included in textbooks for reading. Textbooks now include entire pieces of literature or chapters from trade books. But Hiebert and Raphael (1996) point out that much research continues to use contrived texts. As a result the findings from research seem less relevant to educational practice than they might be.

Placing reading to learn in the context of authentic and meaningful purposes opens up a whole new set of issues that need to be researched. How powerful are structural variables? How fluid are concepts of importance? How general are strategies for negotiating materials in a domain where one is relatively unknowledgeable? Pursuit of this research agenda locates cognitive work on discourse and learning from text in authentic contexts and complex settings. In these settings, multiple sources of information, including texts, peers and knowledgeable others, play a more important role in the learning process.

Thus, it is not only the currency of societal and educational problems that motivates the research agenda suggested here. We have learned a great deal from studying individual learners engaged with individual texts. But as we see these individuals attempt to work across multiple texts that are not preselected and adapted by researchers, and see them try to relate the information they hear from their peers to what they have read, a vast new array of learning-from-text skills and processes emerge. We know little about them. However, they reflect funda-

mental psychological processes as they occur in ecologically valid contexts. If we are to remain a relevant field, we need to tackle these issues.

Acknowledgement: I would like to acknowledge the members of the Cognition and Technology Group with whom I have had the privilege of working over the past 8 years. Their colleagueship has been invaluable in the evolution of my thinking and research. In particular, discussions with Nathalie Coté, Kay Burgess, Susan Hickman, Kristen Gottschalk, Sashank Varma, David Bloome, John Bransford, Daniel Schwartz, and James Pellegrino have influenced the ideas developed in this paper. Arthur Graesser provided very helpful comments on an earlier draft of the article. However, I am solely responsible for any errors or inaccuracies. A number of the funded projects referred to in this article reflect collaborative teams. Members of the Whole Day Whole Year project, funded by the Office of Educational Research and Improvement of the U.S. Department of Education, include (in alphabetical order) Lynn Bercaw, David Bloome, John Bransford, Susan Goldman, Ted Hasselbring, Jerome Morris, Tom Noser, and Jody Underwood. Two projects funded by the National Science Foundation, SMART Assessment (NSF MDR-9252908) and Scientists-In-Action (Grant #ESI-9350510), supported the development of the science materials discussed in the article. Members of the team implementing the river project were Kadira Belynne, Susan Hickman, Taylor Martin, Cynthia Mayfield-Stewart, Daniel Schwartz, Nancy Vye, and Linda Zech. A special thanks to the teachers, students, and administrators in Metropolitan Nashville Public Schools who are collaborating with us on these projects. The Schools for Thought project was supported by the James S. McDonnell Foundation. Development of some of the materials used in SFT classroom-based research projects was supported, in part, by the Mellon and Russell Sage Foundations. However, the opinions expressed in this article are not those of the funding agencies.

REFERENCES

Alexander, P.A. & Jetton, T.L. (1996). The role of importance and interest in the processing of text. *Educational Psychology Review, 8*(1), 89-121.

Alexander, P. A., Jetton, T. L. & Kulikowich, J. M. & Woehler, C. (1994). Contrasting instructional and structural importance: The seductive effect of teacher questions. *Journal of Reading Behavior, 26*, 19-45.

Alexander, P.A., Kulikowich, J.M. & Jetton, T.L. (1994). The role of subject-matter knowledge and interest in the processing of linear and nonlinear texts. *Review of Educational Research, 64*(2), 201-252.

Alexander, P.A., Kulikowich, J.M. & Schulze, S.K. (1994). How subject-matter knowledge affects recall and interest. *American Educational Research Journal, 31*, 313-337.

Alvermann, D.E. (1984). Second graders' strategic preferences while reading basal stories. *Journal of Educational Research, 77*, 184-189.

Alvermann, D.E. & Phelps, S. (1983). Elementary readers' strategic activity in processing story-length material. In J. A. Niles & L. A. Harris (Eds.), *Searches for meaning in reading/language processing and instruction* (pp. 182-186). Thirty-second yearbook of the National Reading Conference. Rochester, NY: National Reading Conference.

Anderson, J.R. (1982). Acquisition of cognitive skill. *Psychological Review, 89*, 369-406.

Anderson, R.C. & Pichert, J.W. (1978). Recall of previously unrecallable information following a shift in perspective. *Journal of Verbal Learning and Verbal Behavior, 17*, 1-12.

Baker, L. & Brown, A.L. (1984). Cognitive monitoring in reading. In J. Flood (Ed.), *Understanding reading comprehension: Cognition, language, and the structure of prose* (pp. 21-44). Newark, DE: International Reading Association.

Barron, B., Schwartz, D., Vye, N., Bransford, J., Moore, A., Petrosino, T. & the Cognition and Technology Group at Vanderbilt (1996). *Doing with understanding: Lessons from research on problem and project based learning.* Manuscript submitted for publication to the *Journal of Learning Sciences.*

Barron, B.J., Vye, N.J., Goldman, S.R., Pellegrino, J.W. & the Cognition and Technology Group at Vanderbilt. (1995). *A SMART model of new standards and assessments in mathematics.* Paper presented at the International Conference on Standards and Assessment, Raleigh-Durham, North Carolina, March.

Barron, B., Vye, N.J., Zech, L., Schwartz, D., Bransford, J.D., Goldman, S.R., Pellegrino, J., Morris, J., Garrison, S. & Kantor, R. (1995). Creating contexts for community-based problem solving: The Jasper Challenge Series. In C. N. Hedley, P. Antonacci & M. Rabinowitz (Eds.), *Thinking and literacy: The mind at work* (pp. 47-71). Hillsdale, NJ: Erlbaum.

Baumann, J.F., Seifert-Kessell, N. & Jones, L.A. (1992). Effect of think-aloud instruction on elementary students' comprehension monitoring abilities. *Journal of Reading Behavior, 24*, 143-172.

Beck, I.L. & Dole, J.A. (1992). Reading and thinking with history and science text. In C. Collins & J.N. Mangieri (Eds.), *Teaching thinking: An agenda for the twenty-first century* (pp. 1-21). Hillsdale, NJ: Erlbaum.

Beck, I.L. & McKeown, M.G. (1992). Young students' social studies learning: Going for depth. In J.J. Dreher & W.H. Slater (Eds.), *Elementary school literacy: Critical issues* (pp. 133-156). Norwood, MA: Christopher-Gordon.

Beck, I.L. & McKeown, M.G. (1994). Outcomes of history instruction: Paste-up accounts. In M. Carretero & J. F. Voss (Eds.), *Cognitive and instructional processes in history and the social sciences* (pp. 237-256). Hillsdale, NJ: Erlbaum.

Bereiter, C. & Bird, M. (1985). Use of thinking aloud in identification and teaching of reading comprehension strategies. *Cognition and Instruction, 2*, 131-156.

Bereiter, C. & Scardamalia, M. (1987). *The psychology of written composition.* Hillsdale, NJ: Erlbaum.

Bereiter, C. & Scardamalia, M. (1989). Intentional learning as a goal of instruction. In L.B. Resnick (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 361-392). Hillsdale, NJ: Erlbaum.

Bereiter, C. & Scardamalia, M. (1993). *Surpassing ourselves: An inquiry into the nature and implications of expertise*. Chicago: Open Court.

Berryman, S.E. (1993). Learning for the workplace. In L. Darling-Hammond (Ed.), *Review of research in education* (pp. 343-401). Washington, DC: AERA.

Bloome, D. & Egan-Robertson, A. (1993). The social construction of intertextuality and classroom reading and writing. *Reading Research Quarterly, 28*(4), 303-333.

Bransford, J.D. (1979). *Human cognition: Learning, understanding, and remembering*. Belmont, CA: Wadsworth Publishing Co.

Bransford, J.D., Franks, J.J., Vye, N.J. & Sherwood, R.D. (1989). New approaches to instruction: Because wisdom can't be told. In S. Vosniadou & A. Ortony (Eds.), *Similarity and analogical reasoning* (pp. 470-497). New York: Cambridge University Press.

Bransford, J.D., Goldman, S.R. & Vye, N.J. (1991). Making a difference in peoples' abilities to think: Reflections on a decade of work and some hopes for the future. In L. Okagaki & R.J. Sternberg (Eds.), *Directors of development: Influences on children* (pp. 147-180). Hillsdale, NJ: Erlbaum.

Bransford, J.D., Hasselbring, T., Barron, B., Kulewicz, S., Littlefield, J. & Goin, L. (1988). Uses of macro-contexts to facilitate mathematical thinking. In R.I. Charles & E.A. Silver (Eds.), *The teaching and assessing of mathematical problem solving* (pp. 125-147). Hillsdale, NJ: Erlbaum and National Council of Teachers of Mathematics.

Bransford, J.D. & Johnson, M.K. (1973). Considerations of some problems in comprehension. In W. Chase (Ed.), *Visual information processing*. New York: Academic Press.

Bransford, J.D., Sherwood, R.S., Vye, N.J. & Rieser, J. (1986). Teaching thinking and problem solving: Research foundations. *American Psychologist, 41*, 1078-1089.

Britt, M.A., Rouet, J-F. & Perfetti, C.A. (1996). Using hypertext to study and reason about historical evidence. In J-F. Rouet, J. Levonen, A. Dillon & R. Spiro (Eds.), *Hypertext and Cognition* (pp. 43-72). Mahwah, NJ: Erlbaum.

Britton, B.K. & Gülgöz, S. (1991). Using Kintsch's computational model to improve instructional text: Effects of repairing inference calls on recall and cognitive structures. *Journal of Educational Psychology, 83*, 329-345.

Britton, B.K., Meyer, B.J., Hodge, M.H. & Glynn, S.M. (1980). Effects of the the organization of text on memory: Tests of retrieval and response criterion hypotheses. *Journal of Experimental Psychology: Human Learning and Memory, 6*, 620-629.

Brown, A., Ash, D., Rutherford, M., Nakagawa, K., Gordon, A. & Campione, J.C. (1993). Distributed expertise in the classroom. In G. Salomon (Ed.), *Distributed cognitions: Psychological and educational considerations* (pp. 188-228). New York: Cambridge University Press.

Brown, A. & Campione, J.C. (1990). Communities of learning and thinking or a context by any other name. *Human Development, 21*, 108-125.

Brown, A. & Campione, J.C. (1994). Guided discovery in a community of learners. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 229-272). Cambridge, MA: MIT Press.

Brown, A. & Campione, J.C. (1996). Psychological theory and the design of innovative learning environments: On procedures, principles, and systems. In L. Schauble & R. Glaser (Eds.), *Innovations in learning: New environments for education* (pp. 289-325). Mahwah, NJ: Erlbaum.

Brown, A. & Palincsar, A.S. (1989). Guided, cooperative learning and individual knowledge acquisition. In L. B. Resnick (Ed.), *Knowing, learning and instruction: Essays in honor of Robert Glaser* (pp. 393-451). Hillsdale, NJ: Erlbaum.

Brown, J.S., Collins, A. & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*, 32-41.

Bruer, J.T. (1993). *Schools for thought*. Cambridge, MA: MIT Press.

Carpenter, P.A., Miyake, A. & Just, M.A. (1994). Working memory constraints in comprehension: Evidence from individual differences, aphasia, and aging. In M. A. Gernsbacher (Ed.), *Handbook of psycholinguistics* (pp. 1075-1122). San Diego, CA: Academic Press.

Cazden, C. B. (1986). Classroom discourse. In M. C. Wittrock (Ed.), *Handbook of research on teaching* (pp. 432-463). New York, NY: Macmillan.

Cazden, C.B. (1988). *Classroom discourse: The language of teaching and learning*. Portsmouth, NH: Heinemann (HEB).

Chambliss, M. (1995). Text cues and strategies successful readers use to consruct the gist of lenghy written arguments. *Reading Research Quarterly, 30*, 778-807.

Chan, C.K.K., Burtis, P.J., Scardamalia, M. & Bereiter, C. (1992). Constructive activity in learning from text. *American Educational Research Journal, 29*, 97-118.

Chi, M.T.H, deLeeuw, N., Chiu, M. & LaVancher, C. (1994). Eliciting self-explanations improves understanding. *Cognitive Science, 18*, 439-477.

Chi, M.T.H., Glaser, R. & Farr, M. (1991). *The nature of expertise*. Hillsdale, NJ: Erlbaum.

Cirilo, R.K. & Foss, D.J. (1980). Text structure and reading time for sentences. *Journal of Verbal Learning and Verbal Behavior, 19*, 96-109.

Cobb, P. (1994). Where is the mind? Constructivist and sociocultural perspectives on mathematical development. *Educational Researcher, 23*(7), 13-20.

Cobb, P., Yackel, E. & Wood, T. (1992). A constructivist alternative to the representational view of mind in mathematics education. *Journal for Research in Mathematics Education, 19*, 99-114.

Cognition and Technology Group at Vanderbilt. (1990). Anchored instruction and its relationship to situated cognition. *Educational Researcher, 19*(6), 2-10.

Cognition and Technology Group at Vanderbilt. (1994). From visual word problems to learning communities: Changing conceptions of cognitive research. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 157-200). Cambridge, MA: MIT Press.

Cognition and Technology Group at Vanderbilt. (1997). *The Jasper project: Lessons in curriculum, instruction, assessment, and professional development*. Mahwah, NJ: Erlbaum.

Collins, A. (1991). Cognitive apprenticeship and instructional technology. In L. Idol & B.F. Jones (Eds.), *Educational values and cognitive instruction: Implications for reform* (pp. 119-136). Hillsdale, NJ: Erlbaum.

Collins, A. (1996). Design issues for learning environments. In S. Vosniadou, E. De Corte, R. Glaser & H. Mandl (Eds.), *International perspectives on the psychological foundations of technology-based learning environments* (pp. 347-362). Hillsdale, NJ: Erlbaum.

Collins, A., Brown, J.S. & Larkin, K.M. (1980). Inference in text understanding. In R.J. Sprio, B.C. Bruce & W.F. Brewer (Eds.), *Theoretical issues in reading comprehension* (pp. 385-407). Hillsdale, NJ: Erlbaum.

Collins, A., Hawkins, J. & Carver, S.M. (1991). A cognitive apprenticeship for disadvantaged students. In B. Means, C. Chelemer & M. S. Knapp (Eds.), *Teaching advanced skills to at-risk students* (pp. 216-243). San Francisco: Jossey-Bass.

Coté, N. (1997). *On learning from expository text: Understanding students' processing and construction of representations.* In progress Ph.D dissertation, Vanderbilt University.

Coté, N. & Goldman, S.R. (in press). Building representations of informational text: Evidence from children's think-aloud protocols. To appear in H. van Oostendorp & S.R. Goldman (Eds.), *The construction of mental representations during reading.* Mahwah, NJ: Erlbaum.

Coté, N., Goldman, S.R. & Saul, E.U. (1997). *Students making sense of expository text: Relations between processing and learning. Discourse Processes.*

Daneman, M. & Carpenter, P.A. (1980). Individual differences in working memory and reading. *Journal of Verbal Learning and Verbal Behavior, 19,* 450-466.

Detterman, D.K. & Sternberg, R.J. (1993). *Transfer on trial: Intelligence, cognition and instruction.* Norwood, NJ: Ablex.

Dewey, J. (1913). *Interest and effort in education.* Boston: Riverside.

Dewey, S. (1933). *How we think, "a restatement" of the relation of reflective thinking to the educative process.* Boston: Heath.

Duffy, G.G., Roehler, L.R., Sivan, E., Rackliffe, G., Book, C., Meloth, M., Vavrus, L., Wesselman, R., Putnam, J. & Bassiri, D. (1987). Effects of explaining the reasoning associated with using reading strategies. *Reading Research Quarterly, 22,* 347-368.

d'Ydewalle, G. & Rosselle, H. (1978). Test expectations in text learning. In M.M. Gruneberg, P.E. Morris & R.N. Sykes (Eds.), *Practical aspects of memory* (pp. 609-617). London: Academic.

Ericsson, K.A. & Kintsch, W. (1995). Long-term working memory. *Psychological Review, 102,* 211-245.

Fitzgerald, J. & Teasley, A. (1986). Effects of instruction in narrative structure on children's writing. *Journal of Educational Psychology, 78,* 424-433.

Foltz, P.W. (1996). Comprehension, coherence and strategies in hypertext and linear text. In J.F. Rouet, J.J. Levonen, A.P. Dillon & R.J. Spiro (Eds.), *Hypertext and cognition* (pp. 109-136). Hillsdale, NJ: Erlbaum.

Frederiksen, C.H. (1975). Representing logical and semantic structure of knowledge acquired from discourse. *Cognitive Psychology, 7,* 371-458.

Garner, R. (1987). *Metacognition and reading comprehension.* Norwood, NJ: Ablex.

Garner, R., Alexander, P.A., Gillingham, M.G., Kulikowich, J.M. & Brown, R. (1991). Interest and learning from text. *American Educational Research Journal, 28,* 643-660.

Garner, R. & Gillingham, M.G. (1992). Topic knowledge, cognitive interest, and text recall: A microanalysis. *Journal of Experimental Education 59,* 310-319.

Garner, R., Gillingham, M.D. & White, C.S. (1989). Effects of "seductive details" on macroprocessing and microprocessing in adults and children. *Cognition and Instruction, 6,* 41-57.

Garner, R. & Reis, R. (1981). Monitoring and resolving comprehension obstacles: An investigation of spontaneous lookbacks among upper-grade good and poor comprehenders. *Reading Research Quarterly, 16,* 569-582.

Gernsbacher, M.A. (Ed.). (1994). *Handbook of psycholinguistics.* San Diego: Academic Press.

Gibson, E.J. & Levin, H. (1975). *The psychology of reading.* Cambridge, MA: MIT Press.

Givón, T. (1993). Coherence in text, coherence in mind. *Pragmatics and Cognition, 1,* 171-227.

Glaser, R. (1991). Intelligence as an expression of acquired knowledge. In H.A.H. Rowe (Ed.), *Intelligence: Reconceptualization and measurement* (pp. 47-56). Hillsdale, NJ: Erlbaum.

Golding, J.M. & Fowler, S.B. (1992). The limited facilitative effect of typographical signals. *Contemporary Educational Psychology, 17,* 99-113.

Goldman, S.R. (1995). Writing as a tool for thinking and reasoning. *Issues in Education: Contributions from Educational Psychology, 1*(2), 199-204.

Goldman, S.R. (1996). Reading, writing, and learning in hypermedia environments. In H. Van Oostendorp & S. de Mul (Eds.), *Cognitive aspects of electronic text processing* (pp. 7-42). Norwood, NJ: Ablex.

Goldman, S.R., Coté, N. & Saul, E.U. (1994). *Children's strategies for making sense of informational text.* Paper presented at the Fifth Annual Winter Text Conference, Jackson Hole, WY, January.

Goldman, S.R., Hogaboam, T., Bell, L.C. & Perfetti, C.A. (1980). Short term retention of discourse during reading. *Journal of Educational Psychology, 72,* 647-655.

Goldman, S.R. & Murray, J.D. (1992). Knowledge of connectors as cohesion devices in text: A comparative study of native-English language and English-as-a-second-language speakers. *Journal of Educational Psychology, 84,* 504-519.

Goldman, S.R. & Pellegrino, J.W. (1987). Information processing and educational microcomputer technology: Where do we go from here? *Journal of Learning Disabilities, 20*(3), 144-154.

Goldman, S.R. & Saul, E.U. (1990). Flexibility in text processing: A strategy competition model. *Learning and Individual Differences, 2,* 181-219.

Goldman, S.R., Saul, E.U. & Coté, N. (1995). Paragraphing, reader, and task effects on discourse comprehension. *Discourse Processes, 20,* 273-305.

Goldman, S.R. & Varma, S. (1995). CAPping the construction-integration model of discourse comprehension. In C. Weaver, S. Mannes & C. Fletcher (Eds.), *Discourse*

comprehension: Essays in honor of Walter Kintsch (pp. 337-358). Hillsdale, NJ: Erlbaum.

Goldman, S.R., Varma, S. & Coté, N. (1996). Extending capacity-constrained construction integration: Toward "smarter" and flexible models of text comprehension. In B.K. Britton & A.C. Graesser (Eds.), *Models of text comprehension*. Hillsdale, NJ: Erlbaum.

Goldman, S.R. & Varnhagen, C.K. (1986). Memory for embedded and sequential story structures. *Journal of Memory and Language, 25*, 401-418.

Graesser, A.C., Gernsbacher, M.A. & Goldman, S.R. (1997). Cognition. In T. Van Dijk (Ed.), *Discourse: A multidisciplinary introduction* (pp. 292-319). London: Sage.

Graesser, A.C., Higginbotham, M.W., Robertson, S.P. & Smith, W.R. (1978). A natural inquiry into the National Enquirer: Self-induced versus task-induced reading comprehension. *Discourse Processes, 1*, 355-372.

Graesser, A.C., Hoffman, N.L. & Clark, L.F. (1980). Structural components of reading time. *Journal of Verbal Learning and Verbal Behavior, 19*, 135-151.

Graesser, A.C., Singer, M. & Trabasso, T. (1994). Constructing inferences during narrative text comprehension. *Psychological Review, 101*, 371-395.

Graham, E. (1997). When terrible twos become terrible teens. *The Wall Street Journal*, February 5, B1, B8.

Green, J.L. & Harker, J.O. (Eds.).(1988). *Multiple perspective analyses of classroom discourse*. Norwood, NJ: Ablex.

Green, J.L. & Wallat, C. (Eds.). (1981). *Ethnography and language in educational settings*. Norwood, NJ: Ablex.

Haenggi, D. & Perfetti, C.A. (1992). Individual differences in reprocessing of text. *Journal of Educational Psychology, 84*, 182-192.

Hare, V.C. & Smith, D.C. (1982). Reading to remember: Studies of metacognitive reading skills in elementary school-aged children. *Journal of Educational Research, 75*, 157-164.

Hartman, D. (1995). Eight readers reading: The intertextual links of proficient readers reading multiple passages. *Reading Research Quarterly, 30*(3), 520-561.

Hiebert, E.H. & Raphael, T.E. (1996). Psychological persepctives on literacy and extensions ot educational practice. In D. C. Berliner & R. C. Calfee (Eds.), *Handbook of educational psychology* (pp. 550-602). New York: Simon & Shuster MacMillan.

Hynd, C.R., Stahl, S.A. & McNish, M. (1996). *Group processes involved in studying multiple documents in history*. Unpublished manuscript, University of Georgia, Athens.

Johnson-Laird, P.N. (1983). *Mental models*. Cambridge, MA: Harvard University Press.

Just, M.A. & Carpenter, P.A. (1980). A theory of reading: From eye fixations to comprehension. *Psychological Review, 87*, 329-354.

Just, M.A. & Carpenter, P.A. (1992). A capacity theory of comprehension: Individual differences in working memory. *Psychological Review, 99*, 122-149.

Kieras, D.E. (1981). The role of major referents and sentence topics in the construction of passage macrostructure. *Discourse Processes, 4*, 1-15.

Kintsch, E. (1990). Macroprocesses and microprocesses in the development of summarization skill. *Cognition and Instruction, 7*, 161-195.

Kintsch, W. (1974). *The representation of meaning in memory*. Hillsdale, NJ: Erlbaum.

Kintsch, W. (1988). The role of knowledge in discourse comprehension: A construction-integration model. *Psychological Review, 95*, 163-182.

Kintsch, W., Britton, B.K., Fletcher, C.R., Kintsch, E., Mannes, S.M. & Nathan, M.J. (1993). A comprehension-based approach to learning and understanding. In D.L. Medin (Ed.), *The psychology of learning and motivation: Advances in research and theory* Vol. 30 (pp. 165-214). New York: Academic Press.

Kintsch, W. & Keenan, J. (1973). Reading rate and retention as a function of the number of propositions in the base structure of sentences. *Cognitive Psychology, 5*, 257-274.

Kintsch, W., Kozminsky, E., Streby, W.J., McKoon, G. & Keenan, J.M. (1975). Comprehension and recall of text as a function of context variable. *Journal of Verbal Learning and Verbal Behavior, 14*, 158-169.

Kintsch, W. & van Dijk, T.A. (1978). Toward a model of text comprehension and production. *Psychological Review, 85*, 363-394.

Kletzien, S.B. (1991). Strategy use by good and poor comprehenders reading expository text of differing levels. *Reading Research Quarterly, 26*, 67-86.

LaBerge, D. & Samuels, S.J. (1974). Toward a theory of automatic information processing in reading. *Cognitive Psychology, 6*, 293-323.

Lamon, M., Secules, T.J., Petrosino, T., Hackett, R., Bransford, J.D. & Goldman, S.R. (1996). Schools for thought: Overview of the project and lessons learned from one of the sites. In L. Schauble & R. Glaser (Eds.), *Innovations in learning: New environments for education* (pp. 243-288). Mahwah, NJ: Erlbaum.

Langer, J.A. (1986). *Children reading and writing: Structure and strategies*. Norwood, NJ: Ablex.

Lorch, R.F., Jr. (1989). Text signaling devices and their effects on reading and memory processes. In *Educational psychology review* Vol. 1 (pp. 209-234). NY: Plenum.

Lorch, R.F. & Chen, A.H. (1986). Effects of number signals on reading and recall. *Journal of Educational Psychology, 78*, 263-270.

Magliano, J.P., Zwaan, R.A. & Graesser, A.C. (In press). The role of situational continuity in narrative understanding. To appear in H. Van Oostendorp & S.R. Goldman (Eds.), *The construction of mental representations during reading*. Mahwah, NJ: Erlbaum.

Manelis, L. (1980). Determinants of processing for propositional structures. *Memory & Cognition, 8*, 49-57.

McCombs, B.L. (1991). Motivation and lifelong learning. *Educational Psychologist, 26*, 117-127.

McCombs, B.L. (1996). Alternative perspectives for motivation. In L. Baker, P. Afflerbach & D. Reinking (Eds.), *Developing engaged readers in school and home communities* (pp.67-87). Mahwah, NJ: Erlbaum.

McCombs, B.L. & Whisler, J.S. (1989). The role of affective variables in autonomous learning. *Educational Psychologist, 24*(3), 227-306.

McGee, L.M. (1982). Awareness of text structure: Effects on children's recall of expository texts. *Reading Research Quarterly, 17*, 581-590.

McGinley, W. (1992). The role of reading and writing while composing from sources. *Reading Research Quarterly, 27*(3), 226-249.

McNamara, D.S., Kintsch, E., Songer, N.B. & Kintsch, W. (1996). Are good texts always better? Interactions of text coherence, background knowledge, and levels of understanding in learning from text. *Cognition and Instruction, 14*, 1-43.

McNamara, D.S. & Kintsch, W. (1996). Learning from texts: Effects of prior knowledge and text coherence. *Discourse Processes, 22*, 247-288.

McNamara, D.S., Kintsch, E., Songer, N.B. & Kintsch, W. (1996). Are good texts always better? Interactions of text coherence, background knowledge, and levels of understanding in learning from text. *Cognition and Instruction, 14*, 1-43.

Meyer, B.J.F. (1975). *The organization of prose and its effects on memory*. Amsterdam: North-Holland Publishing.

Meyer, B.J.F. (1977). What is remembered from prose: A function of passage structure. In R. D. Freedle (Ed.), *Discourse production and comprehension: Advances in research and theory* (pp. 307-336). Norwood, NJ: Ablex.

Meyer, B.J.F., Brandt, D.M. & Bluth, G.J. (1980). Use of top-level structure in text: Key for reading comprehension of ninth-grade students. *Reading Research Quarterly, 16*, 72-103.

Meyer, B.J.F. & Rice, G.E. (1982). The interaction of reader strategies and the organization of text. *Text: An Interdisciplinary Journal for the Study of Discourse, 2*, 155-192.

Meyers, J., Lytle, S., Palladino, D., Devenpeck, G. & Green, M. (1990). Think-aloud protocol analysis: An investigation of reading comprehension strategies in fourth- and fifth-grade students. *Journal of Psychoeducational Assessment, 8*, 112-127.

Millis, K. & Simon, S. (1994). Rereading scientific texts: Changes in resource allocation. In H. van Oostendorp & R.A. Zwan (Eds.), *Naturalistic text comprehension* (pp. 115-133). Norwood, NJ: Ablex.

Mills, C.B., Diehl, V.A., Birkmire, D.P. & Mou, L-C. (1995). Procedural text: Predictions of importance ratings and recall by models of reading comprehension. *Discourse Processes, 16*, 279-316.

Murnane, R.J. & Levy, F. (1996a). What General Motors can teach U. S. Schools about the proper role of market in education reform. *Phi Delta Kappan, 78*, 108-114.

Murnane, R.J. & Levy, F. (1996b). *Teaching the new basic skills: Principles for educating children to thrive in a changing economy*. New York: Free Press.

National Assessment of Educational Progress (NAEP). (1983). *The third national mathematics assessment: Results, trends and issues*. Report No. 13-MA-01, Educational Commission of the States, Denver, CO.

National Assessment of Educational Progress (NAEP). (1988). *Who reads best*? Princeton, NJ: Educational Testing Service.

Olhausen, M.M. & Roller, C.M. (1988). The operation of text structure and content schemata in isolation and in interaction. *Reading Research Quarterly, 23*, 70-88.

Palincsar, A.S. & Brown, A.L. (1984). Reciprocal teaching of comprehension-fostering and comprehension monitoring activities. *Cognition and Instruction, 1*, 117-175.

Palincsar, A.S. & Klenk, L.J. (1991). Dialogues promoting reading comprehension. In B. Means, C. Chelemer & M.S. Knapp (Eds.), *Teaching advanced skills to at-risk students* (pp. 112-131). San Francisco, CA: Jossey-Bass.

Paris, S.G. & Oka, E.R. (1986). Self-regulated learning among exceptional children. *Exceptional Children, 53*, 103-108.

Perfetti, C.A. (1989). There are generalized abilities and one of them is reading. In L.B. Resnick (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 307-333). Hillsdale, NJ: Erlbaum.

Perfetti, C.A. (1994). Psycholinguistics and reading ability. In M.A. Gernsbacher (Ed.), *Handbook of psycholinguistics* (pp. 849-894). San Diego, CA: Academic.

Perfetti, C.A., Britt, M.A. & Georgi, M.C. (1995). *Text-based learning and reasoning: Studies in history*. Hillsdale, NJ: Erlbaum.

Perfetti, C.A. & Goldman, S.R. (1976). Discourse memory and reading comprehension skill. *Journal of Verbal Learning and Verbal Behavior, 14*, 33-42.

Perfetti, C.A. & Lesgold, A.M. (1977). Discourse comprehension and sources of individual differences. In M. Just & P. Carpenter (Eds.), *Cognitive processes in comprehension* (pp. 141-183). Hillsdale, NJ: Erlbaum.

Phillips, L.M. (1988). Young readers' inference strategies in reading comprehension. *Cognition and Instruction, 5*, 193-202.

Pressley, M. & Afflerbach, P. (1995). *Verbal protocols of reading: The nature of constructively responsive reading*. Hillsdale, NJ: Erlbaum.

Pressley, M. & McCormick, C.B. (1995). *Advanced educational psychology: For educators, researchers, and policymakers*. New York: HarperCollins.

Pressley, M., Schuder, T., SAIL Faculty and Administration, Bergman, J.L. & El-Dinary, P.B. (1992). A researcher-educator collaborative interview study of transactional comprehension strategies instruction. *Journal of Educational Psychology, 84*, 231-246.

Resnick, L.B. & Klopfer, L.E. (Eds.) (1989). *Toward the thinking curriculum: Current cognitive research*. Alexandria, VA: ASCD.

Richgels, D.J., McGee, L.M., Lomax, R.G. & Sheard, C. (1987). Awareness of four text strutures: Effects in recall of expository text. *Reading Research Quarterly, 22*, 177-196.

Roschelle, J. (1992). Learning by collaboration: Convergent conceptual change. *The Journal of the Learning Sciences, 2*, 235-276.

Rouet, J.F., Britt, M.A., Mason, R.A. & Perfetti, C.A. (1996). Using multiple sources of evidence to reason about history. *Journal of Educational Psychology, 88*, 478-493.

Rouet, J.F., Levonen, J.J., Dillon, A. & Spiro, R.J. (Eds.). (1996). *Hypertext and cognition*. Mahwah, NJ: Erlbaum.

Rowe, D.W. (1994). *Preschoolers as authors: Literacy learning in the social world of the classroom*. Cresskill, NJ: Hampton Press.

Saul, E.U., Coté, N. & Goldman, S.R. (1993). *Students' strategies for making text make sense*. Paper presented at the annual meeting of the American Educational Research Association, Atlanta, GA, April.

Scardamalia, M. & Bereiter, C. (1984). Development of strategies in text processing. In H. Mandl, N.L. Stein & T. Trabasso (Eds.), *Learning and comprehension of text* (pp. 379-406). Hillsdale, NJ: Erlbaum.

Scardamalia, M. & Bereiter, C. (1991a). Higher levels of agency for children in knowledge building: A challenge for the design of new knowledge media. *Journal of the Learning Sciences, 1*, 37-68.

Scardamalia, M. & Bereiter, C. (1991b). Literate expertise. In K.A. Ericsson & J. Smith (Eds.), *Toward a general theory of expertise: Prospects and limits* (pp. 172-194). New York: Cambridge University Press.

Scardamalia, M., Bereiter, C. & Lamon, M. (1994). The CSILE Project: Trying to bring the classroom into world 3. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 201-228). Cambridge, MA: MIT Press/Bradford Books.

Scardamalia, M., Bereiter, C., McLean, R.S., Swallow, J. & Woodruff, E. (1989). Computer-supported intentional learning environments. *Journal of Educational Computing Research, 5*, 51-68.

Schank, R.C. (1972). Conceptual dependency: A theory of natural language understanding. *Cognitive Psychology, 3*, 552-631.

Schiefele, U. & Krapp, A. (1996). Topic interest and free recall of expository text. *Learning and Individual Differences, 8*(2), 141-160.

Schmalhofer, F. & Glavanov, D. (1986). Three components of understanding a programmer's manual: Verbatim, propositional, and situational representations. *Journal of Memory and Language, 25*, 279-294.

Secules, T., Cottom, C.D., Bray, M.H., Miller, L.D. & the Cognition and Technology Group at Vanderbilt (1997). Schools for Thought: Creating learning communities. *Educational Leadership, 54*(6), 56-60.

Senge, P. (1990). *The fifth discipline: The art and practice of the learning organization.* New York: Currency Doubleday.

Short, K. (1992). Researching intertextuality within classroom learning environments. *Linguistics and Education, 4*(3-4), 313-334.

Spiro, R.J., Feltovich, P.L., Jacobson, M.J. & Coulson, R.L. (1991). Cognitive flexibility, constructivism, and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. *Educational Technology, 31*(5), 24-33.

Spivey, N. & King, J. (1989). Readers as writers: Composing from sources. *Reading Research Quarterly, 24*(1), 7-26.

Stahl, S.A., Hynd, C.R., Britton, B.K. & McNish, M.M. (1996). *What happens when students read multiple source documents in history*? Unpublished manuscript, University of Georgia, Athens.

Swanson, H.L. (1992). Generality and modifiability of working memory among skilled and less skilled readers. *Journal of Educational Psychology, 84*, 473-488.

Tierney, R.J., Readence, J.E. & Dishner, E.K. (1990). *Reading strategies and practices: A compendium.* Boston, MA: Allyn & Bacon.

Trabasso, T. & Magliano, J. (1996). Conscious understanding during comprehension. *Discourse Processes, 22*, 255-287.

Trabasso, T. & Sperry, L. (1985). Causal relatedness and importance of story events. *Journal of Memory and Language, 24*, 595-611.

Trabasso, T., Suh, Payton, P. & Jain, R. (1995). Explanatory inferences and other strategies during comprehension and their effect on recall. In R.F. Lorch & E.J. O'Brien (Eds.), *Sources of coherence in reading* (pp. 219-239). Hillsdale, NJ: Erlbaum.

Trabasso, T. & van den Broek, P. (1985). Causal thinking and the representation of narrative events. *Journal of Memory and Language, 24*, 612-630.

U.S. Department of Labor. (1992). *Secretary's Commission on achieving necessary skills report for American 2000*. Washington, D.C.: Author.

van Dijk, T.A. & Kintsch, W. (1983). *Strategies of discourse comprehension*. New York: Academic Press.

van Oostendorp, H. & de Mul, S. (Eds.). (1996). *Cognitive aspects of electronic text processing*. Norwood, NJ: Ablex.

Varnhagen, C. K. (1991). Text relations and recall for expository prose. *Discourse Processes, 14*(4), 399-422.

Varnhagen, C.K. & Goldman, S.R. (1986). Improving comprehension: Causal relations instruction for learning handicapped learners. *Reading Teacher*, May, 896-904.

Vidal-Abarca, E. (1992). Important information in expository prose: The role of awareness of textual structure and of the skill in ranking ideas in a text. In B. van Hout-Wolters & W. Schnotz (Eds.), *Text comprehension and learning from text* (pp. 35-52). Berwyn, PA: Swets & Zeitlinger.

Voss, J.F. (1984). On learning and learning from text. In H. Mandl, N.L. Stein & T. Trabasso (Eds.), *Learning and comprehension of text* (pp. 193-212). Hillsdale, NJ: Erlbaum.

Wade, S. E. (1992). How interest affects learning from text. In K.A. Renninger, S. Hidi & A. Krapp (Eds.), *The role of interest in learning and development* (pp. 255-277). Hillsdale, NJ: Erlbaum.

Wade, S.E. & Adams, R.B. (1990). Effects of importance and interest on recall of biographical text. *Journal of Reading Behavior, 22*, 331-353.

Wade, S., Buxton, W. & Kelly, M. (1993). *What text characteristics create interest for readers*. Paper presented at the annual meeting of the American Educational Research Association, Atlanta, GA, April.

Wade, S.E., Schraw, G., Buxton, W.M. & Hayes, M.T. (1993). Seduction of the strategic reader: Effects of interest on strategies and recall. *Reading Research Quarterly, 28*, 93-114.

Webb, N.M. & Palincsar, A.S. (1996). Group processes in the classroom. In D.C. Berliner & R.C. Calfee (Eds.), *Handbook of educational psychology* (pp. 841-873). New York: Macmillan.

Wertsch, J.V. & Bivens, J. (1992). The social origins of individual mental functioning: Alternatives and perspectives. *Quarterly Newsletter of the Laboratory of Comparative Human Cognition, 14*(2), 35-44.

Whitehead, A.N. (1929). *The aims of education*. New York: MacMillan.

Wise, A.E. (1996). Building a system of quality assurance for the teaching profession: Moving into the 21st century. *Phi Delta Kappan, 78*(3), 190-192.

Yuill, N. & Oakhill, J. (1988). Understanding of anaphoric relations in skilled and less skilled comprehenders. *The British Journal of Psychology, 79*, 173-186.

Zwaan, R.A., Magliano, J.P. & Graesser, A.C. (1995). Dimensions of situation model construction in narrative comprehension. *Journal of Experimental Psychology: Learning, Memory and Cognition, 21*, 386-397.