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ABSTRACT
        A study examined how elementary school children
spontaneously construct meaning when reading informational text. In
particular, the study explored: what kinds of knowledge they draw on
and how they use it to help them understand what they read; and how
does what they do influence what they recall. Twenty-nine 6th graders
from two elementary schools in Nashville, Tennessee, were taught to
think aloud as they tried to understand novel information. Subjects'
thinking processes were observed as the children read non-narrative
informational texts on science and nutrition on a computer screen.
These texts were 21-27 sentences in length. Analysis of data showed
that children did not take a passive approach to reading. Instead,
they drew on prior knowledge and experience to construct a coherent
representation of the text information, although a coherent
representation did not necessarily mean an accurate one. Children
also used other activities to make sense of new information. Some of
these activities were: monitoring, integrating across texts, and
paraphrasing or rephrasing content. Further research into the nature
of students' representations and the relationship of these
representations to recall reports is needed. (The experimental texts
are appended.) (JW)

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Children's Use of Prior Knowledge and Experience

in Making Sense of Informational Text

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In the past decade, think-aloud or verbal protocol methods have given researchers a valuable window into the thoughts and actions of adults and children as they read. Information from such methods adds to the store of information on reading that researchers have gained from looking at readers' performance on other process measures such as reading time and eye movements as well as outcome measures such as recall. Among the important findings that have surfaced are that readers who use their knowledge and personal experience to elaborate or explain text content perform better on recall and comprehension tasks than readers who do not (e.g., Chi, Bassok, Lewis, Reimann, & Glaser, 1989; Chi, deLeeuw, Chiu, & LaVancher, in press; Graesser, Singer, & Trabasso, 1994; Trabasso & Magliano, 1994; Trabasso, Suh, Payton, & Jain, in press). Trabasso and his colleagues have found that when adults and third graders read narratives, there are positive relationships between causal explanations, elaborations, and recall (e.g., Trabasso et al., in press). Trabasso and Magliano (1994) recently reported that when their adult subjects read simple narratives that have a clear goal structure, the majority of the thoughts the subjects expressed verbally were causal explanations of the text information. That is, the subjects explained actions and events in the narratives in terms of goals or reasons, and explained goal information in terms of higher-order goals. In addition to explaining, but much less frequently, subjects simply repeated information to maintain it in memory, made associations from prior knowledge to the information, or predicted what would happen next. Trabasso and Magliano (1994) concluded that their subjects activated prior knowledge and information from earlier in the text mainly for the purpose of explaining and

thereby understanding new information in the text. That is, they argued that their subjects' use of knowledge and understanding of the narratives was explanation based.

Chi and her colleagues (e.g., Chi et al., 1989; Chi et al., in press) have also found explanation to be important to comprehension. In their research, explanation is defined as think-aloud comments that go beyond the information in the sentence being read; this definition covers causal explanations as well as other types of elaboration. In studies with adults and also with eighth grade students who read textbook-type material, Chi and her colleagues have found that the more subjects explain the material to themselves as they read, the better they do on comprehension and problem-solving tasks.

The explanation effects described above begin to capture the relationship between use of knowledge and text understanding but detailed analyses of knowledge use by children in reading comprehension situations have not been done. In general, researchers still know little about what children do to make sense of non-narrative texts that present them with a lot of new information, which are the type of texts that they confront frequently in school.

Goldman and her colleagues also have used think-aloud methodology to explore how elementary school age children make sense of informational text, but in earlier studies the focus was on the types of comprehension problems that children encounter and how they respond to them. As reported in Saul, Coté, and Goldman (1993), we found that children who tended to use more constructive repair strategies to deal with comprehension problems and who had a higher rate of resolving their problems recalled more text information. Goldman, Coté, and Saul (1994) further noted that the rate of

problem resolution evident in the children's think-aloud protocols was positively related not only to the amount of text information they recalled but also to the quality or coherence of the students' recall reports. In addition, Goldman et al. (1994) reported that their subjects appeared to be flexible in their use of repair strategies: the children used a wider range of repair strategies when they read a harder passage compared to when they read an easier one. Goldman et al. (1994) found that their subjects used prior knowledge frequently; however, they did not analyze the types and functions of the children's prior knowledge use, leaving open the following questions that the two studies reported here will attempt to address:

• In what ways do elementary school-age children spontaneously engage in actively constructing meaning when they read informational text? What kinds of strategies do they use to understand text that presents them with a lot of new information?

• What kinds of knowledge do they draw on and how do they use it to help them understand what they read?

• How does what they do influence what they recall?

As in our earlier studies with children, in the studies to be reported here we used think-aloud methodology in conjunction with subject-controlled computer presentation of text to explore these issues. Sixth grade students were asked to think aloud as they read and then recalled informational texts on science and nutrition. Analyses of the contents of the think-aloud protocols will be presented, followed by data on recall performance. Excerpts from think-aloud protocols and recall reports will be used to illustrate the childrens' processing as well as relationships between their think-aloud comments and the material they included in their reports.

Method

Subjects. The data presented here are a subset from a study in which 29 sixth graders from two elementary schools in Nashville participated (13 from one school and 16 from the other). There was a wide range of reading comprehension ability among the students, as measured by Tennessee's standardized achievement test (the TCAP). The students at both schools had participated in at least three months of reading instruction following the reciprocal teaching (RT) method (Palincsar & Brown, 1984).

Materials. Four non-narrative informational texts on science or nutrition were used, ranging from 21 to 27 sentences in length. Two contained material similar to that found in elementary nutrition textbooks; one was on fat and the other was on sugar. According to readability indices and the judgment of educators, both nutrition texts are at approximately grade 6 or 7 level of reading difficulty. The other two texts were also on scientific topics; one was on metabolism and the other was on plant hybridization. These latter two texts are more difficult (reading level grade 9 or above) than the fat and sugar texts and contain information that was expected to be less familiar to the students (see Appendix).

Procedure. Students were trained to think aloud as they read one sentence at a time on a computer screen; they practiced on a short training text before reading the experimental texts. They could read the sentences of the text as many times and in any order they wished, at their own pace. Neutral prompts were used if a student fell silent. Instructions emphasized talking about how they were understanding the text, what it made them think about, and what was hard or easy to understand. Think-aloud comments were recorded on tape. Students were instructed to read the text as if they would have to make a report on it to their classmates. After reading the text, students dictated a recall report to the experimenter.

The subjects read and recalled one experimental text per session. All of the students read two experimental texts across two sessions in the middle of the school year. The 16 students at the second school returned a few months later at the end of the school year for two sessions to read another two texts.

Results and Discussion

Think-aloud comments

The first questions we wanted to address were in what ways do elementary school-age children spontaneously engage in actively constructing meaning when they read informational text? What kinds of strategies do they use to understand text that presents them with a lot of new information? As outlined earlier, researchers have found positive effects of active processing that goes beyond the information in the text, such as causal explanations. However, most of the research has focused on narrative texts. Our protocol data reveal that while reading expository, informational texts most of our subjects engaged in a variety of activities and drew on a number of sources of information to make sense of the text. However, these activities, even those involving explanation and elaboration, did not always lead to the construction of a full understanding and coherent representation of the text content. After describing the types of processes our subjects engaged in, we will take a more qualitative approach to illustrate the nature and quality of these processes.

General categories of comments. The children's think-aloud protocols were divided into events and coded into five general categories (see Table 1). As was found by Trabasso and Magliano (1994), the majority of the children's think-aloud comments reflected attempts to explain or elaborate on the text (see Figures 1a, 2a, 3a, and 4a). The next largest category was monitoring, which included statements reflecting monitoring of existing knowledge such

as "I knew that" or "That's new" as well as strategic decisions such as "I have to remember that". Another category captured paraphrases of the text; these were restatements of text content that added little or nothing beyond the original text. The fourth category held students' predictions of what they expected to see further on in the text. The last category included extraneous associations to prior knowledge that did not seem to contribute to the reader's understanding; these were relatively infrequent.

Types of self-explanation. Although based on the recent surge of research using think-aloud protocols we now know that many readers actively explain and elaborate text content while reading, we still know relatively little about the nature and content of such activity. What kinds of knowledge do the students draw on to generate explanations? How do they use information from their existing knowledge as well as from the text to construct an understanding of the material? To begin answering these questions, we broke the category of self-explanation events down to a finer level (see Table 1). The most frequent type of self-explanation event in the protocols involved bringing in information from prior knowledge (such as knowledge about food labeling) or personal experience (such as the reader's own dietary habits) to help understand the text, usually at the local level of understanding a single sentence (see Figures 1b, 2b, 3b, and 4b). In addition to drawing on prior knowledge to understand a single sentence, some students also reinstated concepts or inferences from prior knowledge that had been brought in earlier in the reading process.

Another type of processing that reached beyond single sentences was the second most frequent type of explanatory comment, which involved making connections across segments of the text. In these protocol events, students either used information earlier in the text to understand the

information they were currently processing, or they contributed to their construction of a coherent representation of the text through cross-text integration activity such as resolving pronoun references across adjacent sentences, recognizing the beginning of a new subtopic, or summarizing across multiple sentences.

One of the subcategories of self-explanation included comments that were similar to paraphrases, except that the student brought in enough general knowledge to rephrase the text information in their own words. In the fifth type of self-explanation event, subjects drew on discourse or genre knowledge to make editorial type comments on the style or organization of the passage, such as "You ought to give the pronunciation and definition when you have a new word" and "Sentences that are about one thing ought to go together in a paragraph."

The graph that shows the distribution of protocol events across the categories doesn't capture how the students were using different types of information as they read. More informative are the protocols of individual subjects. Consider an excerpt from the protocol of a sixth grader reading the text about sugar (see Table 2). On sentence 4, the student begins to question an assertion made in the text; he wants to know more. The next sentence gives him more information, which leads him to activate some of his existing knowledge about the "goodness" and "badness" of sugar and fruit. In connecting the text information with his knowledge, he infers that some sugar must be good. In sentence 6, he has to integrate new information with his prior experiences with sugar. He begins to realize that there are different types of sugar, a main point in the text. Sentence 7 doesn't resolve his attempt to understand the types of sugar, it merely confirms his sense that there are two types. His comment reflects a continuing attempt to integrate

information from several sentences. Sentence 8 triggers the activation of yet more of his existing knowledge about sugar and the foods that have sugar and other sweeteners. At this point he activates knowledge about Nutrasweet, which he apparently knows is different from sugar, and he considers it a candidate in his search for "the other kind of sugar." He continues in the same vein over the next few sentences, then sentence 11 presents him with another candidate: carbohydrates. Here he integrates the earlier information about processed sugar and the fact that there is more than one kind of sugar to question whether carbohydrates is the other kind. Then he seeks more information about this new type of sugar. Sentence 12 is included to show that the student seems to have concluded that the two types of sugar are processed and carbohydrates and he continues to read with this representation in mind.

This student spent a lot of effort over several sentences trying to understand what the two types of sugar are that the text refers to. In fact, almost all of this student's protocol comments (98%) were attempts to explain the text content. It becomes evident in the full protocol that this student has drawn on prior knowledge about and experiences with sugar and various foods to construct a relatively coherent understanding of the first part of the text. Unfortunately, his representation is somewhat inaccurate; the text was referring to natural and processed sugar. His representation includes two types of sugar, which he believes to be processed and carbohydrates, as well as the types of foods in which they are found. Later we'll discuss the relationship between this student's reading activities and his recall report.

· <u>Processes related to reciprocal teaching (RT)</u>. The first two sessions in which the students participated took place after they had received a few months of instruction following the RT method, which brings readers

together into small groups to practice the comprehension strategies of summarizing, predicting, clarifying, and asking questions on a text one section at a time. The 16 students at the second school returned after a few more months of school (and thus more RT instruction) to read two more experimental texts. As we coded the protocols, we noticed that the influence of RT was not as strong as we had expected, and that there was no clear pattern of RT-related change over time in the processing of the group of students who gave us think-aloud protocols in the middle of the year and again at the end of the year. However, we did see evidence in the protocols of several children of RT activities, especially predicting and questioning, and some children did improve in their use of comprehension strategies. The explanation for the absence of strong results with the students as a group may be that RT was being implemented for the first time in the schools we studied. Conversations with the teachers indicated that their focus during the first year was on learning, and learning how to teach, the four RT strategies.

Recall performance

Recall performance was relatively poor and the differences among recall for the four texts reflected the relative difficulty of the texts (see Materials section). After identifying the core idea of each sentence in the texts, we scored the children's recall reports for the number of core ideas that were included. The criteria were relatively lenient, but the amount of information from the texts that the children included in their recalls was still very low. On average, they included the gist of 26% of the sentences in the fat text, 25% of the sugar text, 22% of the hybridization text, and 20% of the metabolism text (see Table 3). For the 16 students who read all four texts, when the recall proportions for the two easier texts (fat and sugar; M=.28, SD=.08) were averaged together and compared to the average recall performance for the

two more difficult texts (hybridization and metabolism; $M=.22$, $SD=.08$), a repeated measures ANOVA revealed a significant difference, with performance on the less difficult texts being higher, as expected, $F(1,15)=6.38$, $p=.02$, $MSe=0$.

We are in the process of going beyond the quantitative measure of amount recalled to a more qualitative assessment of the quality and coherence of the student's recall reports. A preliminary examination indicates that the students varied from dictating reports that were well-organized and contained important information from the text as well as some salient details, to those that contained quite a bit of information but were less coherently organized, to those that were basically a list of statements with information from the text in no particular order.

Relation of processing to recall performance

Our last question concerned the relationship between the types of processing and strategies the children engaged in and the content and quality of their recall reports. In agreement with the research reviewed in the introduction, we found that self-explaining was positively correlated with recall performance (see Table 4). Based on the data of the 16 subjects who read all four texts, across the texts the correlation ranged from .25 to .69. However, only for the metabolism text was the relationship statistically reliable. The amount of self-explaining that the students did was related to their recall, but clearly much of the variance in recall performance is left unaccounted for. Going beyond the correlations, a better illustration of the type of relationship that in several cases was manifested between reading and recall comes from examining the recall report of the student whose protocol was used earlier to demonstrate how different sources of information were used by the student to construct an understanding of the sugar text (see Table 5).

This student had a very good recall report; it was relatively well-organized and contained the gist of over half of the sugar text. The excerpt from his protocol (Table 3) discussed earlier showed his struggle with the difference between two types of sugar, his attempt to reconcile the text content with what he knew about sugar, and his conclusion that there must be carbohydrate sugar and processed sugar. The student did a lot of self-explaining and integration of existing knowledge and text information to establish an understanding of the sugar text, and this aspect of the representation that we saw him constructing in the protocol excerpt shows up clearly in his report. For example, he begins his recall report by saying "There's two different kinds of sugar. One is carbohydrate sugar and another is processed sugar. Processed sugar is bad for you. Carbohydrates is not." He concludes his report with more specific information about the foods that contain these "two different kinds of sugar;" some of the foods he lists come from the text (e.g , pasta) and some he apparently inferred (e.g., lasagna) by integrating the text with his existing knowledge. In Table 5 the parts of his report that are relevant to the part of his protocol that we discussed are presented in boldface.

Summary and Conclusions

Most of the children in our study did not take a passive approach to reading; they actively drew on their knowledge in a variety of ways to help them understand informational text. However, for these sixth graders active processing was not necessarily sufficient; more important was the nature of their activities and whether their processing produced a coherent representation of the text. The sixth grade student who was presented as an illustrative case drew on prior knowledge about and experiences with sugar and foods to construct a coherent (although inaccurate) representation, which

in his case was evident in the recall report. In addition to integration with prior knowledge, other activities that the children used to try to make sense of the texts included monitoring, cross-text integration and paraphrasing or rephrasing text content. Although the children's recall reports were not extensive, they did tend to include the most important text information, especially for the less difficult texts. However, the children's reports varied in coherence; some reflected a coherent representation of the text while others were fragmentary lists of sentences.

Further analyses will look more closely at the nature of the representation being constructed by the children as they read, and the extent of the relationship between their representations and their recall reports. However, in light of the range of individual differences evident in the think-aloud protocols, we concluded that memory measures such as the recall report are not adequate as the sole measure of readers' representations. Recall does not necessarily capture the richness and depth of the understanding a reader constructs while processing a text. In future research, we plan to use measures such as rating and question tasks to more accurately reflect not just what the children remember from informational texts but rather what they understand and learn from them.

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Appendix

Experimental Texts

Sugar Text

Sugar in Our Diet

Sugar is an important part of our diet because it supplies energy. It is a member of the group of food substances called carbohydrates. There are many natural sources of sugar in the foods we eat. Apples, carrots, and raisins all have a lot of sugar in them.

Many foods have another kind of sugar in them called processed sugar. Some cereals, like Frosted Flakes and Cocoa Puffs, have processed sugar added to them. Soft drinks and cookies also have a lot of processed sugar in them.

Natural sugar and processed sugar both provide us with energy almost as soon as we eat them. But the energy we get from sugar does not last very long. We also get energy from other kinds of carbohydrates such as those found in pasta, bread, and potatoes. It takes us longer to feel the energy from these foods, but it lasts longer than the energy we get from sugar.

Eating too much processed sugar can be harmful to our health in three ways. First, processed sugar does not contain any nutrients or vitamins. Other kinds of carbohydrates, such as starch do provide nutrients. Sugar only supplies energy. It is called an "empty" food.

Eating processed sugar causes tooth decay. This is because it helps form plaque, a coating that builds up on the outside of our teeth. Bacteria that are present in plaque feed on the sugar in food. The bacteria produce acid and the acid softens the teeth. Then the bacteria can get into the tooth. Once inside, they eat away at the tooth and make a cavity or hole. It must be fixed by a dentist.

Eating too much sugar can lead to being overweight. When we eat too much sugar, we get more energy than we need. Our bodies store the extra energy in the form of extra fat. In fact, many foods that have a lot of processed sugar also contain fat. Storing too much fat can lead to being overweight, heart disease, diabetes and high blood pressure.

Fat Text

Fats in Our Diet

Fats are an important part of our diet. They provide twice as much energy as carbohydrates and proteins. Our bodies contain layers of fat that protect some delicate body organs from injury. In addition, fats add flavor and texture to food.

People in the United States eat a lot of foods with fats in them. But our bodies only need a very small amount of fat to be healthy. If we eat more than our bodies need, the extra can be harmful. If we know which foods contain fats, it will be easier for us to eat less of them.

There are three different kinds of fats; some are less harmful than others. Foods that come from animals usually contain the harmful ones. Plant foods usually have less harmful kinds of fats. There are three kinds of fats: saturated, polyunsaturated, and monounsaturated. Saturated fat is the most harmful.

Saturated fat is found mostly in red meat and in many dairy products like butter and whole milk. Some vegetable oils, which are made from plants, also have it. If we eat too much of it, it will slowly clog the walls of our blood vessels. Eventually, eating too much saturated fat can lead to heart attacks, strokes, and other serious illnesses.

Polyunsaturated fat is less harmful than saturated fat. It can still damage the blood vessels and the heart if we eat too much of it. Most vegetable oils and fish oils are polyunsaturated.

Monounsaturated fat is the least harmful to the body. It may even reduce the risk of getting blocked blood vessels. Monounsaturated fats, as well as polyunsaturated, are found in vegetables, many types of nuts, and fish like salmon and mackerel. Most of the monounsaturated fat that we eat comes from olive oil.

Animal foods are the major source of fat in the American diet. We can safely reduce the amount of animal foods in our diets. We can get the fat we need from many plant foods.

Hybridization Text
Improving Mother Nature

Produce departments and garden shops are brimming with odd new hybrids of some familiar fruits and vegetables. This year, the first genetically altered tomato went on the market, and ushered in a new era in growing crops for food.

A hybrid refers to a plant or animal that has been created by crossing two different parents. For example, the "broccoflower" is a hybrid of broccoli and cauliflower. Hybrids such as the broccoflower are being created by scientists through a process known as genetic engineering.

Hybrids are helpful for several reasons. For one thing, plants can be altered so that the hybrid has more vitamins than the original plant did. Or, if the original plant is high in some undesirable substance, such as fat or sugar, the amount may be reduced in the hybrid. This type of hybrid is helpful to people who may only have access to a small amount of food, such as those people living on a submarine.

Another reason that hybrids are helpful is that they may make a plant stronger and better able to resist environmental threats, such as insects or frost. Raising stronger plants helps farmers be assured of a good crop.

Hybrids help farmers in another way as well. They allow farmers to adapt plants to new environments. For example, some tomatoes have been designed to grow in unusual environments such as styrofoam containers, or even in space. Plants that would normally only grow in very warm weather may be changed to allow them to grow year-round.

Finally, hybrids may change the appearance of a plant in some way, perhaps making it easier to grow. For example, scientists have developed a tiny version of the carrot. The hybrid carrot's smaller size makes it possible to grow it in window boxes in the city, or other places where space is limited.

Genetic engineering involves taking the genes of one plant and adding on, or splicing, the genes from another so that the new plant has characteristics of both plants. Scientists can examine the parent plants and decide what traits they wish for the plant to have from each parent. It is a bit like being able to design a human baby so that it has the father's nose, but the mother's eyes, and so on.

Metabolism Text

Metabolism

Customers in many pharmacies may soon be seeing the latest in new devices for the health conscious. A sports physiologist is developing the metabometer, a device that he hopes will measure the human body's ability to produce energy efficiently.

The rate at which the body produces energy is called metabolism. Different people have different metabolic rates that indicate how easily they can produce energy The same person may have different metabolic rates, depending on the circumstances. Different species of animals also have different metabolic rates.

There are several factors that affect metabolic rate. One factor is the type of food a person or animal eats. For example, some foods are hard to digest, such as complex carbohydrates like rice. The body has to work harder to get energy from rice. If a person ate a steady diet of rice, the result would be a higher metabolic rate.

Another factor affecting metabolism is the climate of the environment. Temperature may cause the metabolism to change. People and animals that live in cold environments need to produce more energy in order to keep warm. Most animals that live in polar regions have high metabolisms. If people move from a warm to a cold climate, their metabolic rates will increase.

Metabolic rate also differs depending on activity level. Changing the level of activity may cause the body to change its metabolism because different activities require different amounts of energy. For example, basketball players use more energy than golfers so their metabolic rates are generally higher.

To some degree, metabolic rate is influenced by genetic inheritance. Children of parents who have high metabolic rates tend to have high metabolic rates also. This is because the body chemistry of the children is a combination of the body chemistry of the parents.

Metabolism is regulated by hormones produced by the thyroid gland, a tiny gland located at the base of the neck. These hormones regulate the behavior of all the cells in the body so that enough energy is produced. The metabometer will work by measuring hormone levels in the blood.

Table 1

Coding Categories for Contents of Think-aloud Protocols

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1. Self-explanation/elaboration (SE)

    a. Rephrase in own words, usually using general knowledge

    b. Connect to prior text information/integrate across text

    c. Connect to prior knowledge/draw on experience

    d. Reinstate prior knowledge brought in earlier

    e. Critique text organization/draw on discourse knowledge

2. Monitoring (MON)

3. Paraphrase (PARA)

4. Prediction (PRED)

5. Extraneous association to prior knowledge (ASC,

Table 2

Excerpt from Think-aloud Protocol

Sentence #	[Sentence] and student's comment
4	[There are many natural sources of sugar in the foods we eat]. What foods...is sugar in all foods or just some foods?
5	[Apples, carrots and raisins all have a lot of sugar in them]. So, sometimes people say that sugar is bad for them, but since they say apples, carrots and raisins are good for them, so, sugar must be good for them...but not a lot.
6	[Many foods have another kind of sugar in them called processed sugar]. So it's a different kind of sugar than you would make cookies with. It's probably a different kind of sugar.
7	[Some foods, like Frosted Flakes and Cocoa Puffs, have processed sugar added to them]. Ummm...what's the difference between processed sugar and the other kind of sugar?
8	[Soft drinks and cookies also have a lot of processed sugar in them]. Are there some drinks and cookies that don't have processed sugar in them, that have the other kind of sugar? And does diet cokes and stuff just have the regular processed sugar in it? When they say Nutrasweet ... is that what the other kind of sugar is?
...	
11	[We also get energy from other kinds of carbohydrates such as those found in pasta, bread and potatoes]. Is that what they put in...is that the kind of sugar...not the processed sugar, but the other kind of sugar? Like, where do they get carbohydrates sugar? Where is it found at?
12	[It takes us longer to feel the energy from these foods, but it lasts longer than the energy we get from sugar]. How long does it last for when you eat the other food? When you eat the carbohydrates? ... How longer does it last than the other sugar...from processed sugar?

Table 3

Mean (and Standard Deviation) of Proportion of Text Recalled, by Text

Text	Proportion Recalled
Sugar[a]	.26 (.14)
Fat[b]	.26 (.11)
Hybridization[b]	.22 (.09)
Metabolism[a]	.20 (.10)

[a]n=22

[b]n=24

Table 4

Correlations Between Proportion Recalled and Proportion of Think-aloud

Protocol Events in Each Category, by Text

Text	Protocol Category[a]				
	SE	MON	PARA	PRED	ASC
Sugar[a]	.28	-.35	.04	-.33	.11
Fat[a]	.49	-.55*	.28	.09	-.09
Hybridization[a]	.25	-.28	-.10	.07	-.11
Metabolism[a]	.69**	-.64**	-.07	-.18	-.32

[a] n=16

*p<.05

**p<.01

Table 5

Example Recall Report

There's two different kinds of sugar. One is carbohydrate sugar and another is processed sugar. Processed sugar is bad for you. Carbohydrates is not. Sugar can cause diseases like heart disease, diabetes, and I can't remember the other one. It can cause tooth decay, plaque, and cavities. And when processed sugar gets to your teeth it can soften them. And that will be able the sugar to get into the tooth and cause a cavity. And you cannot fix that yourself you will have to go to a dentist. And you can get overweight by eating too much processed sugar. Sugar only provides energy. And if you get too much energy the energy will store in extra fat and cause you to be overweight. Carbohydrates sugar and starch are both good for you. And processed sugar is not. Processed sugar is in cereals like Frosted Flakes, Cocoa Puffs, and Froot Loops. Carbohydrates sugar is in foods like pasta, spaghetti, and lasagna. Carbohydrates doesn't give you as much energy as processed sugar.

Figure Captions

Figure 1a. Distribution of proportion of protocol comments in each coding category for sugar text.

Figure 1b. Distribution of types of events within self-explanation category of protocol events for sugar text.

Figure 2a. Distribution of proportion of protocol comments in each coding category for fat text.

Figure 2b. Distribution of types of events within self-explanation category of protocol events for fat text.

Figure 3a. Distribution of proportion of protocol comments in each coding category for hybridization text.

Figure 3b. Distribution of types of events within self-explanation category of protocol events for hybridization text.

Figure 4a. Distribution of proportion of protocol comments in each coding category for metabolism text.

Figure 4b. Distribution of types of events within self-explanation category of protocol events for metabolism text.

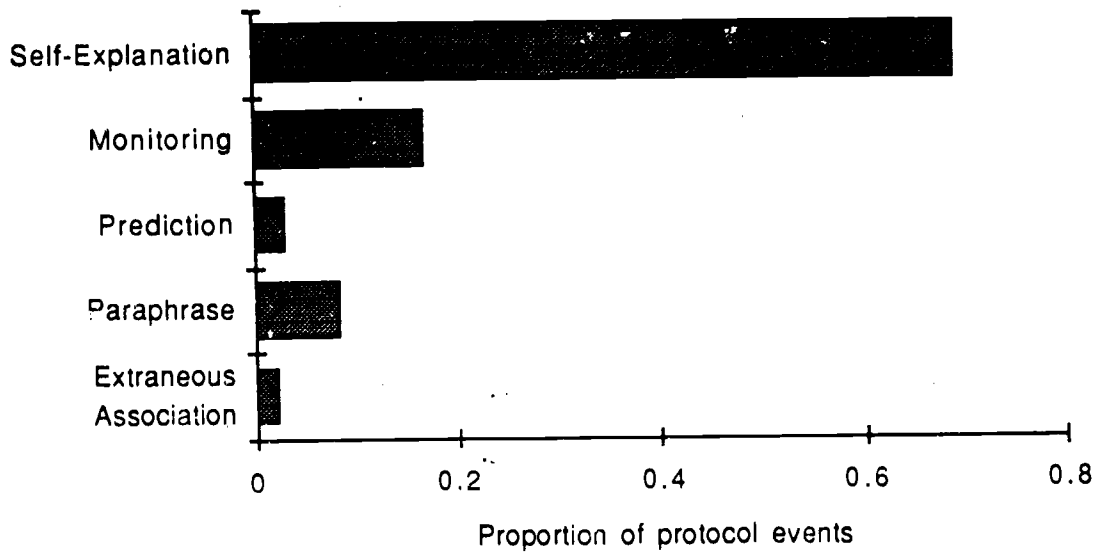Figure 1a. Think-aloud Protocol Event Categories:
Sugar Text

Proportion of protocol events

Figure 1b. Types of Self-Explanation Events:
Sugar Text

Proportion of self-explanation events
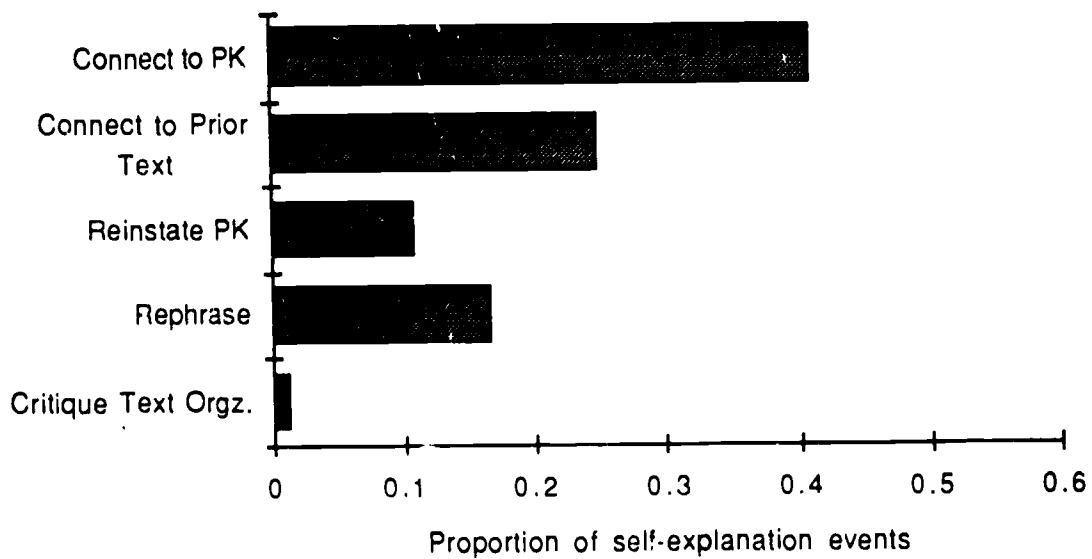
Figure 2a. Think-aloud Protocol Event Categories:
Fat Text

Proportion of protocol events
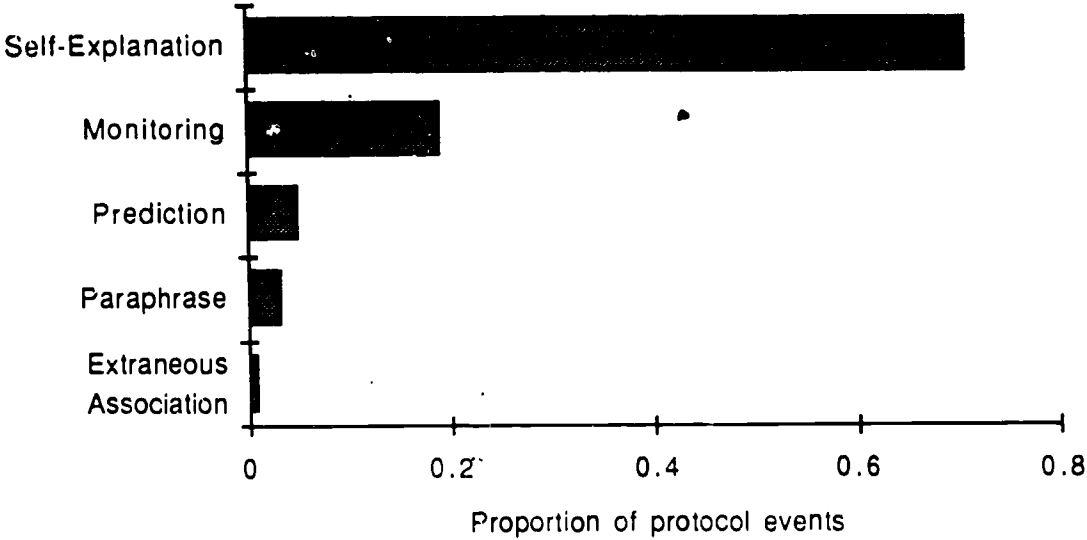
Figure 2b. Types of Self-Explanation Events:
Fat Text

Proportion of self-explanation events
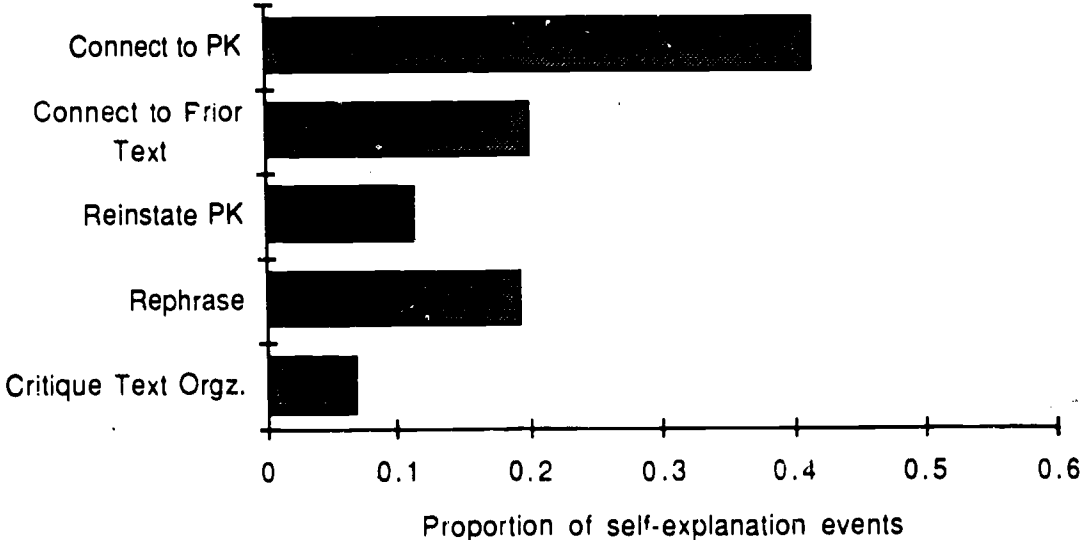
Figure 3a. Think-aloud Protocol Event Categories:
Hybridization Text

Proportion of protocol events
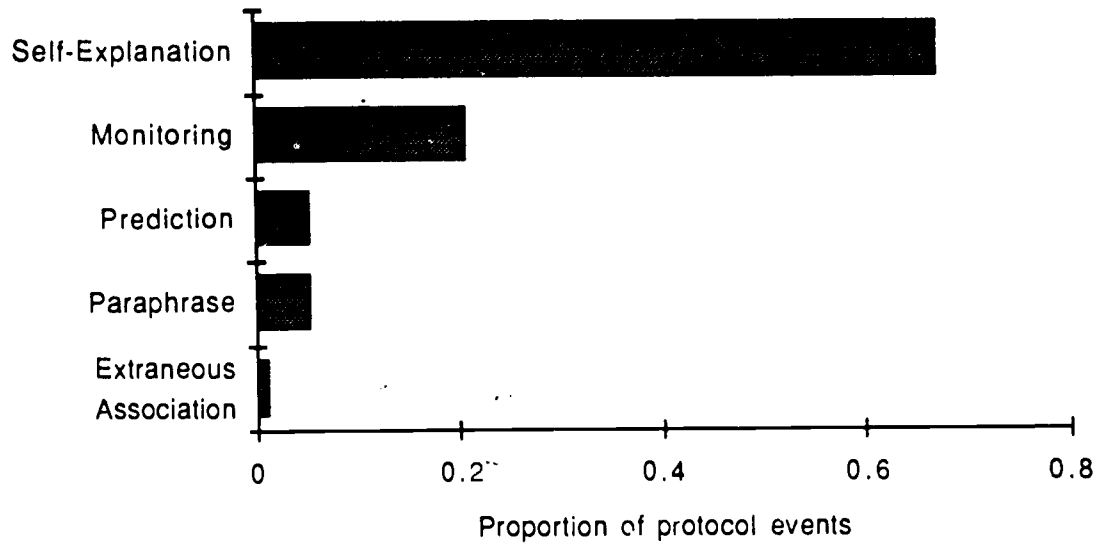
Figure 3b. Types of Self-Explanation Events:
Hybridization Text

Proportion of self-explanation events
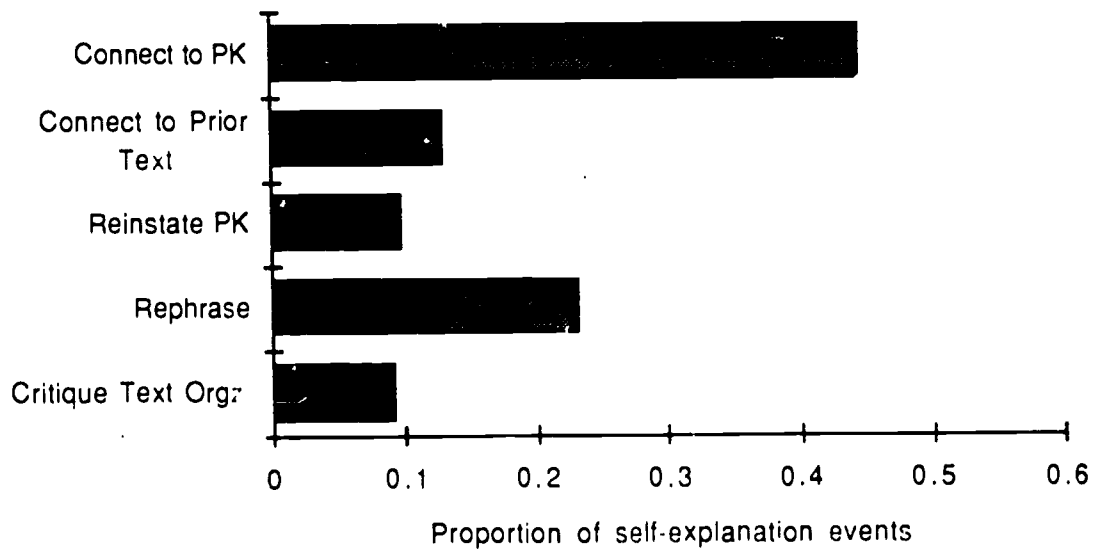
Figure 4a. Think-aloud Protocol Event Categories: Metabolism Text

Self-Explanation

Monitoring

Prediction

Paraphrase

Extraneous
Association
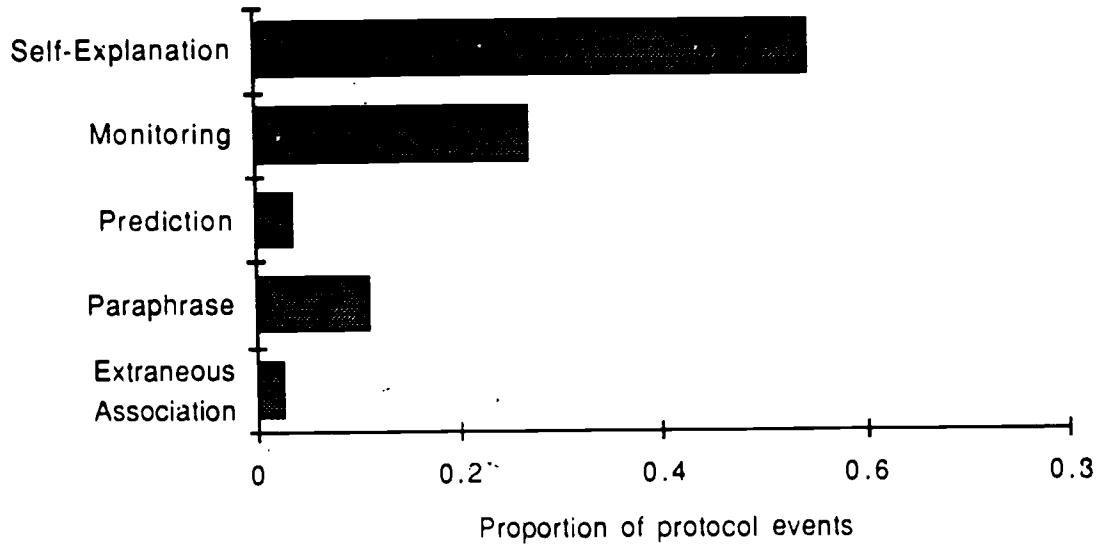
| 0 | 0.2 | 0.4 | 0.6 | 0.3 |

Proportion of protocol events

Figure 4b. Types of Self-Explanation Events: Metabolism Text

Connect to PK

Connect to Prior
Text

Reinstate PK

Rephrase

Critique Text Orgz.

| 0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 |

Proportion of self-explanation events