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Children's knowledge about skimming strategies.

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CHILDREN'S KNOWLEDGE ABOUT SKIMMING STRATEGIES

by

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ABSTRACT

Children's knowledge about variables which affect their own learning has been investigated in studies concerning both memory and other learning (e.g., reading, study) tasks. There are, however, only a few studies on the development of children's awareness about variables that influence their school learning. As part of their school reading program, children often learn about various study skills. Experts on reading have suggested that the use of study skills can facilitate the learning process.

The purpose of this study was to investigate the development of children's knowledge about one of the study skills referred to as a "locational skill." Locational skills are a series of related skills which children learn in order to enhance their capability for independent study and research. Specifically, the present study is concerned with what children come to know about the use of two skimming strategies for the purpose of locating desired facts in text materials. To skim effectively requires at least these two basic pieces of knowledge: (1) the knowledge that the first few sentences of a paragraph often introduce its general content and thereby indicate to the reader whether or not the sought-after

information is likely to appear in that paragraph, and (2) the knowledge that one can anticipate how the sought-after information is likely to appear, i.e., in terms of certain key words or symbols, and can then search quickly looking only for this predetermined "clue." Children's knowledge about the use of key words and this aspect of paragraph structure were investigated in this study. A secondary purpose of the study was to investigate children's skill to use key words to skim for a piece of information.

Children's knowledge was assessed using behavioral and verbal techniques. Children from grades 4, 6, and 8 read three comparable stories under three different reading instructions. Reading speeds obtained under these three conditions were compared to see if children read faster when they were asked to find one fact from stories in which they might spontaneously use either paragraph structure (condition 2) or key words (condition 3) than when they were asked to read a story word-by-word (condition 1). In order to investigate children's skill to locate a fact using key words, in a fourth instruction, they were given key words and told how to use them. This reading speed was compared to their "word-by-word" speed to see if the children read faster when they had knowledge about how to skim using key words.

Children also responded to a series of questions. One set of questions asked children to describe how they read under conditions 2 and 3. A second set of questions was asked to assess children's verbalizable knowledge about the use of paragraph structure and key words for efficient skimming. The first questions in this set did not cue the children to think about paragraph structure or key words. Later questions were intended to cue children about these. The final questions assessed the most basic piece of knowledge needed for skimming about paragraph structure, i.e., what the first sentence generally does for a paragraph, and about key words, i.e., what key words are likely to indicate the location of the sought-after piece of information. Responses to all questions were categorized and analyzed in terms of reference to paragraph structure or key words versus all other types of answers. The categorized responses were analyzed using chi square analyses.

The verbal data of this study indicated that a majority of children at all three grade levels had the basic knowledge about what the first sentence usually does for a paragraph and about how a sought-after fact is likely to be expressed. It was also found that children at all three levels were equally skillful in using key words to skim.

The verbal data also suggested, however, that between grades 4 and 8 children come to know how to apply their basic knowledge when actually searching for a fact. Only about half of grade 4 children, but almost all of grade 8 children were able to verbalize about how to use paragraph structure and key words to skim.

A comparison of the behavioral and verbal data suggested that children come to know when one should deliberately use the skimming strategies studied. About 50 to 60% of grades 4 and 6 children were able to describe how to skim strategically but only a few of these children actually used these strategies during the reading tasks. Most of the grade 8 children, however, not only verbalized knowledge about skimming strategies, but appropriately applied the knowledge according to task demand during the reading session.

The educational implications of these results are discussed.

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CHAPTER I

INTRODUCTION

Recently, children's knowledge about cognitive phenomena (generally known as metacognition) has become an important variable in the investigation of cognitive development (Brown, 1975; Brown, 1978; Flavell & Wellman, 1977). Much of the research has been concerned with children's awareness of their abilities and strategies for the learning of traditional memory tasks, i.e., recall of a list of pictorial items. Although several investigators (e.g., Brown & Smiley, 1978; Mason, 1978; Myers & Paris, 1978) have made initial attempts, children's knowledge about strategies that can assist their school learning has rarely been investigated. The present study is concerned with the development of children's knowledge about one of the study skills, the skill of searching efficiently for information in a written passage.

In the following discussion, the meaning of metacognition will be clarified first. For this purpose, various kinds of metacognition will be illustrated by selectively reviewing existing studies. This will be done by considering the area of memory development since most research on metacognition has been done in that area (Brown,

1978; Flavell, 1978). Then the present study will be outlined.

Children's Knowledge About Memory

Most adults have learned that there are many variables or factors that effect their memory performance. Flavell and Wellman (1977) have classified these variables into three major categories: person, task and strategy. Thus, a growing child will eventually learn that how well a person learns and remembers depends on (a) what he/she is like as a learner (person variable), (b) what the learning task is (task variable), and (c) what behavior he/she engages in to learn (strategy variable; Flavell, 1977, p. 208).

Person. One type of metacognition in the person category refers to a child's knowledge of himself/herself and others as potential learners or memorizers. In relation to this knowledge, the ability of children to estimate their own memory capabilities has been frequently studied. Flavell, Friedrichs and Hoyt (1970), for example, asked children to estimate their memory span. From one to ten pictures were presented to the children incrementally. The children were asked to indicate at each list length whether they could still recall a list that long. Although only a few of the older children (grades 2 and 4) predicted that they could recall all of the ten pictures, more than half of the nursery and kindergarten children predicted in this

manner. Markman (1973) also found that her 5-year-old children were as inaccurate in predicting their own recall as the younger children in the Flavell et al. (1970) study.

The other subcategory of "person" metamemory refers to the ability to monitor and interpret one's own immediate mnemonic experiences in specific memory situations. Adults know, for instance, that they don't have an answer to the question, "What is Beethoven's telephone number?" Or, sometimes a person has the feeling that something he/she is trying to memorize still needs to be studied. These would be examples of this subcategory.

Flavell et al. (1970), in the investigation just cited, instructed children to study a set of items until they were absolutely sure they could recall them all without error. They found that the younger children (4-6 years of age) were less adept at estimating their readiness for recall than children 7-10 years of age. The latter's recall was usually perfect on all recall trials.

Task. One subcategory of task-related metamemory refers to one's awareness of the objective need to employ a specific set of strategic behaviors for the successful completion of a particular memory task. Appel, Cooper, McCarrell, Sims-Knight, Yussen and Flavell (1972) studied the development of this kind of metamemory. In this study, children of ages 4, 7, and 11 were given 15 pictures that

could be grouped into five conceptual categories (e.g., animals, vehicles), and asked under two different instructions to either (a) look at or (b) memorize these items. Only at the 11-year-old level was recall in the "remember" condition higher than in the "look" condition. In addition, observations of the children's behavior during the study time revealed that only the 11-year-olds rehearsed more in the memory condition than in the "looking" condition. These findings suggest that an awareness of the need to use deliberate memorization strategies begins to develop between grade 3 and grade 6.

Another subcategory here includes a person's knowledge about task-related variables that affect the difficulty level of a given memory problem. The development of this kind of knowledge is illustrated by Kreutzer, Leonard and Flavell (1975). Children in this study were first familiarized with paired-associate learning procedures, and then asked if one of two sets of word pairs would be "easier for you to learn" than the other, and if so, why. One list of words consisted of randomly paired items while the second list of pairs were based on common associates (e.g., boy with girl; black with white). Most of the kindergarten children failed to recognize the ease of learning the pairs of opposites, while almost all of the grades 3 and 5 children did recognize it, and in many cases could

explain why. In this same study, the investigators found that grades 3 and 5 children seemed to have at least intuitive understanding of the classical phenomenon of retroactive interference. Thus, many of the grades 3 and 5 children, but almost none of the kindergarten children, indicated that it might be harder to recall a set of people's names if one had learned another set of people's names immediately afterwards than if one had not.

Strategy. The strategy category includes knowledge of how to store and retrieve information effectively. Kreutzer et al. (1975) gave their subjects 20 coloured pictures and told them that two children had to learn them. They were told that one child studied for five minutes while the other child studied for one minute. The subjects were then asked to indicate which child remembered more and to justify their answer. The majority of children at all age levels predicted that studying for five minutes would be a better strategy, but younger children were less able to justify their choices.

Children also acquire several pieces of knowledge concerning retrieval strategies. Children of different ages respond differently when they do not remember something immediately. Some children may terminate their memory search quickly, while others may know that a little more effort sometimes helps them in remembering the desired

answers. Children at a more advanced level may also know that there are various techniques they can use to locate the requested information efficiently. The available studies indicate that knowledge of strategic retrieval (e.g., deliberately think of A in order to remember B) begin to develop between grade 1 and grade 3 (see Kobasigawa, 1977).

Summary and Comments. The purpose of the previous section was to illustrate what people generally mean by metacognition. Metacognition has been characterized as a person's knowledge about what variables affect the course and outcomes of cognitive processes. Most empirical studies on metacognition have centered on knowledge about one's own memory abilities and strategies in relation to simple learning situations. The existing developmental literature appears to suggest that metacognition may be quite mature by third grade. However, Brown (1978) has suggested this conclusion is due to the simple types of metamemorial skills which have been examined, and therefore may need to be qualified. Metacognition can occur in other situations than memory (Flavell, 1978), and in relation to learning tasks which are more relevant to the learning requirements of the school and everyday life than are traditional memory tasks. In the present study, the focus is on children's knowledge about searching for information in the external world rather than in the internal (memory)

world. Such knowledge is related to needs in real life learning situations. In addition, the target strategy of the study is presumably achieved later than those examined in the previous metamemorial studies.

Present Study

Early in the Junior grade years (grade 4), the child is required to read with increased independence. The child at this grade level is also expected to be capable of more independent study and research in the content areas (e.g., social studies, history, science). For these purposes, the child generally learns a series of related skills frequently subsumed under the heading "locational skills." As one of the locational skills, the child may learn that the process of information search will be facilitated if he/she narrows down a broad research topic (e.g., the Rocky Mountains) into smaller subtopics (e.g., What do mountains look like," Why are they called the Rocky Mountains?). They also learn of reference materials (e.g., books, dictionary, encyclopedia, newspapers and periodics) and how they can use them. After the child has located appropriate books and other reference materials, he/she learns to apply knowledge about the various parts of the book (e.g., table of contents, indexes, page headings) to locate the relevant section(s). Then, the student needs to know and use the skill of skimming in order to locate specific pieces of pertinent information in

the text of the relevant section(s) (Thomas & Robinson, 1975; Zintz, 1975; Spache & Spache, 1977).

From among the various locational skills, the strategy of skimming was investigated in this study. Children's knowledge about the other locational skills has been frequently assessed by standardized tests (e.g., "Canadian Tests of Basic Skills") while children's knowledge about skimming has not been studied extensively.

In relation to the skill of skimming, children learn two basic pieces of knowledge. First, they learn that when searching for a piece of information in text materials, they can glance swiftly down the page or column, skipping everything but what they are looking for. To skim effectively assumes that a person has thought about the problem and has determined the kind of information he/she will look for. In determining what he/she will look for, a person may use his/her knowledge that certain kinds of information are often expressed in terms of certain key words, in numerical form or are accompanied by a special symbol (e.g., the degree symbol °, "F" for Fahrenheit or "C" for Centigrade; Thomas & Robinson, 1975; Zintz, 1975; Spache & Spache, 1977).

Second, children learn that they do not have to look through entire paragraphs of a passage if they are irrelevant. In deciding which paragraphs are irrelevant, a person uses his/her knowledge about the commonly used structure of

presenting factual materials that the first sentence of a paragraph usually introduces its content (Thomas & Robinson, 1975; Zintz, 1975; Spache & Spache, 1977).

In the present study, children's awareness of these two pieces of knowledge was investigated by using behavioral and verbal assessment techniques. Previous researchers (e.g., Mason, 1978; Myers & Paris, 1978) have assessed children's school-related metacognitive knowledge mainly on the basis of their verbal reports about learning strategies required by hypothetical situations. One particular difficulty with this methodology lies in relying on children's ability to verbalize accurately what they know about their own mental activities. It is possible that children may know how to perform a particular learning strategy without being able to verbalize that knowledge accurately (see Brown, 1978, for such instances). An alternative way of getting children to externalize their knowledge about learning strategies is to observe their differentiated learning activities (e.g., read slowly versus read fast) under different task instructions (e.g., comprehend the material versus locate a piece of information from the same material). This behavioral assessment technique was successfully used by Appel et al. (1972; the Appel et al. study is summarized on page 3). At the present time, however, is is unclear which of these methods, behavioral or verbal techniques,

gives a more accurate indication of what children know. Consequently, following Brown's (1978) recommendation, both of these techniques were included in this study.

For the purpose of the present study, children were presented with four comparable stories under four different reading instructions. The first reading directive was designed to insure that the children would read the whole story word-by-word and thereby allow a baseline measure of reading speed to be obtained. The second and third reading directives and their corresponding stories were designed to allow children to use, spontaneously, knowledge about paragraph structure and key words or symbols, respectively, to skim effectively. If the children use their knowledge about skimming strategies, they should read the stories faster under the second and third instructions than under the first instruction (behavioral assessment). Even if the children have the appropriate knowledge about skimming strategies, they may not show differentiated reading behaviors under the present task conditions (i.e., read faster under the second and third instructions than under the first instruction) for at least one reason. The children simply may not have the required skills to carry out what they know. In order to investigate this possibility, the fourth reading instruction was included in this study. Under the fourth instruction, the children were given key

words and were explicitly instructed how to use these to locate a piece of information quickly. If the children have the necessary skill to use the knowledge provided in this instruction, they should read more quickly under the fourth instruction than under the first instruction.

After the children had completed the tasks under the first three instructions, they were asked a series of questions to assess their verbalizable knowledge about skimming techniques. These questions were designed to focus on two pieces of knowledge, viz., the use of the paragraph structure and key words, to skim effectively.

Children of grades 4, 6, and 8 were used as subjects. Grade 4 children were used because children at this grade level begin to learn the skill of skimming. Teachers concentrate on such skills throughout the Junior grades, that is, grades 4, 5, and 6 (Spache & Spache, 1977). Thus, one might expect a developmental change to occur in children's knowledge about skimming within this age range.

CHAPTER II

METHOD

Subjects

Twenty-four grade 4 children (12 boys and 12 girls), 24 grade 6 children (12 boys and 12 girls), and 14 grade 8 children (8 boys and 6 girls) participated in the present study. These children were drawn from a parochial school in a suburban area of Windsor, Ontario. The mean chronological ages were 9-11, 12-1 and 13-11 for grades 4, 6 and 8, respectively. According to their teachers' judgements, none of these children should have had difficulty in reading the materials used in this study.

Materials

Stories. Four sets of prose passages, each at the grade 3.8 readability level[1], were prepared. The passages were factual prose similar to those one finds in a children's encyclopedia. Each of the first two stories was composed of two paragraphs. In story 1 (control story), various characteristics of the brown bear were described in the first paragraph while characteristics of the polar bear were described in the second paragraph. In story 2, the major features of the black bear were indicated in the

[1]See Appendix B for discussion of readability formula.

first paragraph and those of the grizzly bear were indicated in the second paragraph. As is illustrated in Figure 1, the general content of each of the paragraphs was introduced by the first sentence of that paragraph. That is, the stories were designed so that children could completely skip a "task-irrelevant" paragraph (e.g., black bear) and proceed to the second paragraph (e.g., grizzly bear) if asked to locate a piece of information about the grizzly bear. The amount of time required by a child to read the first paragraph of each of these two stories was a critical dependent measure of this study. The lengths of the first paragraphs of the two stories were, therefore, equated; both contained 121 words.

Each of the remaining two stories consisted of one paragraph containing various pieces of information about Vancouver (third story) or New York City (fourth story). The average temperature of each city during the winter, the target information of the study, was stated in its respective story as the 121st word, and was expressed in numerical form using the degree symbol. No other temperature information or numerical figure appeared in either of these stories. It should be noted that all four of these stories were made so that the experimenter could measure the speed with which children read the same length of material (i.e., 121 words) under four different task conditions.

IN THIS STORY, FIRST YOU WILL READ ABOUT BROWN BEARS. THE BROWN BEAR IS THE BIGGEST KIND OF BEAR. THEY CAN GROW TO BE AS LONG AS 2.7 METERS. MANY OF THEM WEIGH MORE THAN 360 KILOGRAMS. BROWN BEARS HAVE A SHAGGY COAT. BUT A BROWN BEAR DOES NOT ALWAYS HAVE A BROWN COAT. SOME ARE GRAYISH WHITE. OTHERS LOOK ALMOST BLUE. SOME ARE BLACK. THESE BEARS BECOME AFRAID EASILY. THEY WILL ATTACK WHEN THEY ARE AFRAID. BROWN BEARS LIKE TO BE ALONE. MOST OFTEN THEY LIVE IN THE WILD PARTS OF ALASKA AND ASIA. THESE ARE THE BEARS ONE SEES IN A ZOO. THEY CAN BE TRAINED AND BECOME QUITE FRIENDLY. THESE BEARS LIKE TO EAT MEAT, FISH AND PLANTS.

Figure 1. Sample paragraph showing use of the first sentence to introduce the general content of the paragraph.

Each of these four stories was typewritten on plain white paper (22 x 28 cm) with each paragraph printed on a separate page. The paragraphs were attached together, separately for each story, with a blank paper appearing as the cover page.[2]

Interview Questions. There were two major sets of interview questions. One set of questions was prepared to assess children's knowledge about the use of paragraph structure for efficient skimming. They were:

1. "Suppose you want to teach one of your classmates how to find out from this story where a grizzly bear usually lives. How would you teach them to find the answer quickly?"

2. "Some students tell me that when they are looking for one specific piece of information in a factual article they do not read all of the paragraphs. They say they skip some of the paragraphs. Do you ever read this way when you are searching for a piece of information?"

3. "How do you (these students) find out which paragraphs you (they) can skip? How do you (these students) find out which paragraphs you (they) should read?"

4. "What information does the first sentence or two of a paragraph in a factual article usually tell you?"

The other set of questions was prepared to assess children's knowledge about the use of key words for

[2]Complete stories appear in Appendix A.

efficient skimming. These were:

5. "When you look for the temperature of Vancouver during the winter, is there some way you can find this information right away?"

6. "What might give you a clue where this information could be located? What other clues might help you to locate this information quickly?"

Procedure

The children were tested individually in a quiet room. After the experimenter and child introduced themselves to each other, the experimenter briefly explained to the child the nature of the interview. The remaining session consisted of three main phases: (a) phase 1 in which the child's differentiated reading speeds were obtained with instructions to read a whole story and with instructions to locate one piece of information (assessment of differentiated reading); (b) phase 2 in which the child's verbal knowledge about skimming strategies was assessed with interview questions (assessment of verbal knowledge); and (c) phase 3 in which the presence or absence of basic skills to perform skimming strategies was assessed (final reading task).

Reading Tasks. The experimenter began this phase of the session by saying: "Today I have some stories for you to read and a few questions I would like to ask you." The experimenter told the child that the first two stories would

be about bears. Having assured that the child knew that there were four kinds of bears in North America, the experimenter gave the child the story to be used to obtain the baseline measure of reading speed (story 1) with the following instructions:

"Let's begin with this story. What I would like you to do first is read this story to yourself. I want you to read every line so that you have read everything that is in the story. The story is written on two separate pages. When you have finished with the first page, go right on to the second one. When you are ready to begin, you may turn the page."

The speed with which the child read the first paragraph of this story was measured by using a Hunter 1910 timer to the nearest second. The experimenter manually activated the timer when the child turned the first page and then stopped it when he/she turned the second page. When the child finished reading the first story, the experimenter said: "How did you like that story? Did you know some of the things in the story already?"

The experimenter then proceeded to the second reading task in which the child could skim efficiently by using the paragraph structure. The child was instructed that his/her task was to find out "just one thing" from the second story: "Where does a grizzly bear usually live?" The child was

also told to underline the sentence that contained the requested information. To insure that the child would clearly remember his/her task, he/she was asked to repeat what he/she was to find out. The child then began reading the second story. The amount of time required by the child to read the first paragraph of the story was measured. When the child finished underlining the target sentence, he/she was asked: "How did you read this story to find out where a grizzly bear usually lives? Did you have any special way of reading?"

The experimenter then went on to the third reading task in which the child could skim for "key words" to locate the target information. The child was told to find out "just one thing" from the third story: "How cold is it in Vancouver in the winter?" The child was told: "When you find the answer, please underline it?" the experimenter checked to be sure that the child remembered what he/she was going to look for and then gave him/her the third story. For this task, the experimenter timed the child beginning when he/she turned the first page until he/she began to underline the target sentence. The child was then asked, as he/she was for the second task, how he/she read the story to find the answer to the question.

Assessment of Verbalizable Knowledge. Immediately following the completion of the reading tasks, the child was

interviewed with the two major sets of questions (see Materials). These questions were asked in the same order (in numerical order as seen in Materials) for all of the children. The appropriate story for each of the two major sets of questions about paragraph structure (story 2) and about key words (story 3) was available for the child to look at during questioning. The experimenter emphasized that there were no "right" or "wrong" answers to the questions. If the child was unable to answer or clearly misunderstood the questions, it was repeated or rephrased until the child provided an answer. The entire interview session was tape recorded.

Final Reading Task. The experimenter gave the child story 4, the story to be used to measure reading speed when he/she had been instructed how to use key words to locate information quickly. The child was instructed to find out "just one thing" from the fourth story: "How cold is it in New York City during the winter?" The child was told to find the answer "as quickly as you can by looking swiftly down the page for key words such as winter and temperature or symbols such as a number and the degree symbol." After asking the child to repeat what he/she was going to look for and to underline the answer when he/she found it, the child was given the fourth story. As for the third reading task, the experimenter timed the child

from when he/she turned the first page until he/she began to underline his/her answer. When the child was finished with this task, he/she was thanked for his/her participation in the study and then sent back to the classroom.[3]

Scoring

Each child's interview responses were transcribed into a written account from the tape recorded interview. Lengthy responses were then recoded into short several-word summaries that were semantically equivalent to the original reports. A preliminary examination of these data suggested several response categories for each interview item, in addition to the originally planned categories (e.g., "use of paragraph structure," "use of key words"), which could be used to score the children's responses. The responses for each of the protocols were then scored independently by two judges based on these categories. The reliability of these scoring judgements was calculated as the percentage of the 62 protocols which the two judges scored identically; it was found to be between 93-100%. Scoring disagreements between judges were resolved through mutual agreement. Interjudge reliability was not formally assessed in instances where it was certain that agreement would be perfect, that is, for questions where a "yes-no" answer was appropriate

[3]No child underlined an irrelevant sentence in any of the four stories.

and questions where the number of responses given was the data to be analyzed.

CHAPTER III

RESULTS

Children's knowledge about skimming strategies was examined in the present study in terms of "behavioral" and "verbal" assessment techniques. In the communication of the results, the behavioral data will be summarized first along with the children's verbal reports about their reading behavior. Next, information related to children's "verbal knowledge," as examined by the interview questions, will be presented.

Behavioral Data

The behavioral data consisted of the amount of time each child spent reading a particular length of passage (i.e., 121 words) under four different reading instructions. Under the first task condition, the child was asked to read the whole story word-by-word (hereafter called whole story condition). Under the second condition, the child was asked to look for one piece of information and could read the story quickly by using the paragraph structure (paragraph structure condition). Under the third condition, the child was asked to locate one piece of information and could read the story quickly by using key words (key word condition). Under the fourth condition, the child was explicitly told to skim for certain key words to find the

requested information in the story (explicit condition).

The time data obtained under each of these four reading conditions for each grade level are summarized in Table 1. A 3 (grade) x 4 (type of instruction) analysis of variance[4] performed on these data yielded significant main effects for grade, F (2, 59) = 29.95, and for type of instruction, F (3, 177) = 149.68, $ps < .0001$. As can be seen in Table 1, the different types of instruction produced different effects on reading speeds at the three grade levels, and a significant grade x type of instruction interaction was observed, F (6, 177) = 6.07, $p < .0001$.

The simple effects of type of instruction at each grade level were examined by using Duncan's multiple range test. These additional analyses showed the following: (a) Grade 4 children did not read with different speeds whether they received the whole story, paragraph structure or key word instruction. These children read the story significantly faster only under the explicit instruction than under the whole story condition, $p < .01$. (b) Unlike the grade 4

[4]A preliminary 3 (grade) x 2 (sex) x 4 (type of instruction) analysis revealed no differences attributable to sex of subject, therefore, further analyses did not include this variable.

TABLE 1

Mean Amount of Time (in sec) Required to Complete Task Under Each of Four Instructions at Three Grade Levels

	Type of Reading Instruction			
Grade	Whole Story 1	Paragraph Structure 2	Key Word 3	Explicit 4
4	55.17	48.17	53.43	13.42
6	46.99	36.08	42.66	11.90
8	33.51	18.59	20.81	7.25

children, the grade 6 children's reading speed became faster with the paragraph structure instruction than with the whole story instruction, $p < .01$. (c) At the grade 8 level, children read the stories with faster speeds when they were asked to find out "just one thing" (paragraph structure and key word conditions) than when they were told to read the "whole story," $p < .01$. These children, however, also benefited from the explicit reading instruction.

Also, the significant grade x type of instruction interaction indicates that the reading speed did not differ across the three grade levels under the explicit instruction, although the older children read the stories with significantly faster speeds than the younger children under the remaining three conditions, Fs (2, 59) = 22.74, 31.41, 16.36, ps $< .001$ for the whole story, paragraph structure and key word conditions, respectively. From the time data alone, it is unclear why the grades 4 and 6 children did not modify their reading strategies under the key word condition (see preceding paragraph). It is clear, however, that even the grade 4 children had basic skills to carry out skimming strategies required by the present key word condition (see the data for the explicit condition).

At the end of the paragraph structure and key word tasks, the children were asked to describe their own

reading strategies: "How did you read to find out where a grizzly bear usually lives (How cold it is in Vancouver during the winter?) Did you have any special way of reading?" The children's responses to these questions were classified into one of six categories. Children's responses were labeled "strategic skimming" if they specified how they skimmed the story (e.g., for paragraph structure task, "I skimmed for the word 'live.'" "First I looked for the word 'grizzly.' And when I found the part about the grizzly bear, then I skimmed for the word 'live.'"; for key word tasks, "I skimmed the story for a number and the degree symbol." "I looked over the story quickly for the word temperature."). Children who merely said "I read the story fast" or "I skimmed," without specifying how they skimmed, were categorized under "skimming." If the children said they read the whole story word-by-word or line-by-line (e.g., "I read everything in the story word-by-word." "I read sentence-by-sentence, not skipping anything."), then the response was classified under "word-by-word." A response was scored as "carefully" if the child said he/she read "carefully" or "slowly." Responses such as "I just read the story" or "I read the story to find the answer" which did not include any specification about how the story was read were labeled as "read." Children

who said "I don't know" or gave uninterpretable responses were categorized as "other."

Table 2 shows how children of different grades were judged to have described their own reading behavior under the paragraph structure (see upper half of Table 2) and the key word (see lower half of Table 2) conditions. We have just seen in the preceding section that the instruction to "find just one thing" affected children's reading speed most at the grade 8 level and least at the grade 4 level. Presumably, these differential effects of reading instructions on reading speed at the three grade levels may reflect the fact that more of the older children than younger children used the "strategic skimming" techniques. Being consistent with this expectation, regardless of the task condition, there is a clear age-related increase in the number of children who said they had used "strategic skimming." In addition, it should be noted in relation to the paragraph structure condition that, although no children explicitly mentioned having used the first sentence of the paragraph to skim strategically, six grade 8 children and no grades 4 or 6 children mentioned a two-stage skimming strategy which seemed to indicate some recognition of the use of paragraph structure for skimming (see second example of "strategic skimming" category given

TABLE 2

Number and Proportion (in parenthesis) of Subjects at Each Grade Level Giving Various Types of Answers to Questions About How They Read for the Paragraph Structure (upper half) and Key Word (lower half) Tasks

Grade	Strategic Skimming	(a) Skimming	(b) Word-by-Word	(c) Carefully	(d) Read	(e) Other
			Paragraph Structure Task			
4	1 (.04)	2 (.08)	7 (.29)	9 (.37)	4 (.17)	1 (.04)
6	6 (.25)	0 (.00)	3 (.13)	7 (.29)	6 (.25)	2 (.08)
8	13 (.93)	1 (.07)	0 (.00)	0 (.00)	0 (.00)	0 (.00)
			Key Word Task			
4	4 (.17)	0 (.00)	5 (.21)	8 (.33)	6 (.25)	1 (.04)
6	6 (.25)	1 (.04)	4 (.17)	7 (.29)	6 (.25)	0 (.00)
8	10 (.71)	1 (.07)	1 (.07)	2 (.14)	0 (.00)	0 (.00)

for the paragraph structure condition in Table 2). When the "strategic skimming" category was compared with a combination of the remaining five categories, the observed age trend was significant, χ^2 (2) = 32.77 for the paragraph structure task and χ^2 (2) = 13.08 for the key word task (ps < .001).[5]

Verbal Data

In order to facilitate the presentation of the verbal data, each set of interview questions will be given verbatim and grouped according to its reference to knowledge about paragraph structure or about key words. Also, the purpose of each set of questions will be described.

Paragraph Structure. In order to investigate children's knowledge about the use of the paragraph structure for searching for information in written materials, first, a "general" question was asked. The question was general in that the word "paragraph" was not included in the question although reference was made to the "story about bears" used under the condition of paragraph structure. This first question (Interview Item 1) was:

1. "Suppose you want to teach one of your classmates how to find out from this story (referring to the story

[5]Results of analyses on fourfold contingency tables derived from this 2 x 3 analysis appear in Appendix D.

about bears used for the paragraph structure condition) where a grizzly bear usually lives. How would you teach them to find the answer quickly?"

Table 3a shows how children of different grade levels were judged to have responded to Interview Item 1. The responses were classified into one of three categories. Children who said they would teach another child to skim and specified how to skim (see examples of "strategic skimming" category given for the paragraph structure condition in Table 2) were classified as having given "strategic skimming" responses. A response was scored as "skimming" if a child said that he/she would tell a classmate to "read fast" or to "skim for the answer" (similar to "skimming" category in Table 2). Any response which did not indicate a method for finding the information quickly was classified under "other forms of reading" (e.g., "Tell him to read everything in the story." "Tell him to look carefully through the story." "Tell him to read the story.").

These data show that about one half of the grades 4 and 6 children and virtually all of the grade 8 children specified how one may use skimming strategies to search for a piece of information in written materials. None of

the children, however, explicitly mentioned how one may use the first sentence of a paragraph to skim strategically. Two grade 8 children did mention a two-stage skimming strategy (see example of this strategy given for Table 2), while none of the grades 4 and 6 children mentioned such a strategy, indicating that these grade 8 children may have and the grades 4 and 6 children may not have recognized the possible use of paragraph structure for skimming. The data summarized in Table 3a were analyzed by forming three 2 (e.g., grade 4 vs. grade 6) x 2 ("strategic skimming" vs. combination of the remaining two categories) tables as shown in Table 3b. The observed age differences between grades 4 and 6 vs. grade 8 were statistically reliable, $ps = .007$ (ps calculated using the Fisher exact test).

While none of the grades 4 and 6 children and only two of the grade 8 children referred to the use of paragraph structure for the purpose of efficient skimming, this may not necessarily mean that such knowledge is absent in the majority of children at these levels. The idea might not have occurred to them with the "general" question. In order to determine this possibility, the following two sets of questions (Interview Items 2 and 3) were asked. These questions were prepared to cue children

TABLE 3a

Number and Proportion (in parentheses) of Subjects at Each Grade Level Giving Various Types of Answers to Interview Item 1

Grade	Strategic Skimming	(a) Skimming	(b) Other Forms of Reading
4	12 (.50)	0 (.00)	12 (.50)
6	12 (.50)	7 (.29)	5 (.21)
8	13 (.93)	1 (.07)	0 (.00)

TABLE 3b

Three Fourfold Contingency Tables Derived From Table 3a

Grade	Strategic Skimming	a + b
4	12 (.50)	12 (.50)
6	12 (.50)	12 (.50)
4	12 (.50)	12 (.50)
8	13 (.93)	1 (.07)
6	12 (.50)	12 (.50)
8	13 (.93)	1 (.07)

to think about the use of paragraph structure. The first question was included merely to introduce the major questions (Interview Item 3) to the children.

2. "Some students tell me that when they are looking for one specific piece of information in a factual article they do not read all of the paragraphs. They say they skip some of the paragraphs. Do you ever read this way when you are searching for a piece of information?"

3. "How do you (these students) find out which paragraphs you (they) can skip? How do you (these students) find out which paragraphs you (they) should read?"

Table 4a indicates how children responded to Interview Item 2. Three fourfold contingency tables were derived from Table 4a (e.g., grade 4 vs. grade 8 x yes vs. no; see Table 4b). The Fisher exact test applied to these tables indicated that the difference between the grade 4 and grade 8 children was significant, $p = .01$, revealing that more of the grade 8 than grade 4 children said that they sometimes skip paragraphs when they are searching for one piece of information. The remaining two comparisons were not statistically reliable.

Table 5a shows how children were judged to have responded to Interview Item 3. Children who said they would decide whether or not to read the whole paragraph by reading

TABLE 4a

Number and Proportion (in parentheses) of Subjects at Each Grade Level Giving "Yes" or "No" Answers to Interview Item 2

Grade	Yes	No
4	13 (.54)	11 (.46)
6	17 (.71)	7 (.29)
8	13 (.93)	1 (.07)

TABLE 4b

Three Fourfold Contingency Tables Derived from Table 4a

Grade	Yes	No
4	13 (.54)	11 (.46)
6	17 (.71)	7 (.29)
4	13 (.54)	11 (.46)
8	13 (.93)	1 (.07)
6	17 (.71)	7 (.29)
8	13 (.93)	1 (.07)

the first few sentences of the paragraph were classified under "paragraph structure" (e.g., "I would read the first sentence." "I would read the first few sentences and the last sentence." "I would read the first sentence and then skim to see if there were any words related to my topic in it."). Children who said they would skim the paragraph for key words to decide if the paragraph was important to read or not were grouped under "use of key words" (e.g., "I would look quickly for words related to what I want to find and if I can't find any, then I skip it."). Those children who said they would decide by "skimming the paragraph" or by "reading it over quickly," without specifying how they would skim, were classified under "skimming" (similar to "skimming" category in Table 2). Children were classified under "nonstrategic" if they mentioned other forms of reading than skimming as methods of finding out which paragraphs are relevant for them to read (e.g., "I would read the whole story." "I would read carefully." "I would just read the paragraph."). The "other" category included responses such as "I see if it is interesting" and "I don't know."

The data presented in Table 5a indicate that more of the older children than younger children referred to the use of paragraph structure for deciding the relevancy of a

TABLE 5a

Number and Proportion (in parentheses) of Subjects at Each Grade Level Giving Various Types of Answers to Interview Item 3

Grade	Paragraph Structure	(a) Use of Words	(b) Skimming	(c) Non-Strategic	(d) Other
4	9 (.37)	6 (.25)	3 (.13)	4 (.17)	2 (.08)
6	12 (.50)	4 (.17)	0 (.00)	1 (.04)	7 (.29)
8	12 (.86)	2 (.14)	0 (.00)	0 (.00)	0 (.00)

TABLE 5b

Three Fourfold Contingency Tables Derived From Table 5a

Grade	Paragraph Structure	a + b + c + d
4	9 (.37)	15 (.63)
6	12 (.50)	12 (.50)
4	9 (.37)	15 (.63)
8	12 (.86)	2 (.14)
6	12 (.50)	12 (.50)
8	12 (.86)	2 (.14)

paragraph. The observed age trend (grade x paragraph structure vs. combination of the remaining four categories) was significant, χ^2 (2) = 8.42, $p < .02$. Further analyses were performed on the fourfold contingency tables (see Table 5b) derived from Table 5a (e.g., grade 4 vs. grade 8 x paragraph structure vs. combination of the remaining four categories). These analyses showed that the differences between grades 4 and 6 vs. grade 8 children were significant, χ^2 (1) = 8.31, $p < .01$, and χ^2 (1) = 4.85, $p < .05$, respectively. These findings indicate that significantly more grade 8 children than grades 4 or 6 children mentioned that one can use the first sentence of a paragraph to determine if a piece of information may be found in that paragraph.[6]

More than half of the younger children (grades 4 and 6) failed to refer to the "paragraph structure" in response to Interview Item 3. This observed failure may be partly due to the lack of awareness about the function of the first few sentences in a paragraph. To examine this possibility, children were asked this question (Interview

[6]The data in Table 5a were also analyzed by forming three 2 (combination of the first two categories vs. combination of the remaining three categories) x 2 (e.g., grade 4 vs. grade 6) tables. See Table B in Appendix D for these results.

Item 4):

4. "What information does the first sentence or two of a paragraph in a factual article usually tell you?"

Table 6a shows how children responded to Interview Item 4. Children who said that the first few sentences of a paragraph tell what the paragraph will be about (e.g., "what the paragraph will be about," "what you will find out in that paragraph?) were classified under "general content." Children who mentioned specific items that the first sentence or two of a paragraph might include (e.g., "It tells you how tall the bear is." "They might tell you how much the bear weighs.") were classified under "specific item." The "other" category included such responses as "They are all different" and "I don't know."

These data show that a majority of children at each grade level specified that the first few sentences of a paragraph function to introduce to the reader the general content of the paragraph. Three 2 (e.g., grade 4 vs. grade 6) x 2 ("general content" vs. combination of the remaining two categories) analyses were performed on the data presented in Table 6a (see Table 6b). The Fisher exact test applied to these tables indicated that none of the comparisons were statistically reliable. These results indicate that children at all three grade levels

TABLE 6a

Number and Proportion (in parentheses) of Subjects at Each Grade Level Giving Various Types of Answers to Interview Item 4

Grade	General Content	(a) Specific Item	(b) Other
4	17 (.71)	6 (.25)	1 (.04)
6	19 (.79)	3 (.13)	2 (.08)
8	13 (.93)	0 (.00)	1 (.07)

TABLE 6b

Three Fourfold Contingency Tables Derived From Table 6a

Grade	General Content	a + b
4	17 (.71)	7 (.29)
6	19 (.79)	5 (.21)
4	17 (.71)	7 (.29)
8	13 (.93)	1 (.07)
6	19 (.79)	5 (.21)
8	13 (.93)	1 (.07)

are equally aware of the function of the first few sentences of a paragraph.

Key Words. In order to investigate children's knowledge about how to use key words to locate a piece of information in written materials, children were first asked a "general" question. The question was general in that the terms "key word" and "clue" were not included in the question. The first question (Interview Item 5) was:

5. "When you look for the temperature of Vancouver during the winter, is there some way you can find this information right away?"

Table 7a shows how children responded to Interview Item 5. The responses were classified into one of three categories. Children who said they would find the answer quickly by skimming for key words (see examples of "strategic skimming" category given for the key word condition in Table 2) were labeled as "skimming for key words." A response was scored as "skimming" if a child said that he/she would find the answer quickly by "skimming the story" or by "reading the story fast" (similar to "skimming" category in Table 2). Responses which did not indicate a method for locating the temperature data quickly were classified under "other forms of reading" (see examples of this category given for Table 2 corresponding

TABLE 7a

Number and Proportion (in parentheses) of Subjects at Each Grade Level Giving Various Types of Answers to Interview Item 5

Grade	Skimming for Key Words	(a) Skimming	(b) Other Forms of Reading
4	13 (.54)	0 (.00)	11 (.46)
6	16 (.67)	5 (.21)	3 (.12)
8	13 (.93)	1 (.07)	0 (.00)

TABLE 7a

Three Fourfold Contingency Tables Derived from Table 7a

Grade	Skimming for Key Words	a + b
4	13 (.54)	11 (.46)
6	16 (.67)	8 (.33)
4	13 (.54)	11 (.46)
8	13 (.93)	1 (.07)
6	16 (.67)	8 (.33)
8	13 (.93)	1 (.07)

to the "word-by-word," "carefully," "read" and "other" categories defined there).

The data summarized in this table indicate that more of the older children than younger children specified how to use key words to locate a piece of information. The observed developmental trend (grade x "skimming for key words" vs. combination of the remaining two categories) was statistically reliable, χ^2 (2) = 6.08, $p < .05$. The data were further analyzed by forming three 2 (e.g., grade 4 vs. grade 6) x 2 ("skimming for key words" vs. combination of the remaining two categories) tables as shown in Table 7b. The results of these analyses showed that only the difference between grade 8 and grade 4 was significant, χ^2 (1) = 6.13, $p < .01$.

About one-half of the grade 4 and one-thirds of the grade 6 children did not refer to the use of key words in response to Interview Item 5. This finding may be due, in part, to the inability of these children to choose appropriate key words. To examine this possibility, the following questions (Interview Item 6) were asked:

6. "What might give you a clue where this information could be located? What other clues might help you to locate this information quickly?"

As shown in Table 8, when only the first responses given to Interview Item 6 were examined, the majority of children at each grade level were able to give a good key word (e.g., winter, temperature, numbers, degree symbol). A 3 (grades 4 vs. 6 vs. 8) x 2 ("good key words" vs. "absence of good key words") analysis performed on these data yielded a nonsignificant result indicating that children at all three grade levels are equally likely to think of a good key word on the first trial.

The children were encouraged to think about as many "good clues" as they could for Interview Item 6. Different good clues suggested by children are summarized in Table 9. At all grade levels, temperature and numbers were selected frequently by children. The mean numbers of good clues children could generate were 2.2, 2.9, and 2.9 at grades 4, 6, and 8, respectively. These scores were not statistically different. Thus, the analyses of children's responses to Interview Item 6 suggest that after grade 4 there may not be age-related differences in children's ability to anticipate how the information may be expressed in written materials if one uses tasks similar to the present one.

TABLE 8a

Number and Proportion (in parentheses) of Subjects at Each Grade Level Either Giving or Not Giving a Good Key Word on Trial 1 in Response to Interview Item 6

Grade	Good Key Word	Absence of Good Key Word
4	20 (.83)	4 (.17)
6	24 (1.00)	0 (.00)
8	13 (.93)	1 (.07)

TABLE 8b

Three Fourfold Contingency Tables Derived From Table 8a

Grade	Good Key Word	Absence of Good Key Word
4	20 (.83)	4 (.17)
6	24 (1.00)	0 (.04)
4	20 (.83)	4 (.17)
8	13 (.93)	1 (.07)
6	24 (1.00)	0 (.00)
8	13 (.93)	1 (.07)

TABLE 9

Number of Subjects at Each Grade Level Giving Various Good Key Words in Response to Interview Item 6

Grade	Temperature	Numbers	Celcius/ Fahrenheit	Degree Symbol	Winter	Weather	Cold	Climate	Season
4	10	16	9	7	7	2	2	0	0
6	15	13	13	12	7	10	1	2	1
8	10	9	3	5	10	4	1	1	1

CHAPTER IV

DISCUSSION

Based on the present results, what can be said regarding the development of children's knowledge about skimming strategies? The major discussion will be focused on this question.

In order to use the skimming strategies considered in the present study, children must know (a) what the first sentence generally does for a paragraph and (b) what key words are likely to indicate the location of the sought-after information in a story. The verbal data of this study suggest that a majority of the grade 4 children have such basic knowledge (see Tables 6a, 8a, and 9). It was also found that the grade 4 children could look for a piece of information in a story as quickly as the grade 8 children when they were instructed explicitly how they should skim for key words. This finding indicates that the grade 4 children have the necessary skills to perform the skimming strategy investigated in this study. It may be concluded, then, that as far as basic knowledge and skills are concerned, we may not see much age-related changes after grade 4.

The verbal data also indicate that there are some aspects of knowledge about skimming that show developmental

changes between grades 4 and 8. Researchers on the cognitive development of children (e.g., Flavell, 1970; Yendovitskaya, 1971) have frequently pointed out that children initially acquire various pieces of knowledge about learning materials and cognitive skills. Only at a later point of development do children become aware that they can make use of previously acquired knowledge (e.g., classification) as a means to solve new or different problems (e.g., memory tasks). In an analogous manner, we have seen in the present study that as many grade 4 children as grade 8 children could think that the requested information, "How cold is it in Vancouver in the winter?" may be expressed with a degree symbol or in numerical figures. Only half of the grade 4 children but almost all of the grade 8 children could figure out that they could facilitate the process of information search by using that knowledge (i.e., how the information is expressed). A similar pattern of findings was observed in the data regarding the use of paragraph structure (see Tables 4a and 5a). The findings appear to suggest that for approximately one-third to half of grade 4 children, "how to skim efficiently" may become part of their verbalizable knowledge. This type of knowledge appears to be possessed by many children by the time they reach grade 8.

An examination of both the verbal and behavioral data suggests that, in addition to knowledge about "how to skim,"

there is something else that develops between grades 4 and 8. According to the verbal data, approximately 50 to 60% of the grades 4 and 6 children could describe strategic skimming techniques explicitly (see Tables 3a, 5a, and 7a). The behavioral data indicate, however, that only a small proportion of these knowledgeable children actually used such strategies when they were asked to "find just one thing" (see Tables 1 and 2). This observed discrepancy between the verbal and behavioral data suggests that there were children at the grades 4 and 6 levels who had the knowledge about "how to skim," but were not sensitive to an "implicit" task demand to modify their reading strategies. In contrast, the grade 8 children not only were knowledgeable about skimming strategies, but also spontaneously used that knowledge according to the task demand. These data, then, suggest that part of knowledge about skimming consists of coming to know when one should deliberately use skimming strategies.

In summary, the results of this study indicate that grade 4 children have the basic knowledge (e.g., function of the first sentence of a paragraph) and skills necessary to skim. About half of these children are aware that they can use their knowledge (e.g., about paragraph structure) for the purpose of skimming. This type of knowledge appears to be possessed by many grade 8 children. Also, children

become more sensitive, with age, to task demands calling for strategic skimming.

While attempts were made to assess both children's "higher" and "lower" limits of understanding about how to skim, only two instances were chosen in this study from among a virtually infinite number of situations calling for skimming. To facilitate the collection of data, children who might have had reading problems were not included in this study. Children's sensitivity to task demands may be affected by the nature of retrieval questions and reading materials. Children's metacognitive knowledge about reading skills must be affected by what they learn at school. For these and other reasons, whether or not the present findings are typical needs to be determined by additional investigations.

Presuming that these results are typical, they suggest certain implications relevant to the educational setting. First, experts on school reading programs indicate that children generally begin to learn about the skimming strategies investigated in the study in grade 4 (Spache & Spache, 1977). The results of the study, however, suggest that it is not until grade 8 that the majority of children are able to verbalize about how to use paragraph structure and key words to skim. This discrepancy between what children are said to learn in school and what they know may

indicate either that the present methods of teaching such skills may not be adequate or that the present reading program may not concentrate on the teaching of these skills enough. Teachers may feel that they are not able to take very much time away from other important content areas to teach such reading skills. The importance of "locational skills" such as those investigated in the present study, must not be overlooked, however. Knowledge is growing and changing very quickly in almost every field. A single classroom textbook can no longer be regarded as a sufficient source of knowledge in most of the content areas (e.g., social studies, science; Thomas & Robinson, 1975). In view of this, it seems obvious that students need skills which will enable them to search out information independently. Seeing that many children may not be knowledgeable about at least one such skill, i.e., the skill of skimming for a fact from written material using paragraph structure or key words, until grade 8, educators may want to reevaluate the present program for teaching this independent study skill to children younger than grade 8.

The results of this study not only suggest that children at the younger levels may need more and/or better instruction about how to skim using paragraph structure and key words but that these children also need explicit instruction about what types of tasks may be facilitated

by applying these strategies. Only a small proportion of even those grades 4 and 6 who could verbalize how to use these strategies actually knew that they should use them during the reading tasks. Educators should, it seems, include instructions about both how and when to use these strategies in their reading programs.

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APPENDIX A

STORIES

STORY 1

IN THIS STORY, FIRST YOU WILL READ ABOUT BROWN BEARS. THE BROWN BEAR IS THE BIGGEST KIND OF BEAR. THEY CAN GROW TO BE AS LONG AS 2.7 METERS. MANY OF THEM WEIGH MORE THAN 360 KILOGRAMS. BROWN BEARS HAVE A SHAGGY COAT. BUT, A BROWN BEAR DOES NOT ALWAYS HAVE A BROWN COAT. SOME ARE GRAYISH WHITE. OTHERS LOOK ALMOST BLUE. SOME ARE BLACK. THESE BEARS BECOME AFRAID EASILY. THEY WILL ATTACK WHEN THEY ARE AFRAID. BROWN BEARS LIKE TO BE ALONE. MOST OFTEN THEY LIVE IN THE WILD PARTS OF ALASKA AND ASIA. THESE ARE THE BEARS ONE SEES IN A ZOO. THEY CAN BE TRAINED AND BECOME QUITE FRIENDLY. THESE BEARS LIKE TO EAT MEAT, FISH AND PLANTS.

-2-

NOW, YOU WILL READ ABOUT POLAR BEARS. THE POLAR BEAR IS ONLY A LITTLE SMALLER THAN A BROWN BEAR. THEY HAVE THICK, HEAVY FUR. THIS KEEPS THEM WARM IN COLD WEATHER. THEY EVEN HAVE FUR ON THE BOTTOM OF THEIR FEET. THIS HELPS THEM TO WALK ON ICE. POLAR BEARS NEED THIS FUR BECAUSE THEY LIVE WHERE IT IS ALWAYS COLD. THEY LIVE IN AREAS AROUND THE ARCTIC OCEAN. THEIR FUR IS ALMOST ALL WHITE. SOMETIMES IT LOOKS YELLOW. POLAR BEARS ARE VERY GOOD HUNTERS. THEY ARE ALSO THE BEST SWIMMERS OF ALL BEARS. THEY EAT SEA ANIMALS SUCH AS FISH AND SEALS. THEY LIKE REINDEER MEAT TOO. SOMETIMES WHEN THEY ARE VERY HUNGRY, THEY MAY ATTACK PEOPLE.

STORY 2

IN THIS STORY, YOU WILL READ ABOUT BLACK BEARS FIRST. THE BLACK BEAR IS NOT A VERY LARGE BEAR. THESE BEARS ONLY GROW TO BE ABOUT 1.5 METERS LONG. THEY MAY WEIGH FROM 92 TO 240 KILOGRAMS. NOT ALL BLACK BEARS ARE BLACK. SOME ARE WHITE. SOME ARE BROWN. OTHERS ARE BLACK WITH SOME WHITE FUR. AND SOME ARE BLACK WITH BROWN NOSES. BLACK BEARS ARE THE MOST DANGEROUS KIND OF BEAR. THEY MAY ATTACK EVEN WHEN THEY ARE NOT HUNGRY OR AFRAID. BLACK BEARS ARE ALSO THE MOST COMMON KIND OF BEAR. THESE BEARS LIVE IN THE WOODS IN NORTH AMERICA AND ASIA. THEY CLIMB TREES TO GET FOOD. THEY CAN FIND MEAT AND FRUITS TO EAT IN THE WOODS.

NOW YOU WILL READ ABOUT GRIZZLY BEARS. THE GRIZZLY BEAR IS THE THIRD LARGEST KIND OF BEAR. SOMETIMES THEY GROW TO BE 2.4 METERS LONG AND WEIGHT ABOUT 360 KILOGRAMS. A GRIZZLY BEAR HAS A BROWN COAT WITH SOME WHITE HAIRS IN IT. FOR THIS REASON, THEY ARE SOMETIMES CALLED SILVERTIPS. GRIZZLY BEARS CAN BE VERY DANGEROUS ANIMALS. THEY WILL ATTACK WHEN THEY ARE ANGRY. ONCE GRIZZLIES ROAMED FREELY OVER WESTERN NORTH AMERICA. BUT, HUNTERS HAVE KILLED SO MANY GRIZZLIES THAT THERE ARE ONLY A FEW LEFT. TODAY, SOME LIVE IN THE MOUNTAINS AND IN SAFE PARKS. GRIZZLIES LIKE TO EAT FISH AND WILD BIRDS. THEY CAN NOT CLIMB TO GET FOOD, BUT THEY CAN RUN VERY FAST.

STORY 3

IN THIS STORY, YOU WILL READ ABOUT A LARGE CITY. CANADA HAS MANY LARGE CITIES. VANCOUVER IS ONE OF THEM. VANCOUVER IS CANADA'S THIRD LARGEST CITY. THERE ARE A LITTLE OVER TWO MILLION PEOPLE LIVING THERE. VANCOUVER BEGAN AS A SMALL TOWN. IT GREW INTO A LARGE CITY. PEOPLE WANT TO LIVE IN VANCOUVER BECAUSE THERE ARE MANY GOOD THINGS ABOUT IT. FIRST OF ALL, THE CITY LIES IN A BEAUTIFUL SETTING. HIGH MOUNTAINS AND CALM WATERS ARE ALL AROUND IT. EVERGREEN FORESTS GROW ALMOST TO THE EDGE OF THE CITY. PEOPLE LIKE VANCOUVER'S WEATHER. THE MOUNTAINS AND WARM OCEAN WINDS GIVE THIS CITY MILD TEMPERATURES. EVEN THE WINTER IS NOT VERY COLD. THE AVERAGE TEMPERATURE IN THE WINTER IS 2°C. PEOPLE CAN DO THINGS OUTSIDE ALL YEAR. ALSO, VANCOUVER IS NEAR THE OCEAN. IT MAKES A GOOD PORT CITY. LAND IS ALL AROUND ITS LARGE HARBOUR. THIS MAKES IT A SAFE PLACE FOR LARGE SHIPS TO COME. THESE SHIPS CAN BRING THE THINGS PEOPLE NEED TO LIVE. THE LARGE FORESTS ARE A GOOD NATURAL RESOURCE. PEOPLE CAN USE THE WOOD TO MAKE THINGS. MANY PEOPLE CAN FIND WORK MAKING THESE THINGS. PEOPLE ALSO LIKE VANCOUVER BECAUSE IT HAS MANY THINGS FOR PEOPLE TO DO. IT HAS SEVERAL NICE BEACHES AND MANY PARKS. THE MOUNTAINS ARE A GOOD PLACE FOR SKIING AND HIKING. THE CITY HAS A LARGE MUSEUM AND LIBRARY.

STORY 4

NOW, YOU WILL READ ABOUT A LARGE CITY IN THE UNITED STATES. THE UNITED STATES HAS MANY LARGE CITIES ALSO. NEW YORK CITY IS THE LARGEST CITY IN THE UNITED STATES. IT IS THE THIRD LARGEST CITY IN THE WORLD. ALMOST EIGHT MILLION PEOPLE LIVE THERE. PEOPLE CAME TO THIS CITY FROM ALL OVER THE WORLD. THEY WERE LOOKING FOR A PLACE TO MAKE A BETTER LIFE. TODAY, THIS CITY IS NOT A VERY NICE PLACE TO LIVE. FIRST OF ALL, THE WEATHER IS NOT PLEASANT. IN THE SUMMER, IT IS OFTEN VERY HOT. THERE ARE FEW COOL BREEZES ON HOT DAYS. THE WINTER IN NEW YORK CITY IS NOT VERY COLD. THE TEMPERATURE IN WINTER STAYS AROUND FREEZING, ABOUT 1°C. BUT, THERE IS A LOT OF RAIN AND SNOW. ALSO, NEW YORK CITY IS VERY CROWDED. TOO MANY PEOPLE LIVE THERE. MANY OF THESE PEOPLE ARE POOR. THEY LIVE IN POOR HOMES. ALSO, IT IS DIFFICULT TO FIND WORK IN THIS CITY. MANY PEOPLE THINK THIS IS AN EXCITING CITY TO VISIT. IT HAS SOME OF THE WORLD'S LARGEST MUSEUMS. IT HAS MANY LIBRARIES. PEOPLE CAN ENJOY ALL KINDS OF MUSIC, ART AND PLAYS. THERE ARE SPORTS TO GO TO. THERE ARE MANY GOOD STORES TO SHOP IN. THIS CITY HAS MORE THAN ONE HUNDRED PARKS. IT EVEN HAS A LARGE PARK IN THE DOWNTOWN AREA. PEOPLE CAN ALWAYS FIND GOOD THINGS TO DO IN THIS CITY.

APPENDIX B

READABILITY FORMULA

The readability level of each of the four stories prepared for this study was determined by using the Spoche (1953) new readability formula for primary grade reading materials. The complete formula is as follows:

Grade level = .141 x (average sentence length per 100 words) + .086 x (number of words outside the Dale [1931] "Easy Word List" of 769 words) + .839.

In other words, to calculate the grade readability level of text materials, first multiply the average sentence length in a sample of 100 words by .141. Then multiply the number of words in that sample which are not on the Dale (1931) "Easy Word List" of 769 words by .086. To the sum of these two figures add the constant .839. This sum represents the estimated difficulty of the material being considered. This will be a figure such as 3.832, which when rounded off as 3.8, indicates a book equal in difficulty to school books used in the eighth month of Grade 3.

APPENDIX C

RAW DATA

BEHAVIORAL DATA

Grade 4		Reading Speeds (in sec)				Description of Reading Behavior[a]	
	Sex	Whole Story	Paragraph Structure	Key Words	Explicit	Paragraph Structure	Key Word
1	f	45.8	38.9	33.8	4.0	3	3
2	f	51.4	49.9	46.7	7.0	4	4
3	f	61.1	47.6	41.0	4.4	3	3
4	f	39.5	31.8	58.3	8.5	2	4
5	f	58.4	42.5	101.1	52.5	5	3
6	f	49.6	46.5	101.1	15.8	5	5
7	f	48.8	37.1	45.7	18.7	5	4
8	f	77.0	64.4	82.2	5.0	4	4
9	f	37.5	37.0	42.7	7.4	3	5
10	f	51.9	50.1	50.3	3.4	1	1
11	f	57.5	45.5	51.8	3.8	4	4
12	f	56.9	43.8	45.6	31.9	4	3
13	m	85.8	87.5	64.2	2.6	5	5
14	m	50.9	50.6	38.3	21.5	4	5
15	m	50.8	43.4	37.2	2.7	2	1
16	m	50.7	44.2	44.2	4.6	6	6
17	m	48.6	34.8	33.4	16.7	4	1
18	m	50.7	63.2	44.6	16.1	3	1
19	m	56.5	55.2	56.1	32.2	3	4
20	m	62.4	70.1	68.4	11.2	4	5
21	m	54.2	42.1	45.0	20.7	3	5
22	m	53.5	34.1	55.0	6.5	4	4
23	m	56.8	53.3	48.4	3.7	4	4
24	m	60.1	42.5	42.1	21.2	3	3

[a] 1 = Strategic Skimming
2 = Skimming
3 = Word-by-Word
4 = Carefully
5 = Read
6 = Other

VERBAL DATA

Grade 4	Interview Item: Paragraph Structure 1[a]	2[b]	3[c]	4[d]	Key Words 5[e]	6 Trial 1	No. of Good Key Words Given
1	3	1	3	1	3	2	0
2	3	1	2	1	1	1	2
3	3	1	3	2	3	2	0
4	3	2	5	3	4	1	5
5	1	2	1	1	1	1	3
6	3	2	3	1	4	2	0
7	1	1	1	2	3	1	2
8	1	2	1	1	1	1	2
9	3	1	2	1	1	1	1
10	1	2	1	1	1	1	3
11	3	2	4	2	1	1	2
12	3	2	1	2	1	1	1
13	1	2	2	1	1	1	5
14	3	1	2	1	4	1	1
15	1	2	1	1	3	2	0
16	1	1	4	1	3	1	5
17	1	2	2	1	1	1	2
18	1	1	2	1	1	1	2
19	3	2	1	1	3	1	3
20	1	1	1	1	1	1	5
21	3	1	4	2	3	1	3
22	1	1	5	1	1	1	3
23	3	1	4	2	1	1	1
24	1	1	1	1	4	1	2

[a] 1=Strategic Skimming
2=Skimming
3=Other Forms of Reading

[b] 1=Yes
2=No

[c] 1=Paragraph Structure
2=Use of Key Words
3=Skimming
4=Nonstrategic
5=Other

[d] 1=General Content
2=Specific Item
3=Other

[e] 1=Skimming for Key Words
2=Skimming
3=Other Forms of Reading

[f] 1=Good Key Words
2=Absence of Good Key Word

BEHAVIORAL DATA

Grade 6		Reading Speeds (in sec)				Description of Reading Behavior[a]	
	Sex	Whole Story	Paragraph Structure	Key Words	Explicit	Paragraph Structure	Key Word
1	f	49.8	47.3	52.7	34.3	5	4
2	f	49.8	28.0	46.6	5.4	3	5
3	f	44.7	47.3	46.3	8.3	4	5
4	f	42.7	28.0	29.1	5.2	1	1
5	f	27.3	21.3	26.5	5.6	4	4
6	f	36.4	24.7	54.8	3.7	4	5
7	f	46.9	33.0	37.7	15.3	3	4
8	f	67.4	45.4	59.5	30.4	5	3
9	f	38.5	33.1	22.6	6.0	1	3
10	f	58.4	27.7	27.0	8.8	6	5
11	f	45.7	40.3	49.6	19.7	5	3
12	f	59.6	56.8	63.2	41.1	4	4
13	m	40.6	15.9	21.3	7.3	1	1
14	m	29.5	24.8	17.4	22.3	1	3
15	m	39.7	24.0	29.5	12.0	5	1
16	m	45.2	34.5	43.1	3.2	6	4
17	m	55.3	44.3	41.4	7.3	3	5
18	m	38.4	43.8	22.1	4.5	1	1
19	m	51.3	43.7	39.7	5.0	4	2
20	m	57.8	48.0	50.2	7.7	1	1
21	m	60.0	42.7	42.6	10.3	4	1
22	m	35.2	21.1	24.4	4.1	5	5
23	m	51.9	45.6	43.3	11.3	4	4
24	m	55.7	44.7	109.3	6.8	5	4

[a]1 = Strategic Skimming
2 = Skimming
3 = Word-by-Word
4 = Carefully
5 = Read
6 = Other

VERBAL DATA

	Interview Item						
	Paragraph Structure					Key Words	
	1[a]	2[b]	3[c]	4[d]	5[e]	6	
Grade 6						Trial 1	No. of Good Key Words Given
1	1	1	1	1	1	1	3
2	3	2	1	1	3	1	1
3	2	1	5	3	2	1	1
4	2	1	2	1	2	1	3
5	2	1	2	1	1	1	2
6	1	1	1	1	1	1	3
7	2	2	5	1	1	1	3
8	2	1	5	2	1	1	1
9	1	1	1	1	1	1	4
10	1	1	1	3	1	1	2
11	3	1	2	2	1	1	6
12	3	2	1	1	1	1	4
13	1	1	4	2	1	1	4
14	3	1	2	1	1	1	3
15	1	2	1	1	4	1	3
16	1	1	5	1	1	1	3
17	1	2	1	1	1	1	5
18	1	1	1	1	2	1	3
19	3	1	1	1	1	1	3
20	1	2	5	1	1	1	5
21	2	1	1	1	2	1	1
22	1	1	1	1	4	1	1
23	2	2	5	1	2	1	1
24	1	1	5	1	1	1	4

[a] 1=Strategic Skimming
2=Skimming
3=Other Forms of Reading

[b] 1=Yes
2=No

[c] 1=Paragraph Structure
2=Use of Key Words
3=Skimming
4=Nonstrategic
5=Other

[d] 1=General Content
2=Specific Item
3=Other

[e] 1=Skimming for Key Words
2=Skimming
3=Other forms of Reading

[f] 1=Good Key Word
2=Absence of Good Key Word

BEHAVIORAL DATA

Grade 8	Sex	Reading Speeds (in sec) Whole Story	Paragraph Structure	Key Words	Explicit	Description of Reading Behavior[a] Paragraph Structure	Key Word
1	f	30.7	26.8	24.6	12.7	1	1
2	f	29.9	14.9	15.4	5.3	1	3
3	f	40.5	23.7	36.8	4.2	1	4
4	f	30.3	3.8	10.3	7.0	1	1
5	f	30.1	17.4	16.1	6.7	1	1
6	f	23.1	9.7	20.1	14.3	1	1
7	m	31.4	26.5	27.0	3.9	1	1
8	m	31.1	29.5	17.4	2.3	2	4
9	m	31.4	15.7	23.3	2.7	1	1
10	m	48.7	19.6	23.6	5.5	1	1
11	m	34.3	27.8	26.3	12.0	1	1
12	m	33.7	17.1	22.4	17.4	1	2
13	m	31.3	11.8	14.9	4.8	1	1
14	m	42.6	16.0	13.1	2.7	1	1

[a] 1 = Strategic Skimming
2 = Skimming
3 = Word-by-Word
4 = Carefully
5 = Read
6 = Other

VERBAL DATA

	Interview Item						
	Paragraph Structure					Key Words	
Grade 8	1[a]	2[b]	3[c]	4[d]	5[3]	Trial 1	6 No. of Good Key Words Given
1	1	1	1	1	1	1	3
2	1	1	1	1	1	1	6
3	1	1	1	1	2	2	0
4	1	1	1	1	1	1	3
5	1	1	1	1	1	1	3
6	1	1	1	1	1	1	3
7	1	1	2	1	1	1	4
8	2	1	1	1	1	1	1
9	1	1	1	1	1	1	5
10	1	2	2	1	1	1	5
11	1	1	1	3	1	1	3
12	1	1	1	1	1	1	1
13	1	1	1	1	1	1	2
14	1	1	1	1	1	1	2

[a] 1 = Strategic Skimming
2 = Skimming
3 = Other Forms of Reading

[b] 1 = Yes
2 = No

[c] 1 = Paragraph Structure
2 = Use of Key Words
3 = Skimming
4 = Nonstrategic
5 = Other

[d] 1 = General Content
2 = Specific Item
3 = Other

[e] 1 = Skimming for Keywords
2 = Skimming
3 = Other Forms of Reading

[f] 1 = Good Key Word
2 = Absence of Good Key Word

APPENDIX D

AUXILLIARY TABLES

TABLE A

Three Fourfold Contingency Tables Derived from Each of the Upper (Paragraph Structure Task) and Lower (Key Word Task) Halves of Table 2

Strategic Skimming	a + b	c + d + e
Grade	Paragraph Structure Task	
4[a]	1 (.04)	23 (.96)
6	6 (.25)	18 (.75)
4[b]	1 (.04)	23 (.96)
8	13 (.93)	1 (.07)
6[c]	6 (.25)	18 (.75)
8	13 (.93)	1 (.07)
Grade	Key Word Task	
4[d]	4 (.17)	20 (.83)
6	6 (.25)	18 (.75)
4[e]	4 (.17)	20 (.83)
8	10 (.71)	4 (.29)
6[f]	6 (.25)	18 (.75)
8	10 (.71)	4 (.29)

a Fisher exact test applied to these data indicated $p = .04$.

b $\chi^2(1) = 29.89$, $p < .0001$.

c $\chi^2(1) = 16.29$, $p < .0001$.

d This comparison was not statistically significant.

e $\chi^2(1) = 11.40$, $p < .001$.

f $\chi^2(1) = 7.81$, $p < .01$.

TABLE B

Three Fourfold Contingency Tables Derived From Table 5a

Grade	Paragraph Structure + Use of Key Words	b + c + d
4[a]	15 (.63)	9 (.37)
6	16 (.67)	8 (.33)
4[b]	15 (.63)	9 (.37)
8	14 (1.00)	0 (.00)
6[c]	16 (.67)	8 (.33)
8	14 (1.00)	0 (.00)

[a]This comparison was not statistically significant.
[b]Fisher exact test applied to these data indicated $p < .008$.
[c]Fisher exact test applied to these data indicated $p < .01$.

VITA AUCTORIS

Christine Conheady Ransom was born on April 10, 1954 in Rochester, New York. In June of 1972 she graduated from St. Agnes High School of Rochester and in September of the same year was matriculated at St. John Fisher College of the same city. She graduated with the Bachelor of Arts degree, summa cum laude, in May of 1976. Since September, 1976 she has been enrolled in the Master's program in clinical psychology at the University of Windsor.

Christine Conheady Ransom is married to Richard W. Ransom.