are answered by the text, (2) identifying words that need to be clarified, (3) summ
text, and (4) predicting what will come next in a text. Although these skills have lon
part of reading comprehension programs taught to millions of students, we are just b
ning to understand how these skills are related to the process of reading comprehen
In this chapter, we explore three kinds of knowledge suggested by Brown, Campio
and Day (1981) that a reader might use in the process of "effort after meaning":

Content knowledge: refers to information about the subject domain of the passage and
discussed in the section "Using Prior Knowledge."

Strategic knowledge: refers to the reader's collection of procedures for learning more ef
tively. These procedures are discussed in the sections "Using Prose Structure" and
"Making Inferences."

Metacognitive knowledge: refers to the reader's awareness of her own cognitive process
and whether she is successfully meeting the demands of the task. These skills include
comprehension monitoring, which is explored in the section "Using Metacognitive
Knowledge."

In particular, we focus on the cognitive processes of using prior knowledge, using pr
structure, making inferences, and using metacognitive knowledge.

Using Prior Knowledge

WHAT IS THE READER'S PERSPECTIVE?

One of the most persistent findings in the literature on adult prose learning is that peop
prior knowledge about the topic of a passage influences what they remember from the
passage. The reader's perspective includes the prior knowledge that the reader uses t
understand the passage. What is remembered seems to depend both on what is presente
in the passage and on what perspective the reader brings to the reading task.

RESEARCH ON DIFFERENCES IN READERS' PRIOR KNOWLEDGE

Differences in the Amount of Prior Knowledge As an example of the role of pri
knowledge, consider the passage shown in the top of Figure 3–4. Bransford and Johnso
(1972) asked college students to read this passage, to rate its comprehensibility (1 is low
and 7 is high), and to recall it. Some students were given a title ("Washing Clothes") before
they read the passage, other students were given the title after they had read the passage,
and still others were given no title at all. The table at the bottom of Figure 3–4 shows the
performance of the three groups on the recall and comprehension rating tasks. The group
that had the title before reading had a much higher comprehension score and recalled
about twice as much as the other groups. Apparently, giving students the title of the
passage allowed them to relate the new information to their prior knowledge about
washing clothes; providing the title after reading or not at all left the reader without a wa
of meaningfully relating the new information to prior knowledge during reading.

Similar results have been obtained in studies with younger readers. Pearson, Hanse
and Gordon (1979) asked second graders to read a passage on spiders. Although all of th

FIGURE 3–4 The "Washing Clothes" passage

THE PASSAGE

The procedure is actually quite simple. First you arrange items into different groups. Of course one pile may be sufficient, depending on how much there is to do. If you have to go somewhere else due to lack of facilities, that is the next step; otherwise, you are pretty well set. It is important not to overdo things. That is, it is better to do too few things at once than too many. In the short run this may not seem important, but complications can easily arise. A mistake can be expensive as well. At first, the whole procedure will seem complicated. Soon, however, it will become just another facet of life. It is difficult to foresee any end to the necessity for this task in the immediate future, but then, one never can tell. After the procedure is completed, one arranges the materials into different groups again. Then they can be put into their appropriate places. Eventually they will be used once more, and the whole cycle will then have to be repeated. However, that is part of life.

COMPREHENSION AND RECALL SCORES FOR THE PASSAGE

	No Topic	*Topic After*	*Topic Before*	*Maximum Score*
Comprehension ratings	2.29	2.12	4.50	7.00
Number of idea units recalled	2.82	2.65	5.83	18.00

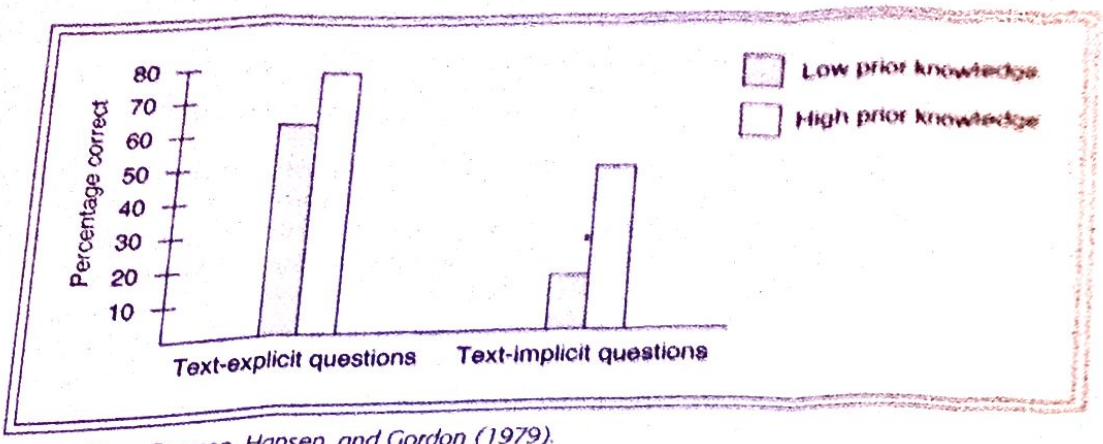
Source: Reprinted from Journal of Verbal Learning and Verbal Behavior, 61, Bransford, J. D., & Johnson, M. K., Contextual prerequisites for understanding: Some investigations of comprehension and recall, p. 722, Copyright 1972, with permission from Elsevier.

children were classified as good readers based on their scores on standardized reading comprehension tests, half of the students knew a lot about spiders and half did not. After reading the spider passage, the children answered text-explicit questions that dealt with information specifically presented in the passage, such as "What does Webby bite insects with?" and text-implicit questions that required inferences, such as "What part of Webby's body is nearly the same as part of a snake's body?" Figure 3–5 shows that the high-knowledge readers scored almost three times better than the low-knowledge readers on questions requiring inference and about 25% better on questions requiring retention of facts. These results are consistent with the idea that good reading skill is not the sole determinant of what is learned from reading a passage. In addition, the knowledge that the reader brings to the reading situation seems to influence heavily the reader's ability to make inferences about the material.

Marr and Gormley (1982) also found evidence that prior knowledge tends to enhanc readers' inference-making performance more than simple retention of facts. Fourt graders were asked to read either familiar or unfamiliar passages about sports, and the asked to retell the story and to answer some questions. The familiar passage concern baseball:

FIGURE 3–5

Effects of background knowledge on reading comprehension and retention



Adapted from Pearson, Hansen, and Gordon (1979).

Baseball is a summer game. Usually it is played outdoors on a field. Baseball is a team sport that has nine players. A baseball has a rubber center that is covered with both string and leather. The pitcher winds up and throws the baseball to the batter. Then the batter tries to hit the ball out of the baseball field. A run is made each time a baseball batter hits the ball, runs all three bases, and touches home plate. A game is won by the team scoring the most runs. This game is an exciting sport.

The Unfamiliar passage concerned curling:

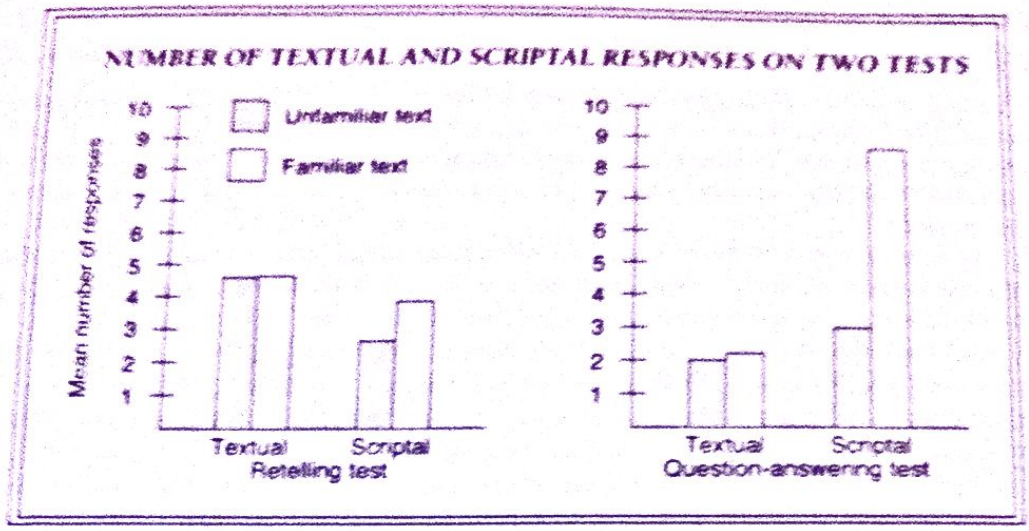
Curling is a winter game. Usually it is played indoors on the ice. Curling is a team sport that has four players. A curling stone is a round rock that has a handle on the top. The curler slides the stone down the ice toward colored circles. The team captain or skip stands at the end with these circles. A point is scored each time the curling stone is thrown, aimed toward the skip, and stops on a colored circle. A game is won by the team scoring the most points. This game is an unusual sport.

Responses were scored as "textual" if they referred to material in the text and as "scriptal" if they involved inferences. As you can see in Figure 3–6, the differences between the familiar and unfamiliar texts were not great for textual responses on the retelling and question-answering tasks; however, the familiar texts generated considerably more scriptal responses as compared to the unfamiliar text for both the retelling and question-answering tasks. Again, it appears that prior knowledge has its strongest effects on helping readers make useful inferences rather than on simply retaining facts.

Differences in the Kinds of Prior Knowledge Figure 3–7 presents another passage for you to read. Suppose I asked you to read the passage from the perspective of a potential homebuyer. Alternatively, suppose I asked you to read it from the perspective of a burglar. Would what you remembered from the passage be influenced by your perspective—homebuyer versus burglar—while reading the passage? Pichert and Anderson (1977) asked students to read the house passage from the perspective of a potential homebuyer or burglar or with no perspective instructions. Students' recall of details from the passage was greatly influenced by their perspective while reading. For example, details such as when the father keeps the coin collection were better recalled by the students who had read with

FIGURE 3–6

Effects of familiar and unfamiliar passages on reading comprehension and retention



Adapted from Marr and Gormley (1982).

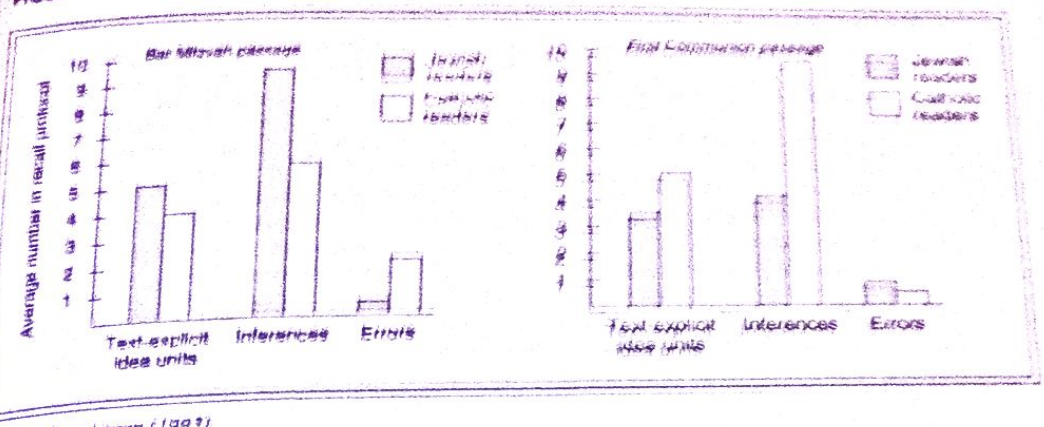
the burglar perspective. These results show that what is learned from reading depends on both the passage and the kind of prior knowledge the reader activates during reading.

In another well-controlled study, Lipson (1983) varied the background knowledge of readers who were all given the same passages to read. The subjects were Jewish and Catholic students in Grades 4, 5, and 6. All were classified as good readers, but they differed in their knowledge of Jewish and Catholic ceremonies. The passages included one titled "Bar Mitzvah" and one titled "First Communion." Students were asked to read and recall the material in the passages. As expected, the Jewish students read the Bar Mitzvah passage faster than the Catholic students, whereas the Catholic students read the First Communion passage faster than the Jewish students. Figure 3–8 (see page 87) summarizes the number of pieces of information correctly recalled (text-explicit recall), the number of correct inferences (inference recall), and the number of errors (error recall). As you can see, readers recalled more text-explicit information, made more inferences, and made fewer errors on passages for which they possessed a large amount of prior knowledge than on passages for which they did not.

IMPLICATIONS FOR INSTRUCTION: PROVIDING PRIOR KNOWLEDGE

The main theme of this section of the chapter is that readers of all ages seem to use their prior knowledge to help them understand what they are reading. The foregoing examples demonstrate that a passage may be difficult to comprehend when the reader lacks an appropriate perspective or has a perspective different from that of the writer. Overall, research on the role of prior knowledge in reading comprehension has consistently "demonstrated strong effects of knowledge on comprehension" (Roller, 1990, p. 83).

FIGURE 3–8 How different perspectives affect what is remembered from the same passage



Adapted from Lipson (1983)

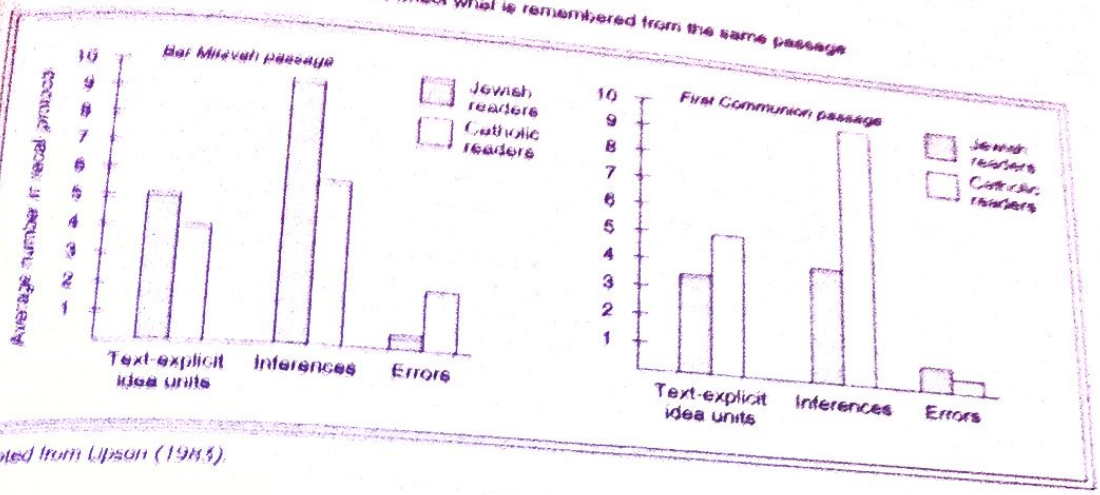
Do students come to such a reading task with appropriate prior knowledge? To answer this question, McKeown and Beck (1990) interviewed elementary school children before they took a course in American history. Although their textbooks assumed that the readers possessed adequate background knowledge, McKeown and Beck found that the students had only a small part of the needed background knowledge and that this knowledge was not well interconnected.

To examine the role of providing background knowledge in aiding comprehension, Beck et al. (1991) rewrote the passage on the French and Indian War to contain appropriate background knowledge. For example, the original first sentence in the text was replaced with the following seven sentences:

> About 250 years ago, Britain and France both claimed to own some of the same land, here, in North America. This land was just west of where the 13 colonies were. In 1756, Britain and France went to war to see who would get control of this land. Because the 13 American colonies belonged to Britain, the colonists fought on the same side as Britain. Many Indians fought on the same side as France. Because we were fighting against the French and Indians, the war has come to be known as the French and Indian War. The war ended in 1763. (p. 257)

As you can see, the first sentence is intended "to activate a conflict schema in the reader's mind" (p. 257), so the reader can understand that the motive for the war was that two parties wanted to possess the same object. Activating this schema can help the reader see how the pieces of information fit together. The first and second sentences also set the time and place for the conflict episode in a way that is familiar to the reader. The third sentence explicitly shows how the war was a result of the conflict introduced in the first sentence.

FIGURE 3–8 How different perspectives affect what is remembered from the same passage



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[illegible] sentences explain who fought on which side and why, and how the war [illegible] results.

The [illegible] sentences in the original text were "As a result of this war France was [illegible] North America. Britain would now rule Canada and other lands that [illegible] to France" (Beck et al., 1991, p. 258). According to Beck and colleagues, the problem with this text is that it begins by talking about the loser and uses the unfamiliar wording "[illegible] North America." To activate appropriate prior knowledge, they revised the [illegible] sentences: "Britain won the war. Now Britain had control of North America, [illegible] the French had to leave North America" (p. 259). This wording is intended to [illegible] an important slot in the child's conflict schema, namely the "winner." The child [illegible] prior knowledge about winning a conflict to understand that Britain won the [illegible] of North America and that France had to give up control of North America.

Beck et al. (1991) asked fourth- and fifth-grade students to read either the original versions of four American history lessons, including one on the French and [illegible] war, or the revised lessons. After they were asked to recall the information in the lessons, students who had read the original lesson remembered 44% of the key facts in the original lesson, whereas those who had read the revised lesson remembered 58%. On an open-ended question requiring them to recall everything they could remember covering the material in the original lesson, students who read the revised lesson had 40% correct, whereas those who read the original lesson had 29% correct.

In a follow-up study using the same text, McKeown, Beck, Sinatra, and Loxterman (1992) found that students who read some background information (e.g., material explaining that Britain was the owner of the colonies) were better able to remember [illegible] questions about the original passage than were students who had not received [illegible] information. Taken together, these results provide strong evidence that [illegible] are better when they can use their background knowledge to understand a text. [illegible] educational implication is that the teacher should play a central role in helping [illegible] the appropriate background knowledge for making sense out of text. Hoskins (1980) and McKeown (1994) pointed out that "many teachers need assistance, because at the elementary level, few have the background in subject matter that allows them to [illegible] sections of the texts and provide students with the kind of enhanced information [illegible]."

Another way to help prime young readers' prior knowledge while reading is to ask [illegible] questions that focus on what the text is saying. For example, Glenberg et al. (2004) asked [illegible] to read stories and then recall them. For example, one story titled "Bres[illegible]" consisted of seven sentences (p. 436):

[illegible] went to feed the animals.
[illegible] climbed down the hole.
[illegible] ate hay.
[illegible] took some chicken.
[illegible] went up to the cart.
[illegible] gave apples to the pig.
[illegible] animals are happy now.

Students who simply read and reread the story (control group) remembered a [illegible] information sentences from the story (i.e., the second, third, fourth, fifth, and [illegible] sentences).

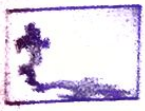
In contrast, some children (activity group) were given toy objects corresponding to elements in the story. They read each sentence, but after each of the major sentences, they were instructed to manipulate the objects to correspond to the action in the sentence (such as putting hay near the goat for the third sentence). Overall, these children recalled 55% of the major sentences. In another study, children who were asked to simply imagine manipulating the objects to correspond to the action in each major sentence, also remembered many more of the major sentences (64%) than children who read the story twice (30%).

Why is reading comprehension improved by physically or mentally acting out the sentences with concrete objects? Based on theories of embodied cognition, Glenberg et al. (2004) argue that language becomes meaningful through bodily activity, such as simulating what the sentence is saying with your hands. In this way, the meaning is connected with the previously known objects and actions stored in long-term memory. In short, when students physically or mentally act out the actions in stories they are connecting the meaning of the sentences with their prior knowledge. This research provides a promising first step in understanding how to improve reading comprehension by asking readers to simulate the content of sentences.

The implications of these findings for instruction include making sure that reading material is appropriate for the interests and experience of the child. This recommendation is particularly important when children are reading either far above or below their grade level. For example, a student who reads books intended for children who are 3 or 4 years older may be able to decode each sentence, but may lack the necessary prior knowledge to appreciate the theme of the material. Similarly, a student who is reading books intended for children 3 or 4 years younger may be bored with the immature theme of the material.

A related implication is that reading should be integrated with other subject areas. For example, if a topic such as the Mayan Indians in Mexico is covered in social studies, then it might be appropriate to read a folk story about the life of Mayan children. The material learned in the social studies unit could provide the prior knowledge students need to appreciate the folk story.

Finally, classroom discussion and activity can also provide the prior knowledge readers need for comprehending a passage. This kind of prereading activity can help turn unfamiliar passages into familiar ones.



Using Prose Structure

DOES THE READER REMEMBER IMPORTANT INFORMATION?

Another persistent finding in the literature on adult learning from prose is that important information from a passage is remembered better than unimportant information (Gernsbacher, 1994; Johnson, 1970; Kintsch, 1976; Mayer, 1992b; Meyer, 1975; Meyer & McConkie, 1973; Meyer & Poon, 2001). This research suggests that skilled readers know about the macrostructure of the passage—that is, about how the passage may be broken down into main ideas and how the main ideas may be related in a hierarchical outline.

As an example, suppose that we broke a typical story passage into idea units—sentences or phrases that convey one event or action. Then suppose that we asked some skilled adult readers to point out one fourth of the idea units as the least important (rated 1), one fourth

In contrast, some children (activity group) were given toy objects corresponding to elements in the story. They read each sentence, but after each of the major sentences, they were instructed to manipulate the objects to correspond to the action in the sentence (such as putting hay near the goat for the third sentence). Overall, these children recalled 55% of the major sentences. In another study, children who were asked to simply imagine manipulating the objects to correspond to the action in each major sentence, also remembered many more of the major sentences (64%) than children who read the story twice (30%).

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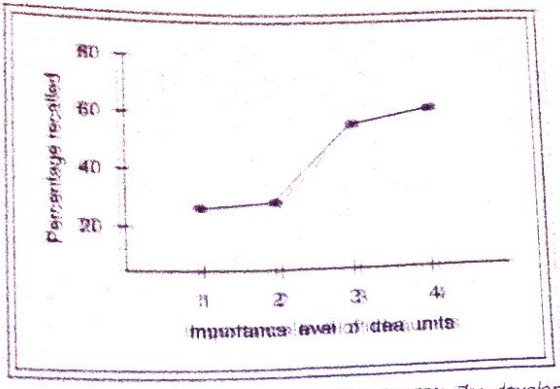
FIGURE 3–9

Percentage recalled by skilled readers for four levels of importance



Source: From Brown, J. S., & Smiley, S. S. (1978). The development of strategies for studying texts. Child Development, 49, 1082. By permission of the Society for Research in Child Development.

as the second least important (rated 2), one fourth as the second most important (rated 3), and one fourth as the most important (rated 4). Now, let's ask some other skilled adult readers to read this story in its normal form and then recall the information. Do you think that they will show a preference for recalling the important information over the unimportant information? Figure 3–9 summarizes the results of just such a study carried out by Brown and Smiley (1978). As shown, the recall of important information is much better than the recall of unimportant information. This pattern, obtained in many studies, can be called a *levels effect* because the level of importance of an idea unit influences its probability of being recalled.

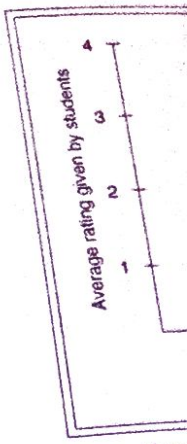
RESEARCH ON DIFFERENCES IN CHILDREN'S USE OF PROSE STRUCTURE

Age-Related Differences in the Use of Prose Structure There is some evidence that more able and older readers have a better awareness of the structure of passages that they read as compared to less able or younger readers. Awareness of structure would be reflected in recognizing and paying attention to information that is important to the theme of the passage. For example, Brown and Smiley (1977) conducted a study using short stories called "The Dragons' Teeth" and "How to Fool a Cat." First, they broke down each story into idea units and asked a group of skilled adult readers to identify one quarter of the idea units as least important (rated 1), one quarter as second least important (rated 2), one quarter as second most important (rated 3), and one quarter as most important (rated 4). Then, Brown and Smiley asked third graders, fifth graders, seventh graders, and college students to rate the importance of each idea unit, using a procedure similar to that just described.

Figure 3–10 gives the average rating for each category by age group. As you can see, the third and fifth graders were not able to recognize which of the idea units were important and which were unimportant; they tended to rate the most important idea units about the

FIGURE 3–10

Average importance ratings for text given by students at four age levels



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