THE EFFECTS OF FOUR DIFFERENT TEXT STRUCTURES ON THE RETELLINGS OF FOURTH AND SIXTH GRADE STUDENTS

by

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(ABSTRACT)

The purpose of this study was to analyze the influence of different expository text structures on fourth and sixth grade students' written retellings. Although previous research has shown that text structure can assist in understanding and recalling text, little work has been done with the use of different expository text structures by elementary school students, who typically have difficulty with expository text.

The basic questions of the study were

(1) Is there a difference in students' use of structure or number of idea units?

(a) in retellings of passages presented in four different structures?

(b) in the retellings of students in grade four compared with those in grade six?

(2) Is there an interaction between structural pattern and grade level in the use of structure or the number of idea units?

(3) Is there an interaction between structural pattern of text and topic in the use of structure or the number of idea units?

Subjects were thirty-nine students in each grade with average and above average reading ability. Using passages in four top-level structures identified by Meyer (1975)--collection/description, problem/solution, comparison/contrast, and cause/effect--subjects read and immediately retold passages in writing. The retellings were scored for the use of the author's original structure and the number of targeted idea units. Hypotheses were tested using a 4 (text structure) x 4 (topic) x 2 (grade level) factorial analysis of variance for each dependent variable.

The analysis indicated the following results: (1) For the dependent variable of level of text structure use, there was a significant difference for grade level and interactions between topic and structure. There were no interactions between grade and structure. (2) For the dependent variable of number of idea units, there were was a significant difference for grade level, but none for text structure. There were no interactions between grade and structure and none between topic and structure. Subjects were found to use the original structure for problem/solution more than for the other three patterns. Differences in text structure were found to have little effect on the number of idea units in the students' retellings. Developmental differences were evident both in the use of structure and in the number of idea units produced by fourth and sixth grade students.

Dedication

This dissertation is dedicated to my parents, William R. and Ruth P. Thacher, whose combined service to education as professor and principal totaled 88 years; and to my son, William Van Evera, who is continuing the family tradition.

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CHAPTER 1

Introduction

Learning to understand expository text is a difficult task for elementary school children. During the elementary years expository (non-fiction) materials become increasingly prominent, especially after third grade. Demands of the task may increase more rapidly than the reader's skill, raising the possibility of academic failure. Skill in reading expository materials becomes essential to success in school.

It is well-documented that children have more difficulty with expository than with narrative texts (Spiro & Taylor, 1987; Baker & Stein, 1978; Lapp & Flood, 1978). While many factors may contribute to children's difficulty with expository text, one prevalent theory suggests that children's experience with narrative texts facilitates comprehension because they learn early how narratives are typically organized (story schemata) (Spiro & Taylor, 1987). Expository text can be organized in many different patterns, making the use of these unfamiliar structures even more difficult for children.

Readers' use of text structure has been associated with superior understanding and recall. The amount and type of information children understand and remember may be affected by differences in the organizational patterns of expository text. This study attempted to analyze the influence of various expository text structures on children's written retellings at two grade levels and for different topics. Knowledge about developmental trends and which text structures are more useful should ultimately facilitate instruction in expository text.

Conceptual Framework

The background for the proposed study is based on Rumelhart's (1980) schema theory that explains reading comprehension as the process of choosing and verifying conceptual schemata for the text. Schemata are made up of elements each of which has a "slot" or "placeholder" to be filled in by specific information (Anderson & Pearson, 1984). As readers process information, they match their own knowledge of concepts and structure to that of the text. Understandings of schemata theory include representations of meaning as well as the processing and structural aspects of knowledge (Rumelhart & Ortony, 1977).

The term "schemata" came into the psychology from the writings of Bartlett (1932). According to Bartlett, the

schema of text structure can enable a reader to remember a text. He viewed memory as creative rather than reduplicative. Bartlett referred to schema as the "active organization of past reactions, or past experience." Bartlett's used the term "active" to emphasize what he considered to be the constructive character of remembering, which he contrasted with a passive retrieval of "fixed and lifeless" memories (Anderson & Pearson, 1984). The individual uses a general impression, Bartlett suggested, and on this basis constructs the probable details.

In addition to content schemata, structural schemata is also used by skilled readers in the processing of text. The understanding of a text's organization assists the reader in comprehension and the reconstruction of that text. Using schemata, the skilled reader forms a representation of the text in memory corresponding to that of the original text. When recalling the text, it is thought to be the top-level structure that serves as a guide. Although the ability to use the author's top-level organizational structure is seen as a basic prerequisite for the competent reader (Meyer, 1987), little is known about factors that influence children's use of structure.

Research on children's use of structure in retellings (the reconstruction of text) has mostly been with narratives. Results have shown that the use of narrative

structure contributes to children's reconstruction of stories. Bower (1976) found that young children who did not use structure for retellings told stories out of sequential order, missing elements, and lacking cohesiveness. According to Morrow (1986), a sense of story structure helps a child know what to expect in a story and what to include in a retelling. Little is known about children's use of expository text structure.

While the background for this study is based on Rumelhart's schema theory, the conceptual framework used to ground the study is from Meyer (1975). Meyer's work led to the analysis of expository text structure, enabling researchers to examine what information had been processed in the text.

The method used by Meyer to determine the underlying text structure is a procedure based on the work in linguistics of Grimes (1968). Three primary levels of expository text are identified in prose analysis (Meyer, 1985; van Dijk & Kintsch, 1983). The first is the sentence or microproposition level, concerned with the way ideas are organized within sentences, and the way sentences cohere and are organized within a text. The second is the macropropositional level, which pertains to logical organization and argumentation. The third is that of top-level structure or overall organization of the text as a

whole. The proposed study will focus mainly on effects of differences in the top-level structures.

The top-level structure of the text corresponds to its overall organizing principal. For example, the four rhetorical relationships of collection/description, causation/effect, problem/solution, and comparison/contrast represent ways of thinking about topics (abstract schemata). These rhetorical relationships may or may not be signaled by explicit previews, summary statements or signal words. Since different types of organizational plans are thought to affect expectations differentially during reading, as well as search plans during retrieval, these structures would be likely to have an impact on retelling. Different structures may affect the number of idea units recalled and the organizational structure used to organize the retelling.

Through her research with adults' use of top-level text structure, Meyer observed that more complex structures provided a stronger framework for memory of the passage. Comparison and causation structures were found to facilitate recall more than descriptive structures (Meyer & Freedle, 1984) when graduate students recalled passages they had heard. The cause/effect, comparison/contrast and problem/solution structures have more components or "slots" to be filled in than the collection/description structure. According to Meyer & Freedle (1984), these additional

organizational components facilitate understanding and recall for those who are presumably familiar with them.

Meyer's studies with adults have shown that the organization of passages influences both the amount and the organization of the recall itself. It appears that adult subjects recognize differences in passage organization and arrange their recall accordingly. According to Danner (1976), if we could gain some insight into the development of this understanding in children, we could incorporate it into the design of reading material and into techniques for improving comprehension and recall.

Developmental studies have found that children's awareness of different expository text structures increased between grades 3 and 6 (Englert & Hiebert, 1984). Rather than developing in a parallel manner, however, awareness of discourse types was shown to be acquired differentially. While Englert and Hiebert's study showed the developmental pattern of children's awareness of different structures, there is little knowledge of the developmental pattern of the **use** of these structures.

Another study of subjects' awareness of text structures by Richgels, McGee, Lomax and Sheard (1987) showed that sixth grade students were more aware of some structures than others. Their study had one age group and each topic was written in only one structure.

Studies of text structure have used one of two approaches: assessment of awareness (the ability to detect or recognize text structure) (Kletzien, 1992, Garner & Gillingham, 1987; Richgels, McGee, Lomax & Sheard, 1987; Englert & Hiebert, 1984; Hiebert, Englert & Brennan, 1983; and Taylor, 1980), or assessment of their use of text structure in oral or written retellings (Zinar, 1990; Meyer & Freedle, 1984; McGee, 1982; and Meyer, Brandt & Bluth, 1980). While a few studies have assessed children's awareness of structure, most studies of the use of expository text structures have been for high school or adult subjects.

The studies of structure use have usually been limited to one topic. There is evidence that structure and content schemata do not function in isolation but combine to affect the processing of text (Horowitz, 1982; Ohlhausen & Roller, 1988). More than one topic is necessary in order to examine interactions between structure and topic.

Although Meyer found that for adults comparison and causation structures facilitated text recall better than descriptive structures, it is not known whether the same would hold for upper elementary children. Since more complex structures may be difficult for these children to grasp, a simpler structure might be more suitable. This issue of the effectiveness of different top-level text

structures in prompting the retellings of upper elementary children will form the theoretical basis for the study.

Statement of the Problem

Much important information is conveyed through expository text in the upper elementary classroom. Because upper elementary school children are known to experience more difficulty with expository text than with narrative and because these demands of learning from expository text increase during the later elementary years, there was a need to examine factors that can influence learning from these texts. Since text structure had been shown to assist in understanding and recalling text, it was important to investigate effects of differing structures on structure use by these children. Although Meyer's studies had shown that adults' learning and recall were highest when the top-level structures were the more complex patterns, it was uncertain whether the same would be true for children, less experienced in these complex structures. Therefore, the procedural problem of this study was to analyze the influence of different expository text structures on fourth and sixth grade students' retellings of different topics.

Purpose of the Study

The purpose of the study is to establish the usefulness of various expository text structures for fourth and sixth grade students' written retellings. The researcher will:

1. Synthesize extant literature.
2. Determine text structures to be used in the study.
3. Develop passages written with different top-level structures.
4. Separate the passages into idea units.
5. Assess students' written retellings.
6. Identify the differences in usefulness of various top-level structures for upper elementary students and discuss the implications of the findings.

Research Questions

1. When expository passages are read in four different structural patterns, is there a difference across the different structural patterns in the level of structure use?
2. When expository passages are read in four different structural patterns, is there a difference between fourth and sixth grade students' level of structure use?
3. Is there an interaction between structural pattern and grade level on the use of structure in the retellings?
4. Is there an interaction between structural pattern and topic on the use of structure in the retellings?
5. When expository passages are read in four different structural patterns, is there a difference by pattern in the number of idea units in the students' retellings?
6. When expository passages are read in four different structural patterns, is there a difference between students in grades four and six in the number of idea units in the retellings?
7. Is there an interaction between structural pattern and grade level on the number of idea units in the retellings?
8. Is there an interaction between structural patterns and topic for the number of idea units in the retellings?

Significance of the Study

Since there is a gap in our understanding of the use of text structure by upper elementary students, a need exists to determine which text structures are most effective for these students. To find that certain organizational patterns facilitate the use of top-level structure would have important implications for theory of how children process information and practical implications for those who prepare or select written texts or oral presentations for children.

This study is needed to provide publishers of children's texts and curriculum planners with the knowledge of the usefulness of different text structures in elementary expository materials. The knowledge that certain top-level structures are more easily used by children at fourth or sixth grade might guide book publishers as to the appropriateness of various structures in children's expository texts. Curriculum planners would be better able to select expository materials and plan for their use in the elementary classroom.

Educators need to know the suitability of different text structures for use with elementary students. Since it has been shown that the use of structure is associated with increased comprehension, it is important to know which structures are better for children beginning to learn these

structures. The knowledge of the effects of various text structures on children's retellings may facilitate the use of retellings and offer insight to teachers for instruction in expository text.

Developmental studies have suggested that awareness of some discourse types is acquired earlier than others (Englert & Hiebert, 1984). It is not known whether the developmental patterns differ for the use of different structures. We know that young children use narrative text structures for retelling (Morrow, 1985, 1986), but we know very little about their use of expository text structures. While we know that sixth grade students vary in their awareness of different text structures (Richgels, McGee, Lomax & Sheard, 1987), we do not know how structures are used and whether there is a change in usefulness of these structures from grade four to grade six and from one topic to another.

Because few studies have examined the effects of various expository text structures for fourth and sixth grade children's retellings, we do not know which structures would be more likely to be used successfully by those who are unfamiliar with them. It is not known whether simpler structures would be more suitable for these children at first, since complex structures can be difficult to grasp. We do not know whether different topics affect structure

use. Finally, we do not know the pattern of developmental differences for fourth and sixth grade students' use of top-level expository structures. This knowledge is needed to help students learn to use structure strategies effectively with expository text.

Definition of Terms

Intrusions- propositions that are irrelevant to the information in the passage or simply erroneous (Gambrell, Koskinen & Kapinus, 1991)

Idea unit- meaningful units represented by a word phrase, or sentence. Idea units are the segments into which a passage is broken as a result of a discourse analysis procedure (Meyer, 1975)

Macropropositions- the level of prose analysis involving the central ideas of the text and relationships among ideas (Meyer, 1975)

Micropropositions- in text analysis, the way ideas are organized within sentences and the way sentences cohere and are organized within a text (Meyer, 1975)

Retelling- the verbal reconstruction of text-acquired information (Gambrell, Kapinus, & Koskinen, 1991). Retellings may be oral or they may be written as in the present study.

Schema (plural schemata)- a data structure for representing the generic concepts stored in memory; may contain a network of interrelationships that is believed to hold the components of the concepts in question (Rumelhart & Ortony, 1977); the fundamental elements upon which all information processing depends (Rumelhart, 1980)

Signaling- information in text that does not add new content on a topic, but which gives emphasis to certain aspects of the semantic content or points out aspects of the structure of the content (Meyer, 1975)

Story schema- the set of expectations about the internal structure of narrative material that serves to facilitate comprehension and retrieval (Mandler & Johnson, 1977)

Structure strategy- the approach to text in which the reader seeks the primary thesis and the supporting details, increasing the depth with which they are processed and the ease with which they can be retrieved (Meyer, Brandt, & Bluth, 1980)

Top-level structure- the overall organization of the text. Meyer (1975) has identified four top-level structures that will be used in this study: comparison/contrast, problem/solution, cause/effect and collection/description.

Delimitations

1. The population of this study included students who were enrolled in the regular upper grade classrooms of one Fairfax County Public School during the spring of 1993. These students had done retelling as a part of their regular classroom activities. They had no special instruction in text structure.
2. Students enrolled in the Gifted/Talented Center program (a separate school for gifted and talented students) were not included in the population for the study.
3. Students in learning disabled programs were included if they received language arts instruction in a regular classroom setting.
4. The subjects used for this study were limited to students whose primary language is English or whose proficiency in English was at a level that did not require any special instruction in English. No students were excluded from the study because of limited English proficiency.

Limitations

1. The findings for the study will be generalizable only to a similar population--average and above average readers in grades four and six.

2. The findings will be limited to short expository passages similar to those used in the study.

Organization of the Study

In this first chapter, the need for determining which text structures facilitate the comprehension and retrieval of expository text for fourth and sixth grade students was discussed. An introduction and background information were presented, followed by a discussion of the problem statement, purpose of the study, and the research questions. Essential terms were defined. Finally the delimitations and limitations were discussed.

In Chapter Two, a review of the literature will be provided. Relevant information pertaining to text structure and retelling will be presented.

In Chapter Three, the research design and the methods will be described. Descriptions of the subjects, the instrumentation, the data collection procedures, and the method of analysis will be discussed.

The results and analysis of the data will be presented in Chapter Four.

Chapter Five will interpret findings of the study. Conclusions and implications will be discussed.

CHAPTER 2

Review of the Literature

Introduction

The purpose of this study was to analyze the influence of different top-level structures (problem/solution, comparison, cause/effect, and collection of descriptions) on fourth and sixth grade students' retellings. It was hypothesized that some of the structures would facilitate retellings more than others.

Using the schema theory of reading comprehension as a framework, the review will first describe some text analysis systems designed to be used in research. Next it will describe studies of the awareness or use of text structure, including developmental studies. Literature will be reviewed that shows the use of retelling as assessment and as an instructional device. Finally it will show the need for a study that would inform educators of the appropriateness of different expository structures for retellings of students in fourth and sixth grades.

Schema Theory of Reading Comprehension

Bartlett (1932) is recognized as the first to use the term "schema" as it is used today. In his book Remembering (1932, p. 201), he defines the term as "an active

organization of past reactions or past experiences." Bartlett attempted to dismiss the idea that memory is a reproductive process and to characterize it as a creative process. He made clear the importance of a top-down process:

> an individual does not ordinarily take...a situation detail by detail and meticulously build up the whole. In all ordinary circumstances he has an overmastering tendency to get a general impression of the whole; and on the basis of this, he reconstructs the probable detail. Very little of his construction is literally observed...but it is the sort of construction which serves to justify his general impression (1932, p. 206).

Bartlett showed that subjects did not remember stories exactly. Stories were reworded, had detail added, and similar transformations. The fact that transformations occurred in recall led Bartlett to the conclusion that memory is reconstructive. Bartlett's concept of schema or structure and its influence on comprehension was used by investigations of the internal structure of stories (Adams & Collins, 1979; Mandler & Johnson, 1977; Minsky, 1975; Rumelhart & Ortony, 1977; Norman & Rumelhart, 1975; Stein & Glenn, 1979).

Rumelhart and Ortony (1977, p. 99) confirmed Bartlett's view of memory as the "...processing and reprocessing of information, imposing on it and producing from it knowledge which has structure." They describe schemata further as

"data structures for representing the generic concepts stored in memory."

The schema concept was advanced further by the development of information processing. Computer scientists developing artificial intelligence systems and cognitive psychologists interested in the organization of knowledge began working together in a field called "cognitive science" (Rumelhart and Ortony, 1977). Schema-type concepts were given various names in this new field. Schank and Abelson (1975) use the term "frames" to refer to one type of schemata and the term "plan" for a more abstract schema. Minsky's (1975) theory is based on "frames". Bobrow and Norman (1975) have used the term "schemata" like Rumelhart & Ortony (1977).

Rumelhart's model of reading comprehension based on schema theory (1977) is described as "the process of choosing and verifying conceptual schemata for the text." According to Rumelhart, the three major functions of schemata are

(1) the perceptual processes that suggest that the interpretation of the whole and parts must work together to recognize the sensory data taken in

(2) the understanding of discourse or the process of finding a schema that can interpret the information presented

(3) the remembering of information.

He describes remembering as similar to perceiving except the source is no longer sensory, but from the memory. Schemata are used to reinterpret the stored data in order to reconstruct the original interpretation. Bartlett's (1932) finding that we remember the gist of the story is similar to this conclusion.

Comprehension can be considered to consist of selecting schema that will explain the material to be comprehended.

The following example from Schank and Abelson (1977) illustrates the use of schema in comprehending sentences:

(a) John knew that his wife's operation would be expensive.

(b) There was always Uncle Harry....

(c) John reached for the suburban telephone book.

In this example, abstract schemata can be used to interpret meaning. There is an event that causes a need and requires a problem-solving schema. John's awareness that his wife's operation would be expensive causes him to want money. The reader can expect John to try to get money. (actives TRY schema) After seeing the next sentence about Uncle Harry, the reader concludes that borrowing is one way to get money. (activates BORROW schema) A condition on borrowing is asking and one way to ask is by phone. (activates PHONING schema) A phone book is used when telephoning. The reader

then interprets the third sentence that John is trying to phone Uncle Harry to ask for the money.

This interpretation of the input, or a partial copy of it, is what stays in the reader's memory, rather than the input itself. To reconstruct the message from memory the reader uses schemata to assist, similar to the use of schemata in interpretation during reading. According to Rumelhart and Ortony (1977, p. 117) memories "....are not merely fragments of the initial sensory input, but a fragmentary representation of our interpretation of that input."

The Rumelhart and Ortony (1977) model for the use of story schemata stresses both bottom-up and top-down processing of text. While small pieces of information from the text may suggest the appropriate schema, it is often only in the context as a whole that the selection of schema can be confirmed. The model is progressively refined as the reader gathers more information from the text. The final determination is made both by local clues and by consistency among the various levels. Schemata at various levels are used in coordination in the comprehension process. The skilled reader uses bottom-up and top-down processes simultaneously when reading. Reading comprehension thus involves progressive refinement of a model of the meaning of the text in the readers' mind.

Research in text processing was facilitated by procedures for analyzing text. During the late seventies several systems for text analysis were developed. These systems will be described in the next section.

Text Analysis Systems

Descriptions of text structure provide several benefits for research. One is a way to classify texts according to their similarities and differences. Another is the provision of a way of identifying the amount and type of information that the reader remembers from text. A third benefit is the way of comparing the original passage with the reader's understanding of the text.

The story schema used in narratives has been researched extensively (van Dijk & Kintsch, 1983). Schemata used for expository text have been researched less often, according to Meyer (1987). There is a need to fill a gap in the research and add to the body of knowledge in the area of processing of expository text.

Analysis of Narrative Story Structures

Narrative story structures have been analyzed by Mandler and Johnson (1977), Stein and Glenn (1979), and Thorndyke (1977). They have analyzed the underlying structure of simple stories to form story schemata which can be used to guide comprehension and retrieval. Using

Bartlett's (1932) study of memory that suggested that people form schemata for stories, enabling them to recall the story, they characterized the different story units. While Bartlett's analysis used schema to include style, mood, and various classifications of stories, Mandler and Johnson developed a representation of the parts of a typical story and the relationships among those parts. Stein and Glenn's (1979) story analysis includes setting, episode, plan, attempt, resolution and consequences and arranges them according to the internal structure of the story. Thorndyke's (1977) narrative analysis focused on identifying the underlying structural elements such as setting, theme, plot and resolution.

Analysis of Expository Text Structures

Of all of the expository text structure systems the three most widely used in educational and psychological research are those of Fredericksen (1975, 1977); Kintsch (1974); and Meyer (1975, 1983, 1985). A brief description of these systems follows.

Frederiksen's system. In Frederiksen's system the minimal unit is the concept, which can be a single word or word group. It makes finer distinctions among relationships than the other two systems. It has a more elaborate set of relationships. It does not provide for hierarchical structure but uses network-like graphs. Frederiksen's

system is most appropriate for scoring inferences made by readers, both text-implied and inferences from prior knowledge. The approach provides a classification of different types of inferences that can occur. Frederiksen's does not result in a hierarchical system and has no provision for top-level structure.

Kintsch's system. The purpose of Kintsch's theory is to describe (a) the problems that readers experience with a text and (b) what readers remember after reading (van Dijk & Kintsch, 1983; Kintsch, 1987). While the system does not use a tree structure, it is based on a hierarchical representation that follows the text surface structure more closely than the other systems. It is based on repetition of content rather than logical relationships.

Meyer's system. The Meyer (1975) system produces a hierarchically organized representation of a passage's structure. A tree structure is produced with labels that state the relationships among the ideas. The tree pattern makes the structure of the passage more obvious.

There are differences in suitability for different research purposes. Meyer's system scores both inferred and explicit relationships in the text. Kintsch's system is well-suited to those expository texts where the concern is the content rather than the relationships. Meyer's is considered more sensitive to developmental differences in

recall than the Kintsch system (Meyer, 1983, 1985; Meyer and Rice, 1984).

Meyer's system has three main levels--

-The top-level structure indicating the overall organization of the passage. This top-level structure provides a classification system for four types of organizational patterns--problem/solution, description/collection, cause/effect, and compare/contrast. These patterns will be described more fully in a subsequent section of this chapter.

-The macropropositional level is involved with the relationships among ideas in paragraphs and represents the major ideas. These relationships may also use the structural patterns of collection, causation, problem-solution, comparison, and description.

-The micropropositional level is concerned with the way that ideas are organized within sentences, and the way that sentences cohere and are organized within a text. The relationships are defined by case grammar based on the work of Fillmore (1968) and Grimes (1975). (Descriptions of the role relations and predicates may be found in Appendix C).

A skilled reader views text with a knowledge of how texts are organized (Meyer, 1987). The reader chooses the schemata that best match the text. The reader then fills in the slots of the selected structure by looking for content

to fill in the placeholder. For example, in a comparison/ contrast structure used for the political speeches of two candidates, the issues that one presented would help to remind the reader of the point of view of the other candidate on the same issue. When recalling the speeches the skilled reader would use the same structure to retrieve the information in a top-down fashion. If the reader remembers that one candidate spoke about taxes, then the fact that the other candidate also spoke about taxes does not have to be remembered separately.

Text structure is known to be facilitative for skilled readers. Signaling words such as "cause", "effect" and "by contrast" can play an important role in helping the reader determine the text structure to use. Little is known about the use of text structure by younger, less skilled readers.

Effects of Text Structure on the Comprehension Process

Following the development of text structure analysis, research shifted increasingly to what the reader does with the text (Weaver & Kintsch, 1991). The process of comprehension, became the focus of research effort rather than the analysis of text.

Research has yielded seven basic research findings involving text structure in discourse processing by students and adults (adapted from Meyer, 1987). More complete

descriptions of the research will follow a list of the findings:

-First, that higher level information is recalled better than information at the lower levels of the organizational hierarchy (Meyer, 1975, 1977; Meyer & Rice, 1984).

-Second, the use or awareness of top-level structure is related to passage comprehension (Meyer, Brandt, & Bluth, 1980; Hiebert, Englert, & Brennan, 1983).

-Third, the use or awareness of text structure is influenced by stage of development (Englert & Hiebert, 1984; Taylor, 1980; McGee, 1982; Mandler & Johnson, 1977; Garner & Gillingham, 1987).

-Fourth, there is a difference in the use of text structures by good and poor readers (McConaughy, 1985; Zinar, 1990).

-Fifth, training in recognition and use of top-level structures improves recall for text (Selinger, 1992; Bartlett, 1978; Taylor, 1982; Taylor & Beach, 1984; McDonell, 1978).

-Sixth, differences in topics may affect the use of structure (Roller & Ohlhausen, 1988; Horowitz, 1982).

-Seventh, different types of top-level structures (comparison/contrast, problem/solution, etc.) affect processing of text by high school students and adults

(Kletzien, 1992; Meyer & Freedle, 1984; Meyer, Brandt, & Bluth, 1980).

Studies Showing the Effects of Different Levels in the Structural Hierarchy

To determine whether college students recalled information differentially when it was placed in different locations in the hierarchy, Meyer (1975) had students listen to a passage and write everything they could remember. It was found that ideas higher in the structure, or ideas from which many other things originated were more easily recalled. It was also found that when an idea was recalled, there was a good chance that the idea immediately above it in the structure was also recalled. Another result of this study was that information high in the content structure of a passage is recalled much better than when the same information is low in the content structure of another passage. The pattern of relationships at the top levels had a strong effect on recall, while recall of the same information presented in a lower level varied only according to content.

In another study of the relationship between discourse structure and recall (Meyer & Rice, 1984), three adult age groups were asked to read a 641-word passage once and to write their recalls. All subjects were found

to remember more from the top levels of the content structure.

Studies Showing That the Use of Structure is Related to Comprehension

Meyer, Brandt, and Bluth (1980) studied ninth graders' use of the author's top-level structure. The use of top-level structure was found to be related to comprehension of the passage. Ninth grade students read passages that were well-organized. Signaling was used to inform the readers of the text structures used in the study, problem/solution and comparison. Some of the passages were not signaled. Results showed that signaling had no effect on recall or structure use by good or poor comprehenders. Signaling did, however, increase recall and text structure use by comprehension underachievers (readers who could use the top-level structure, but would not do so without encouragement). For all subjects there was a strong relationship between comprehension and the use of the top-level structure. The ability to use the author's top-level structure appears to be important to the recall of information.

A study by Hiebert, Englert, and Brennan (1983) examined college students' awareness of four expository text structures. To determine whether subjects were more aware of some text structures than others in reading and writing,

fifty-two college students were divided into two reading ability groups and given a 12-item test to assess their ability to use text structure to recognize related details and obtrusive information in a reading passage. For the writing task, subjects were given a topic sentence for a paragraph and they were to produce relevant details. Findings showed that awareness of the four text structures varied in both recognition and production. General comprehension, measured by the Degrees of Reading Power, was related to recognition and production. Recognition and production measures were found to be moderately related. Both the recognition and production tasks revealed that the higher ability students were more skilled in the recognition and use of text structure. The findings support the ideas from the models of van Dijk and Kintsch (1983) and Meyer (1975), that the use of text structure is an important skill in comprehending text.

Studies Showing That Awareness or Use of Text Structure is Related to Developmental Level

Since a previous study by Hiebert, Englert, and Brennan (1983) had shown that college students' general comprehension was related to awareness of text structures, a study by Englert and Hiebert (1984) investigated the relationship of the same four types of expository text

structures--description, comparison/contrast, enumeration, and sequence--to the general reading ability of third and sixth grade students. Subjects were given sentences written to indicate different text structures then asked to rate how well target and distractor statements fit with stimulus sentences. Results showed that knowledge of text structure was highly related to grade level and to reading ability. Englert and Hiebert concluded that knowledge of discourse types underlies effective comprehension and that this ability increases as children reach the upper elementary grades. This study required the subjects to identify sentences that fit with different text structures. They were not asked to use text structure. It is not known how fourth and sixth graders' use of structure would be affected by different text structures.

The relationship of reading ability and age to children's awareness of text structure and their recall of expository text was investigated by Taylor (1980). Sixth grade good and poor readers, fourth grade good readers and adults read silently a short expository passage then orally recalled the passage. Two days later subjects were asked to recall the passage again. Results showed that sixth grade good readers had better recall than fourth grade good readers and sixth grade poor readers. Sixth grade good readers used the original text structure more, especially in

the delayed recall. Taylor concluded that children's memory is enhanced if they use top-level structure to organize their recalls. Her study used only one form of text structure--that of a hierarchical structure of superordinate and subordinate concepts.

McGee (1982) examined whether third and fifth grade good readers and fifth grade poor readers differed in their use of text structure during oral recalls. Subjects were asked to read a passage and to retell the passage. She found that older poorer readers displayed a greater awareness of text structure and recalled more superordinate ideas than younger good readers. She believed that this may have been because of the greater exposure to expository text for fifth grade students. This study showed the benefits of following the top-level structure. However, only one structure, a collection of descriptions was used.

Using narrative text, Mandler and Johnson (1977) compared children with adults in story recall. Children in first and fourth grades and university students were asked to retell two stories they had heard. It was found that adults recalled more than fourth graders and fourth graders recalled more than first graders. In addition to these quantitative differences, the younger children's retellings were strong in settings, beginnings, and outcomes, and poor in attempts, endings, and reactions. The use of the story

structural analysis allowed insights into the differences in the subjects' use of story structure.

Another study compared fifth and seventh grade students' knowledge of expository text structure (Garner & Gillingham, 1987). Using computer software, subjects were provided with sentences that could be used to write a good paragraph and a bad paragraph about a given topic. Some sentences were unrelated to the text and could be "trashed". Subjects were also asked to explain what makes a paragraph good. If the subjects could construct good paragraphs, it was inferred that they were knowledgeable about text structure. In addition, if text features were mentioned in the descriptions of a good paragraph, text knowledge could be confirmed. It was found that the subjects' descriptions of paragraphs were not accurate reflections of performance on the paragraph construction task. Garner and Gillingham found the seventh graders scored higher than the fifth graders on the verbal report of what makes a good paragraph. For the performance data, there were no significant grade differences. About half of the students "trashed" irrelevant sentences and placed the topic sentence appropriately. Garner and Gillingham concluded that these subjects were not skillful in the use of text structure and cohesion, but that the older students knew more about how to describe a good paragraph.

Most of the studies in this section indicate that awareness and use of text structure are related to developmental factors. Structure was shown to be used less by younger children. None of these studies, however, examined whether varying text structures affected the use of structure in children's retellings.

Studies That Show Differences in Text Structure Use by Good and Poor Readers

In addition to studies of awareness and developmental differences and the use of text structure, good and poor readers' differences have been researched. Findings indicate that good readers are more likely than poor readers to recognize and use text structure to guide comprehension and recall. A study by McConaughy (1985) used narrative materials to examine good and poor sixth grade readers' use of structure in their summaries. Subjects were asked to summarize a short story for each of four modalities for input and output: listening-oral recall, listening-written recall, reading-oral recall, and reading-written recall. McConaughy found that the poor readers did as well as the good readers in their use of structures in their summaries, possibly due to the simplicity and familiarity of the narrative structure. Although the good readers recalled

more of the story, there were no significant differences found between the different modalities.

A recent study by Zinar (1990) examined the recall and of fifth grade students whose reading was above or below average reading comprehension ability. They were asked to read passages, then retell the passages. Materials used were three types of expository passages--explicit causal, implicit causal, and noncausal (descriptive). She found that the above average readers recalled more causal relationships when they were explicit. Below average comprehenders recalled almost no causal relationships.

In Taylor's (1980) study described in the previous section, the good readers who used the text structure in their delayed recalls retold no more than the poor readers who used this strategy. In general these studies show that readers who use the structure of the text are better able to recall the information. The text structure strategy appears to be a valuable one for readers. Because of this, researchers have attempted to train students to use text structure.

Studies Showing That Training in Use of Top-Level Text Structure Improves Recall for Text

A study using instruction to improve students' awareness and use of text structure was conducted by

Bartlett (1978). He taught ninth grade students to use a hierarchical (general statement followed by details) text structure for their written recalls. Students who received instruction in text structure showed better comprehension of the material than those who received regular instruction.

In a study of fifth grade students, Taylor (1982) instructed students in summarizing content using a hierarchical text structure. She found that students who had learned to summarize text in this manner had better memory for the text than those who had answered questions on the material.

A later study by Taylor and Beach (1984) investigated the effects of a hierarchical text structure instruction on seventh grade students' reading and writing of expository text. Results showed that instruction and practice in the hierarchical summarizing procedure improved students' recall for relatively unfamiliar, but not relatively familiar social studies text.

McDonell (1978) taught fourth grade disabled readers to use narrative story structure. She found that one instructional session improved story recall and that subjects who received two or three treatments showed greater improvement in their retellings for each session. By increasing awareness of the structure of stories, subjects were able to use this pattern for retrieval. Successive

treatments also improved the recall of high level information.

Studies Showing that Differences in Topic May Affect the Use of Structure

Ohlhausen and Roller (1988) conducted a study with adults and students in fifth, seventh, and ninth grades to examine use of schemata during reading. Passages were developed to allow readers to use both content and structural schemata or to encourage the use of one more than the other. Results showed that both content and structural schemata influence the processing of text, and that the two schemata interact with schooling and different text types to influence text processing.

A study by Horowitz (1982) with high school freshmen and college freshmen investigated the effects of four structural patterns on the recall of expository text. Subjects read and recalled passages that varied by topic and structural pattern. Results showed that topic affected number of idea units recalled more than the structural pattern of the text. There were main effects for topic but none for structural pattern. In addition, Horowitz found a significant interaction between structure and topic.

Studies Showing That Differences in Top-Level Structures Can Affect Processing

Meyer, Brandt, and Bluth (1980) conducted a study of ninth grade students' use of a structure strategy using the problem/solution and comparison structures. Subjects were good, average, and poor comprehenders and underachievers. The subjects read and retold the passages that were signaled or unsignaled. Findings showed that subjects used the structure strategy for the problem/solution passage than for the comparison passage. Differences in the use of structure may have been due to topic and differences in signaling, familiarity, or developmental differences in the use of structure with different discourse types.

Meyer and Freedle (1984) conducted studies of graduate students' memory for text written in four different structures. The researchers hypothesized that the more complex structures (comparison, problem/solution, and causation) would be more easily remembered than the collection/description passage. Forty-four graduate students listened to a recording of the passage in one of the four structures. Subjects were then asked to write all they could remember from the passage, to complete a delayed free recall test and to answer questions written to test

their recall of 16 of the idea units. Results showed that memory was superior on the passage written in the causation and comparison structures, but less on the problem/solution and collection/description passages. Contrary to expectation, the problem/solution structure was the least often used for the free recall. Further searching revealed that the group who had read the problem/solution passage thought the solution in this case was too harsh (that coaches who approved water deprivation as a means of weight loss should be dismissed). Since the subjects disagreed with the solution, they tended not to use the structure and this fact may have accounted for their lower recall scores. An alternative explanation for the subjects' performance on the problem/solution passage was the construction of the passage. The cause of the problem was presented in the first paragraph and then the solution. However, the nature of the problem is not explained until the last paragraph. An additional study was conducted using only the comparison and collection/description structures. Results supported the findings from the first study.

Richgels, McGee, Lomax and Sheard (1987) conducted a study to examine sixth grade students' awareness of four expository text structures (collection, comparison/contrast, causation and problem/solution). Students' awareness was assessed in three ways: interview responses, use of 100

structure in written recall of scrambled and unscrambled passages, and the use of structure in composition. Results showed that students showed varying degrees of awareness of text structure depending on the structure and the task. The awareness of the causation factor was found to be the poorest, while the other structures grouped together.

The proposed study will differ from Richgels, McGee, Lomax and Sheard (1987) in several ways. Their purpose was to determine differences in awareness. Their subjects were all one age group. They used only one structure for each topic, allowing the possibility that differences in background knowledge and interest could affect the outcome.

Some studies have examined the differences in student response to texts written with different top-level structures. Kletzien (1992) conducted a study of proficient and less proficient high school subjects' use of strategies as they read material with different structures. Content area passages with three different top-level structures--collection, causation, and comparison--were used. A form of cloze was used which deletes words that are content-dependent (subjects must be aware of the meaning of the passage in order to answer). Subjects were tested individually with three cloze passage, each with a different top-level structure--collection, comparison, and causation. The use of strategies was examined through an interview held

immediately after each student had completed the cloze activity. Students were asked to explain their reason for the choice of each word to go in the blank.

Kletzien classified the strategies according to the source of cue used to determine the missing word: (1) syntax, punctuation, style or known phrases, (2) reading of the previous text, (3) reading of the subsequent text, (4) recognition of the structure of the passage, (5) recognition of the structure of the sentence, (6) visualization, (7) use of main idea, (8) using inference or drawing conclusions, (9) paraphrasing author's words, (10) looking for key phrases or vocabulary, (11) use of previous knowledge or background, and (12) non-use or non-awareness of any strategy, but with correct response for the deleted word.

The results of Kletzien's study showed no significant difference in either the total number of strategies used or the cloze scores by reading ability group or for different structures. The prediction, based on Meyer and Freedle's (1984) study, that subjects would use structure more often on the causation and comparison passages than on the collection passage was found to be only partially true. The subjects used more strategy types on the causation passage but fewer on both the collection and the comparison passage. There was no significant difference in the use of the structure strategy by group. This seemed to be a

contradiction to earlier studies. Englert and Hiebert, (1984); McGee, (1982); Meyer, Brandt, and Bluth, (1980); Taylor, (1980) all found that better readers are more likely to use text structure as a strategy than were poorer readers. Kletzien suggests that the developmental aspect of the use of structure may have played a part in the difference between her study and earlier ones. Except for Meyer et al. (1980), the research cited above was done with elementary age children. Kletzien suggested that her study was limited because only three passages were used and that the differences in topics for each structure may have confounded the results.

Another study that used instruction in text structure to improve student comprehension was done by Selinger (1992) with developmental college students. After instruction in identification of the three top levels of structure, students performed significantly higher in a summary writing posttest than the control group. There was no significant difference between the treatment and control group's standardized reading test scores, perhaps due to the fact that the standardized test given did not measure ability to detect and use a hierarchical structure.

Tasks Used to Assess Structure Use or Awareness

Many researchers have used retellings to assess structure use or awareness (Richgels, McGee Lomax & Sheard, 1987; Morrow, 1986, 1985; Meyer & Freedle, 1984; Meyer, Brandt & Bluth, 1980; Taylor, 1980). Others have used a task involving the construction of a paragraph (Garner & Gillingham, 1987; Englert & Hiebert, 1984; Hiebert, Englert & Brennan, 1983). Garner and Gillingham (1987) asked students to describe a good paragraph and rated the description on the structural elements mentioned. A cloze procedure was given to subjects in Kletzien's research (1992). Subjects were then asked to tell what strategy (among them a structural strategy) they had used to determine the missing word.

Role of Retelling in Research

Use of Retelling for Assessment

Johnston (1984) has reviewed the use of retelling in reading assessment from an historical point of view. According to Johnston, verbatim free recalls were used as early as 1914 by Courtis, who counted the number of idea units in a story. Johnston describes this method as a primitive version of the propositional analysis system of Kintsch and van Dijk's 1978 system. About 1915 Starch used free recall after a timed reading. He suggested scoring by

the ratio of the number of "relevant words" to the total words.

Little use was made of the verbatim free recall for a number of years. It may have been dropped because of its labor intensive scoring procedures and the fact that it was believed that the ability to reproduce and the ability to get meaning were not the same (Johnston, 1984).

Goodman and Burke (1970) revived the approach in a different form called "retelling." These retellings were different from the early free recalls because the reader was not instructed to tell the story verbatim. These retellings were scored according to a story structure model, by awarding points for character analysis, theme, plot, and events.

Methods of Assessing Retellings

Retellings, evaluated with a text analysis system, allow researchers to examine closely the subjects' processing of text. Studies in discourse processing analysis cited earlier in this chapter use retellings to compare subjects' recall with identified structural features of the text, and thus to compare processing at different levels of the text and the use of top-level structure.

Retelling has been recently recommended as valuable part of assessment to be used by classroom teachers, since it matches whole language instructional

practices more closely than standardized tests (Bembridge, 1992). Farr (1990) developed an instructional program with a group of classroom teachers using retelling for assessment as well as instruction.

Retellings have been measured quantitatively in various ways. Many studies have used a count of the idea units in the passage (Zinar, 1990; Gambrell, Kapinus & Koskinen, 1991; Gambrell, Pfeiffer & Wilson, 1985; McConaughy, 1985; Meyer & Freedle, 1984; Horowitz, 1982, 1980; Taylor, 1980). Others have used a percentage or proportion (Richgels, McGee, Lomax & Sheard, 1987; Meyer, Brandt & Bluth, 1980). Some narrative retellings have been measured by the number of story structural elements (Morrow, 1985, 1986). Glenn (1980) counted the number of recalled sentences.

The quality of retellings has been measured by researchers in different ways. A number of researchers examined the degree to which the retelling matched the original structure (Richgels, et al. 1987; Meyer & Freedle, 1984; and McGee, 1982; Taylor, 1982). Other studies examined negative intrusions and positive elaborations (Gambrell, Kapinus & Koskinen, 1991). McConaughy (1985) classified statements into categories and rated the additions of students to the original story. McDonell (1978) used a Schema Scoring System that assessed important propositions and inferences. A holistic grading system

rating the retellings on generalizations beyond the text and irrelevant supplementations has been suggested by Irwin and Mitchell (1983).

Retelling As An Instructional Strategy

Although retelling has played a dominant role in reading research as an assessment task in the past (Mandler & Johnson, 1977; Stein & Glenn, 1979; Thorndyke, 1977), more recently it has been suggested as an instructional strategy (Koskinen, Gambrell & Kapinus, 1991; Morrow, 1985; Marshall, 1983). Retelling requires the reader to organize text information to provide a personal rendition of it. Engaging in retelling focuses the reader's attention on restructuring the text holistically (Koskinen, Gambrell, Kapinus & Heathington, 1988).

In their book Read and Retell (1987), Brown and Cambourne describe retelling as having the characteristics of a natural learning process, similar to that used when children are acquiring spoken language. Retelling activities increase opportunities for children to use reading, writing, listening, and oral language in a way that these four language behaviors support and develop each other. Retelling not only encourages children to use meaning, but to reflect upon it and to recreate it in their retellings. During retelling, the student is involved in

-a whole range of significant language processes, including recall of events, characters, main points, rhetorical features, stylistic devices, and text structure.

-a continuous cycle of different cognitive activities, including the selection of information, the organization of information, and paraphrasing.

Brown and Cambourne believe that retelling is "...an activity which resembles the powerful learning processes involved in language acquisition" of which we have only "just scratched the surface of the potential."

Retelling has been shown to be associated with improved reading comprehension. Gambrell, Pfeiffer and Wilson (1985) compared the comprehension of fourth grade students in two strategy treatment groups--retelling and illustrating. For each of four training sessions the subjects, who were in the third stanine or above, read an expository passage, then illustrated or retold orally the important parts of the passage. Immediately following the retelling or illustrating, the subjects were asked to answer questions about the material. The results showed that the retelling group performed better than the illustrating group on the measures of comprehension. Researchers concluded that retelling is a potent learning strategy that benefits children's processing of text.

Better retellings have been associated with improved comprehension. A later study by Gambrell, Kapinus, & Koskinen (1991) examined the effects of practice in retellings of narrative material on proficient and less proficient students' reading comprehension. Using material at two different levels, good and poor fourth grade readers read silently then orally retold the story. After the first and fourth sessions the subjects answered questions about the story. No instruction in retelling was provided. Over the four practice sessions using different passages, the number of story structure elements and number of propositions recalled increased. The proficient readers incorporated significantly more elaborations in their retellings. There were no significant differences in the negative intrusions for either good or poor readers across four practice sessions. Both good and poor readers' comprehension benefitted from retellings. Researchers observed that by engaging in the verbal reconstruction of narrative material the reader learned something about organizing and remembering text-acquired information.

In a study with Kindergarten subjects, Morrow (1985) investigated whether practice in story retelling could improve story comprehension, concept of story structure, and oral language complexity. In one study the experimental group was asked to retell the story and the control group

was instructed to draw a picture about the story after listening to it. Pre- and post-tests required children to answer questions about a story that had been read to them. The results indicated that there was a small improvement in the comprehension score for those children who retold the story. Because it was apparent that many of these kindergarten children did not know how to retell, a second study was done to give children practice in retelling and structural guidance from an adult. Pre- and post-tests were carried out similar to those in the first study. Morrow found that there was a large significant improvement in the comprehension scores of the children in the experimental group. Results indicated improvement in both structural questions and traditional (literal, interpretive, and critical) questions, even though the treatments stressed only the structural elements of the story. She speculates that an understanding of the structural features of a narrative enhances the ability to comprehend stories from a literal, interpretive, and critical point of view.

Aside from practice, we know little about factors that might enhance children's retellings. Although we know that the use of text structure can facilitate children's retellings, we do not know whether some text structures are more useful than others, whether structures work equally

well for different topics, nor at which developmental levels they would be most appropriately used.

Since retelling has been recently suggested as a strategy for use in the classroom by Koskinen, Gambrell, Kapinus and Heathington (1988), there will be a need for knowledge that will assist educators in its use. Because retelling has been shown to increase comprehension of expository text (Gambrell, Pfeiffer & Wilson, 1985), it will be useful to know which structures facilitate retellings for fourth grade students who may be less familiar with them and sixth grade students who would be likely to have greater experience with different structures.

CHAPTER 3

Procedures

Introduction

The general purpose of the proposed study was to analyze the influence of different expository text structures on the retellings of fourth and sixth grade students. In order to accomplish this purpose, written retellings based on passages written in four different top-level structural patterns were examined.

This chapter will describe the procedures involved in carrying out the investigation. First, the subjects will be described. Next, the development of the passages and the scoring procedures will be reviewed. Finally, the analysis of the data will be described.

Subjects

The subjects were 39 students, two classes each, of grades four and six. The students were enrolled in the regular education program of a large suburban school system in northern Virginia. Students included were the full population of those present for all sessions. Learning disabled students who participated in this study were receiving language arts instruction in a regular classroom setting.

Reading Ability

All of the students in this study scored at the fourth stanine or higher on standardized reading tests administered during the same year that the data were collected. These scores reflected the average and above average ability level of the school's population. For the fourth grade group, scores on the Iowa Tests of Basic Skills, administered in March, 1993, were used to describe the students' reading ability level. The mean score for the fourth grade group was 78%ile. For the sixth grade group, scores on the Degrees of Reading Power, administered in February, 1993, were used. The mean score for the sixth grade group was 74%ile.

Ethnic Make Up

For the students in grade four, 6% were Asian; 8% were Black; 3% were Hispanic; and 83% were White. For the students in grade six, 10% were Asian; 8% were Black; 3% were Hispanic; and 79% were White. The socioeconomic level was mainly middle and upper middle class.

Subject Familiarity with Text Structure and Retelling

The students in the study had some familiarity with retelling. They had used oral and written retellings of narratives in classroom activities. No additional training in retelling was given for the study. The subjects did not

receive any training in the use of structures before or during the study.

Materials

The four expository passages read by each subject were based on material from Reading about Science, (Phoenix Learning Resources, 1990), written by J. F. Mongillo, and others, with special reading consultant Roger Farr. These materials had not been in use for instruction in the school. Science material was chosen rather than social studies for two reasons: (1) the social studies curriculum extends over a broader range of topics such as American History, making it more difficult to find ample material that would not have been previously taught and (2) because there were no single texts adopted for use in the elementary science program. This fact made it more likely that the students were less experienced in reading science texts than social studies text and increased the possibility that the students were unskilled in the use of structural patterns found in science texts.

Each of the four passages was written in four different structures: cause/effect, problem/solution, comparison/contrast and collection/description (see Appendix I). Each subject read one passage in each structure and one passage on each topic.

The passages were approximately 150 words each. An effort was made to keep the passages similar in familiarity of subject matter, number of unfamiliar words, and number of different concepts. The number of idea units common to each passage was approximately 50. To minimize the effects of prior knowledge, topics chosen were those which had not been taught as part of the science curriculum for the current school year. The texts were then modified to conform to the four different text structures used in the study. The information in each of the four passages was the same, except for the signal words needed to change the top-level structure of the passage and the accompanying content material. Each passage contained signaling to indicate the structure of the passage. Students of this age could have difficulty determining an implied structure and other studies found signal words helpful to the subjects (Meyer, Young & Bartlett, 1989; Meyer & Freedle, 1984; Richgels, McGee, Lomax, & Sheard, 1987; Meyer & Rice, 1980; Meyer, Brandt, & Bluth, 1980).

The difficulty level of the material was controlled so that no student encountered material that was too difficult or too easy. Studies have shown that when material is too difficult the use of structural strategies declines. A recent study by Kletzien (1991) revealed that students were most likely to use a structural strategy when the passages

were near the students' instructional level. The use of structure declined for both good and poor readers when the material was three years above or three years below the readers' instructional level. The readability levels of the material had been determined by the authors of Reading about Science, using the Spache (1963) and the Dale-Chall (1948) readability formulas. Science words had been checked against The Living Word Vocabulary by Dale and O'Rourke that provides a percentage score on words familiar to children. If the percentage indicated that a word was too difficult, the authors either substituted a synonym or the word was defined in context.

After the addition of the structural signal words and accompanying content, the readability was measured by the researcher using a computerized version of the Flesch-Kincaid formula. (Grade level = .39 x average sentence length + 11.8 x average # of syllables/words). The level of the passages ranged from 4.7 to 5.2. In addition, the passages were evaluated for their appropriateness for fourth and sixth grade students by their classroom teachers in addition to the researcher. Klare (1984) suggests that, in addition to readability formulas, the judgement of the professionals who work with children should also be tapped.

Instrumentation

Degrees of Reading Power

Scores from the Degrees of Reading Power test (1989 edition) were used as a measure of the sixth grade subjects' reading ability. The Degrees of Reading Power is a measure of how well the messages within text are understood (Touchstone Applied Science Associates, 1989). These tests measure how well students process or construct meaning from paragraphs as they read through a selection. Each test consists of a number of expository passages for which the reader must complete the missing section correctly, using a set of response options. The construct validity is shown by the fact that when read out of context the test items cannot be answered correctly except by chance. The internal-consistency for items within the test has been shown to be reliable by the calculation of the Kuder-Richardson (KR-20) which ranged from .93 to .97 with 59 of the 72 coefficients equal to or greater than .95.

Iowa Tests of Basic Skills

Scores from the reading comprehension subtest of the Iowa Tests of Basic Skills (Hieronymous, Hoover & Lindquist, 1986) were used for fourth grade subjects. The content validity was developed over many years of research in curriculum and measurement. The selection of items involved both empirical and judgmental procedures, including

professionals from diverse cultural groups. Approximately 15,000 students per grade level were involved in establishing norms for the test. The reading comprehension section contains several passages of varying text type followed by a series of questions about the passage. The answer is selected from a choice of four possibilities.

Procedures

The data gathering was done in a classroom setting as a part of the regular language arts instruction. The researcher conducted the classroom procedures. Students were accustomed to her teaching in their classroom as the school's reading teacher. The retellings were done in four sessions over a period of two weeks, with two sessions each week. One retelling was done at each session, to lessen the possibility that subjects would tire of retelling before completing the session. Since the students were familiar with retelling as a part of their language arts instruction, no additional instruction was given for the written retellings.

Written retellings were used since most of the studies using expository materials had used written retellings (Richgels, McGee, Lomax, & Sheard, 1987; Gambrell, Pfeiffer, & Wilson, 1985; Meyer & Freedle; 1984; Meyer, Brandt, & Bluth, 1980; Meyer, 1975.) McConaughy (1985) examined text

structure use by good and poor sixth grade readers. She found that oral retellings were longer than the written ones, but that there was no significant difference between written and oral retellings in the use of text structure.

For each of the four sessions the subjects were given an envelope containing the passage to be read. They were allowed to look at the passage for as long as needed. When all were finished reading, they were told to return the passage to the envelope and pass them in. They could then begin writing their retelling on lined paper that was provided to them. When they had completed their retelling they were asked to raise their hand so that the researcher or classroom teacher could collect it. It was necessary for each subject to complete all four sessions of the retellings, since the subjects' retellings were being compared with their own retellings of different structures. No partial scores were used in the study.

Scoring

To prepare for scoring, the passages were analyzed according to the number of idea units found in the common section of the passages, omitting the words used to signal the structure type and the content material needed to establish the structure. A procedure adapted from Meyer (1975) by Taylor (1978) was used. This method breaks a

passage into idea units, according to the predicate and its role. Definitions of the various roles and the rules followed in analyzing the passages can be found in Appendix C and D. A list of idea units for each topic was prepared for use during scoring (see Appendix F).

The written retellings were scored for the use of the author's original structure and the number of targeted idea units. These two measures used different portions of the retellings. The use of the author's structure was rated on that portion of the retelling that was different for each of the four passages and contained the words needed to establish the top-level structure. The number of idea units was counted using the portion of the passage that was common to all four versions of the passage, omitting the top-level structure and the accompanying content material.

Since evaluating retellings involves some subjectivity, a random sample of 39 of the protocols was scored by a second rater to determine reliability. A percentage of agreement was computed (Guilford, 1954). First, the scores were ranked and divided into quintiles. If the scores of the researcher and second scorer were one quintile apart, it was counted as a one half disagreement. If the scores were two quintiles apart, it was counted as one full disagreement. For three quintiles, one and one half disagreements were counted. Percentages of agreement were

then computed, using the total number of protocols and the number of disagreements. The percentage of agreement was 72% for the number of idea units and 78% for the level of structure use. In cases where scores were two or more quintiles apart, the midpoint score was used for the statistical analysis.

Design

The study had a balanced design with each subject responding to one each of four structures and one each of four passage topics. The order of structures was also balanced. Topics and structures were randomly assigned to students. To vary the order of exposure to the different structures and to see that each structure had a similar number of students for each session, four patterns of sequence were used (adapted from Campbell & Stanley, 1966).

Session 1	A	B	C	D
Session 2	B	D	A	C
Session 3	C	A	D	B
Session 4	D	C	B	A

Analysis of the Data

The data were analyzed using a 2 (grade level) by 4 (text structure) by 4 (topic) factorial analysis of

variance. A multivariate ANOVA was not used because the number of observations was too low. Data were analyzed according to the procedures specified in the Number Cruncher Statistical System, version 5.03, (Hintze, 1990). One ANOVA was done for each of the two dependent variables, the number of idea units recalled and level of structure use in the subjects' retellings. The raw scores of the number of idea units recalled and the level of use of the author's structure were used for the analysis. The level of use of the author's original structure was rated according to the following scale:

5 = The protocol used the author's original structure and included at least one signal word from the original structure.

4 = The protocol used the author's original structure but included no signal words from that structure.

3 = The protocol had at least one signal word from the original structure but was organized in a pattern that was different from the original.

2 = The protocol was organized with an organizational pattern different from the original with or without signal words for the subject's structure.

1 = The protocol was randomly organized with or without signal words.

CHAPTER 4

Results

Introduction

The general purpose of this study was to analyze the influence of the effects of four top-level structural patterns (collection/description, problem/solution, comparison/contrast, and cause/effect) on written retellings of fourth and sixth grade students. In order to accomplish this, four passages on science topics were written in the different structural patterns. Signal words indicated the structure of each passage. Each subject read four passages, one of each topic and one of each structural pattern. After reading each passage, subjects completed a written retelling of the passage. Text topics were electric cars, geothermal energy, quicksand, and sound.

Subjects were average and above average readers in grades four and six. There were 39 subjects at each grade level. All the subjects were familiar with retelling as a part of their classroom activities, and were given no special instruction in retelling nor in the use of expository text structures.

Findings are reported for the dependent measures used in the experiment. These include (a) the students' use of the original top-level structural pattern in their written

retellings and (b) the total number of target idea units (the section common to all four versions of the passage) recalled in the subjects' retellings. Developmental differences between fourth and sixth grade subjects' retellings were examined.

Each dependent measure was submitted to a factorial analysis of variance (ANOVA) on the three factors of grade (2), structure (4), and topic (4). ANOVA tests were performed with an **a priori** significance level of .05.

Effects of Structural Patterns on Subjects' Use of Structure

Hypotheses one through four dealt with the subjects' level of use of the author's top level structural pattern in their own written retellings. The data were analyzed to determine main effects for structural pattern, grade, and interactions between grade and structural pattern and between topic and structural pattern.

Hypothesis one. There will be no significant difference in the mean ratings for structure use in the subjects' retellings across the four structural patterns.

Hypothesis two. There will be no significant difference in the mean ratings for structure use between fourth and sixth grade subjects' retellings.

Hypothesis three. There will be no significant interaction between structural pattern and grade level in

the mean ratings for structure use in the subjects' retellings.

Hypothesis four. There will be no significant interaction between structural pattern and topic in the mean ratings for structure use in the subjects' retellings.

The first step in the analysis of data was to determine the means and standard deviations for the level of structure use, based on a five-point scale. The mean level of structure use in the students' retellings ranged from 2.7 for the cause/effect structure to 3.7 for the problem/solution structure. The means and standard deviations for combined and separate grade levels appear in Table 1.

To determine differences in the subjects' use of structure in written retellings, a 2X4X4 ANOVA was performed, using the level of structure use as the dependent measure. These ANOVA results appear in Table 2.

The first null hypothesis, that means for structure use across the four patterns would be equal, was rejected ($F = 9.81$, $df = 3/280$, $p < .01$). Newman-Keuls comparisons for the means of different structures showed that the problem/solution pattern resulted in a significantly higher level of structure use than the other three structural patterns.

Separate grade level ANOVAS revealed main effects for structure for subjects at each grade level. Newman-Keuls comparisons revealed a difference in the structures for the two grade levels. For subjects in grade six, the least used structure, cause/effect, was significantly different from problem/solution. For subjects in grade four Newman-Keuls comparisons showed that the problem/solution structure was significantly different from the other three.

The level of significance of the F-ratio for the grade variable ($F = 32.33$, $df = 1/280$, $p < .01$) led to the rejection of the second null hypothesis, that means for structure use by subjects in grades four and six would be equal. To further examine the data, a Newman-Keuls comparison was performed between grade levels. The results indicated that there were significantly higher levels of structure use for sixth grade subjects compared with subjects in grade four.

There was not sufficient evidence to reject null hypothesis three, that there would be no interaction between the structural pattern and grade level ($F = 1.38$, $df = 3/280$, $p > .05$). The effects of structural pattern on subjects' structure use did not vary from grade four to grade six.

The analysis yielded evidence for the rejection of the fourth null hypothesis ($F = 2.03$, $df = 9/280$, $p < .05$).

There was significant interaction between the structural patterns and the passage topics. Subjects' use of structure varied from one topic to another. Separate grade level ANOVAS showed that there was an interaction between structure and topic for grade six, but none appeared for grade four.

Table 1: Means and Standard Deviations for Level of Structure Use

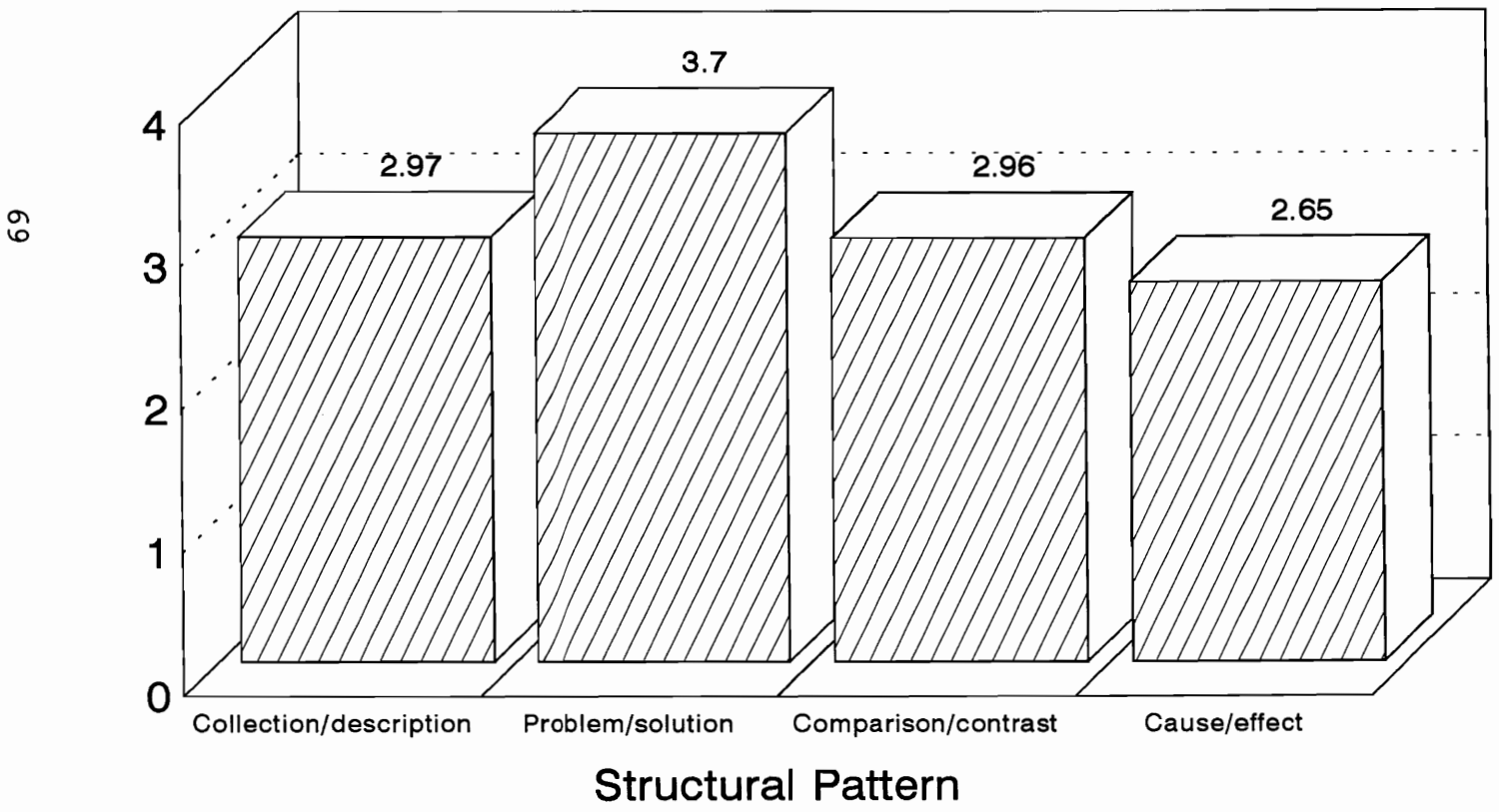
Structural Pattern	Mean	S.D.
Collection/description	2.97	1.92
Problem/solution	3.70	1.25
Comparison/contrast	2.96	1.33
Cause/effect	2.65	1.23

Table 2- Summary Table for Analysis of Variance for Level of Structure Use

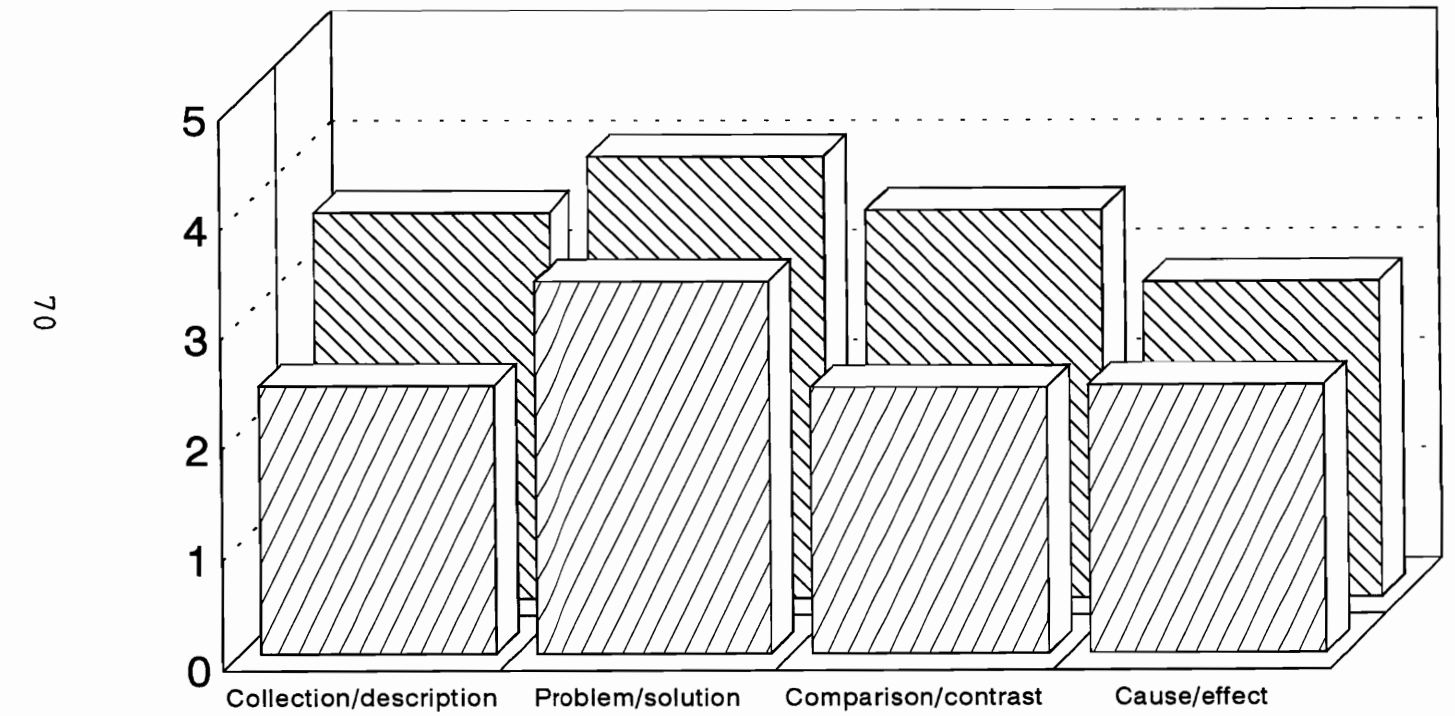
Source	df	F	p
Structure	3	9.81	.000
Grade	1	32.33	.000
Topic	3	3.25	.017
Structure/topic	9	2.03	.028
Structure/grade	3	1.38.	.208
Grade/structure/ topic	9	1.41	.181
Error	280		

Mean Level of Structure Use in Retellings of Passages in Different Structures

(Grades 4 and 6 combined)



Mean Level of Structure Use in Retellings of Passages in Different Structures for Grades Four and Six



6th grade	3.51	4.02	3.53	2.87
4th grade	2.43	3.38	2.41	2.43

Structural Pattern

Summary of the Findings for Hypotheses One through Four

The tests for hypotheses one through four showed that the use of structure in subject retellings did vary when the same information was presented in four different top-level structural patterns. Grade and structure of text affected the level of structure use. There were significant interactions between structural pattern and topic in hypothesis four. The only hypothesis not supported was the third. No significant interaction was found between structure and grade level.

Separate grade level ANOVAS showed significant differences for structure at both grade levels (see Appendix B). There was an interaction between structure and topic for grade six, but no significant interaction for structure and topic for grade four.

Effects of Structural Pattern on the Number of Idea Units

Hypotheses five through eight dealt with the number of idea units in the retellings. The data were analyzed to determine main effects for structural pattern and grade, and interactions between grade and structural pattern and between topic and structural pattern.

Hypothesis five. There will be no significant difference in the mean number of idea units across the four structural patterns.

Hypothesis six. There will be no significant difference in the mean number of idea units for grade four compared with grade six.

Hypothesis seven. There will be no significant interaction between structural pattern and grade level in the mean number of idea units in the subjects' retellings.

Hypothesis eight. There will be no significant interaction between structural pattern and topic in the mean number of idea units in the subjects' retellings.

Means and standard deviations were computed for the number of idea units in the students' retellings. The mean number of idea units in the students' retellings was similar for each of the differing top-level structures. The range was between 18.1 for collection/description and 16.7 for comparison/contrast. The means and standard deviations for separate and combined grade levels are shown in Table 3.

To determine significant differences in the number of idea units when the same information was presented in differing structural patterns, a 2 (grade) X 4 (structure) X 4 (topic) ANOVA was performed using the number of idea units as the dependent measure. These ANOVA results appear in Table 4.

No main effect for structural pattern was found on the dependent measure of number of idea units recalled. Therefore, the fifth null hypothesis, that there would be no

difference in the mean number of idea units across four structural patterns, could not be rejected ($F = 1.56$, $df = 3/280$, $p > .05$). Separate grade level ANOVAS showed no main effect for structural pattern for either grade level.

There was evidence to reject the sixth hypothesis that there would be no difference between grade four and six in the mean number of idea units. Significant main effects were found for grade. ($F = 23.34$, $df = 1/280$, $p < .01$). A Newman-Keuls test revealed that the sixth grade students had significantly higher numbers of idea units in their retellings than the fourth grade students.

Clear evidence was not present to reject the seventh hypothesis, since the analysis resulted in a non-significant interaction ($F = 1.18$, $df= 3/280$, $p > .05$). There was no interaction between the four structural patterns and the four different topics. Separate grade level ANOVAS revealed no interaction between structural pattern and topic for either grade level.

Hypothesis eight was not rejected, since no significant interaction occurred between the two different grade levels and the four different structural patterns ($F = 0.33$, $df = 9/380$, $p > .05$). The number of idea units in the subjects' retellings was similar for each grade level from structure to structure.

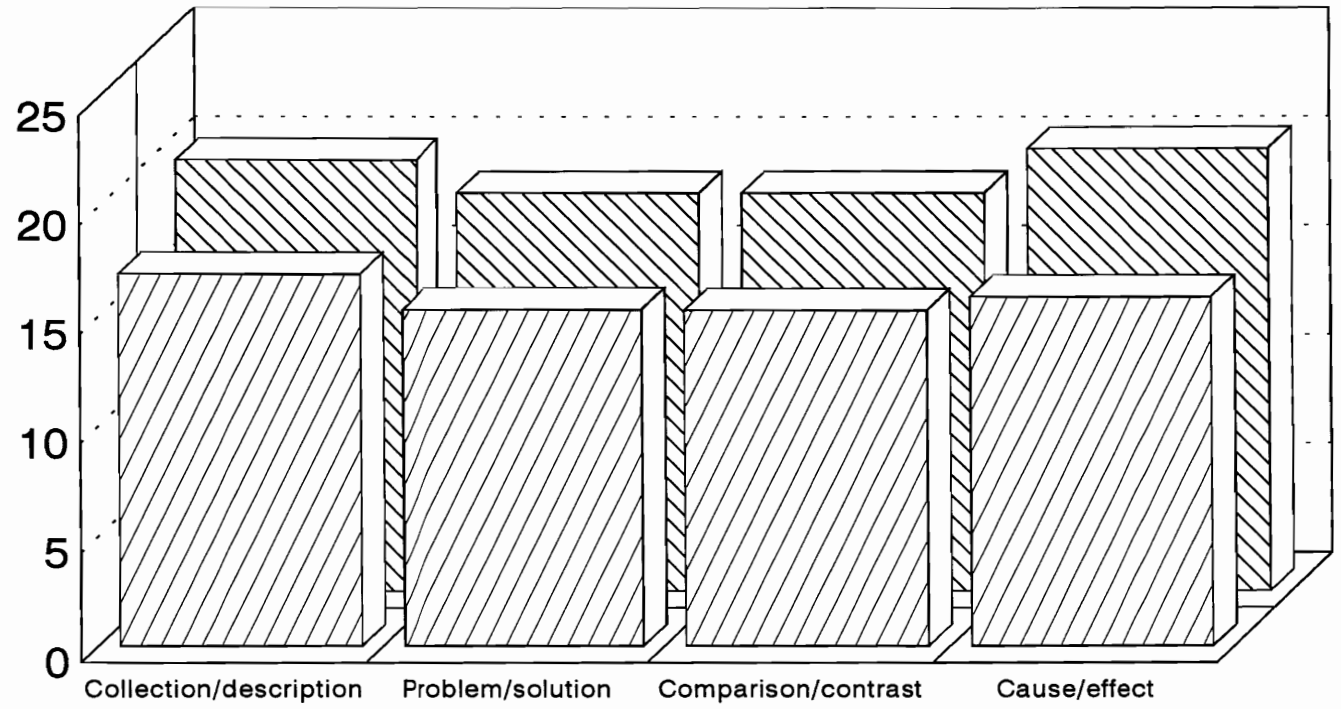
Table 3- Means for Idea Units

Structural Pattern	Means	S. D.
Collection/description	18.19	6.16
Problem/solution	16.98	6.54
Comparison/contrast	16.71	5.67
Cause/effect	17.92	6.00

Table 4- Summary Table for Analysis of Variance for Number of Idea Units

Source	df	F	p
Structure	3	1.56	.198
Grade	1	23.34	.000
Topic	3	4.01	.008
Structure/grade	3	0.33	.801
Structure/topic	9	1.18	.304
Grade/structure/ topic	9	1.41	.181
Error	280		

Mean Number of Idea Units for Retellings of Passages in Different Structures for Grades Four and Six



6th grade	19.76	18.25	18.25	20.28
4th grade	17.02	15.38	15.35	15.97

Structural Pattern

Summary of Findings for Hypotheses Five through Eight

Only one of these hypotheses, hypothesis six, was supported. There was a significant difference for grade level in the mean number of idea units recalled, with sixth grade students recalling more than fourth grade students. Hypothesis five was not supported. Subjects recalled about the same number of idea units for passages written in all four structural patterns. In hypothesis seven, there was no interaction observed between structural patterns and grade level. Hypothesis eight was not supported. There was no significant interaction between structural pattern and topic. These results show that there is little difference in the number of idea units produced by subjects when retelling passages written in four different top-level structural patterns and no interaction between topic and structural pattern nor between grade and structural pattern.

Separate ANOVAS for grades four and six showed similar results (see Appendix B). There were no main effects for either grade level for structure and no interactions between structure and topic in the number of idea units.

Additional Findings

Supplementary Observations of Elaborations and Randomly Organized Protocols

The protocols were examined for further insight into the processing of information in the different structures. Occasional evidence of elaboration was noted, showing the addition of pertinent information that was not in the original text as well as inferential material and summary-type sentences. In addition, randomly organized protocols were re-examined for further clues about the subjects' reconstruction of the passage.

While elaborations on the text were evident in the retellings, they occurred very infrequently (10 in grade four and 14 in grade 6). There were no patterns of elaborations in specific topics or structures.

Subjects used their background knowledge to add pertinent information. (Example: **Sound is all around us.**) The use of background information in the retelling occurred more frequently in the retellings of the sixth than fourth grade subjects, suggesting that the older subjects had greater background knowledge or made greater use of it in reading and constructing their retellings.

Inferential statements occurred more evenly than the use of background information in the two grade levels. (Example: **A lot of people have hearing loss.**) The presence

of inferential material in the retelling shows evidence of an connection between the readers' thoughts and the text. In this example, the subject read that loud music or machinery can cause hearing loss. Knowing that noise from rock concerts and tractors are at levels loud enough to cause hearing loss and that many people listen to rock concerts and tractors, the reader concluded that many people have experienced hearing loss.

Other elaborations were in the form of summary-type statements. These occurred infrequently for both grade levels, and were almost non-existent in the fourth grade retellings. (Example: **Geothermal energy can be made into electricity, but it is expensive.**) This example shows evidence of gathering the ideas in the passage and assembling them into one sentence.

Randomly organized protocols with no top-level structure were examined further. Most of these protocols were short and had no elaborations. The appearance of these protocols suggests that the subjects simply wrote each idea as it occurred to them, without connecting these ideas in any way. The few randomly organized retellings that were long looked as if the subjects were intent on recording as much as possible about the passage and in their effort to remember more, ignored any thought of a logical arrangement. They may have been unaware that a structure strategy could

have helped them to reconstruct the text more economically. The randomly organized retellings occurred nearly three times as often for fourth grade subjects as for sixth grade subjects.

Negative Intrusions

The retelling protocols were examined for presence of negative intrusions defined as erroneous or irrelevant material. While negative intrusions occurred infrequently (66 times for grade four subjects and 57 times for grade 6 subjects out of the 156 retellings at each grade level), the number of negative intrusions was less for retellings of the problem/solution passages than the other three structures. This finding shows an additional measure of the effects of different structural patterns on the subjects' retellings. The frequency of the negative intrusions in retellings of passages in different structural patterns appears below:

Structural Pattern	Grade 4	Grade 6
Collection/description	19	18
Problem/solution	10	8
Comparison/contrast	20	18
Cause/effect	17	13

Use of Macropropositional Level of Text in the Retellings

Protocols were examined for the presence of macropropositional level information (level of main idea of paragraphs). For each topic there were four sentences at this second level. The occurrences of second level information were recorded and compared to the total amount of second level information in the text. The percentages computed appear below:

(Structures and Topics Combined)

	GRADE 4	GRADE 6
Collection/description	32%	45%
Problem/solution	29%	41%
Comparison/contrast	28%	37%
Cause/effect	39%	46%

There were differences among the structures in the amount of second level information included in the retellings. Fourth grade subjects recalled less than sixth grade subjects in the second level. Retellings for the cause/effect structure produced somewhat more second level information than the other structures. The difficulty of the top level cause/effect structure may have led the subjects to use the second level to a greater extent in their retellings.

Levels of Structure Use with and without Signal Words

The chart below shows that retellings of subjects who used a structure different from the original did not frequently have signal words to accompany the structure. For the fourth grade level, only two out of 56 used a signal word when the retelling was written in a structure different from the original. At the sixth grade level, three out of 43 retellings had a signal word to accompany the retelling when the structure was different from the original.

For level one, retellings that were randomly organized, there were fewer signal words used. For fourth grade retellings at level one, two had a signal word that was in the original structure, and one had a structure word that was different from the original. Retellings of sixth grade subjects had one with an original signal word and one with a signal word different from the original.

	Use of Signal Words		
	Original	Their own	None
Structure			
	Rating 5		Rating 4
Original	4th = 25		4th = 22
	6th = 42		6th = 44
Their own	Rating 3	Rating 2	Rating 2
	4th = 19	4th = 2	4th = 54
	6th = 15	6th = 3	6th = 40
Random	Rating 1	Rating 1	Rating 1
	4th = 2	4th = 1	4th = 30
	6th = 1	6th = 1	6th = 10

Percentages of Structure Use by Grade Levels

To further analyze the differences between fourth and sixth grade subjects' retellings, percentages of the use of author's structure were calculated, using the same data used for the ANOVA. Two degrees of structure use were included in the percentages: level 5--the subject used the author's original structure and included at least one of the signal

words; and level 4--the subjects used the author's original structure, but no signal words appropriate to that topic.

The percentage of subjects who used the author's structure was 23% for grade four and 57% for grade six. This finding contributes to the pattern of developmental differences in structure use shown in this study. The number of retellings at each level of structure use appears in the following chart:

Level of Structure Use	Grade 4	Grade 6
Level 1 (randomly organized)	33	12
Level 2 (patt. different)	56	43
Level 3 (" " + sign. word)	19	15
Level 4 (same patt. as orig.)	22	44
Level 5 (" " " w/sign.)	25	42

Chapter Summary

The problem investigated in this study was the influence of different top-level structures on the retellings of fourth and sixth grade students. Two dependent variables, use of the original top-level structure and the total number of targeted idea units in the subjects' retellings, were examined using a 2 (grade) by 4 (structural pattern) by 4 (topic) ANOVA.

Based on the results of this study it is evident that differences in top-level structural patterns affect the use of structure in the retellings of fourth and sixth grade students. Students were found to use the author's structure more often when the passages were written in a problem/solution structure than when written in the other three patterns. Further evidence of the usefulness of the problem/solution structure is apparent in the fewer number of negative intrusions in the retellings for this structure. Subjects in both grades used the cause/effect pattern less than the other three patterns, but only for the sixth grade was it significantly lower.

Main effects for grade level in the subjects' use of the original structure reveal the greater use of structural patterns by sixth grade students when compared with fourth grade students. Sixth grade subjects used the original structure for organizing their retellings twice as often as fourth grade students. The study revealed significant interactions between structural pattern and topic for grade 6, but none between structural patterns and grade level.

Differences in the number of idea units for each structure were much less evident. Structural pattern differences were found to have little effect on the number of idea units in the students' retellings. There were no interactions between structure and topic and none between

structure and grade level for the number of idea units. Developmental differences did appear in the number of idea units produced by fourth and sixth grade subjects.

CHAPTER 5

Discussion and Implications

Introduction

The general purpose of the study was to analyze the influence of different structural patterns of expository text on recall and the use of the author's structure in the retellings of upper elementary students. The primary purpose was to examine the effects of four different top-level structural patterns on the retellings of subjects in grades four and six, using science passages.

Dependent variables were the number of targeted idea units (information common to all four topics, but not including the structural elements) and the level of use of the author's structure in the subjects' retellings. The subjects were 39 students in each grade level, with average or above average reading ability. Four passages, one written in each structural pattern and one for each topic, were read by each student. The topics and structural patterns were randomly assigned to the subjects.

Two factorial ANOVAs were used to analyze the data to answer the research questions. For questions one through four the dependent variable for the ANOVA was the level of use of the original structure in the subjects' retelling. For questions five through eight the dependent variable for

the ANOVA was the number of idea units in the subjects' retellings. Independent variables were different patterns of text, grade levels, and topic.

This chapter will compare the findings of this study to other research and discuss the theoretical and educational implications.

Use of Structure in Retellings

The Effects of Different Structural Patterns on Structure Use in Retellings

The data in the present study demonstrated that the subjects used the author's structure when the original passage was in the problem/solution structure more than when it was in the other three patterns. These results are consistent with Meyer, Brandt, and Bluth's (1980) study with ninth grade subjects. In their study of signaling/ nonsignaling effects on the use of structure by good, average and poor readers, they found that a greater percentage of the recalls was organized with the author's top-level structure for the problem/solution pattern (42%) than for the comparison pattern (34%). The difference was greatest for the poor readers. Twice as many poor readers used the same structure as the original when the original structure was problem/solution as when it was written in a comparison structure. The results of the Meyer et al. study

differ from the Meyer and Freedle (1984) study with adult subjects. Meyer et al. concluded that the ability to use structure during reading may develop with age and schooling. They suggest that competence with story structure precedes competence with expository structure.

It appears that the use of the various expository text structures may develop at different rates. Since the poor readers in the Meyer, et al. (1980) study used the problem/solution more than the other patterns, and in the present study subjects younger than Meyer's subjects used the problem/solution to a greater extent, it is possible that its use may evolve sooner than the use of the other structures.

Another explanation for the subjects' greater proficiency in the use of the problem-solution structure may, in part, be related to its similarity to one of the prevalent patterns found in fairy tales or stories in which the characters attempt to solve a problem.

Story = Problem-------> Attempt------> Outcome

This pattern is based on story grammars (Mandler & Johnson, 1977; Rumelhart, 1977, 1980, 1981; and Thorndyke, 1977).

According to Meyer, Young, and Bartlett (1989), certain structures are better suited to some contexts. Scientific

text more frequently uses the problem/solution structure. The problem/solution pattern has also been identified by Jordan, (1980), as characteristic of scientific writing. Following the analysis of thousands of examples of technical text, Jordan found that a majority of scientific texts can be described with a four-part pattern (situation, problem, solution, and evaluation). Mayer (1985) described scientific text as a passage that contains a functional relationship between two or more variables in the natural world. There are predictable linkages with the real world and fewer inferences required with scientific text in comparison to narrative text (de Beaugrande, 1980). These characteristics of scientific text may have influenced structure use of subjects in the present study.

While analysis with combined grades showed that the problem/solution structure was the most used structure, separate grade level analyses revealed grade level differences in structure use. On the separate grade four analysis, problem/solution was found to be significantly different from the other three structures. However, the grade six analysis showed the cause/effect structure, the least used structure, to be significantly different from the problem/solution structure. These findings for sixth grade subjects partially agree with results of a structural awareness study by Richgels, McGee, Lomax, and Sheard

(1987). On three measures of structural pattern awareness, Richgels et al. consistently found low awareness of the causation structure. On a recall task subjects showed a high awareness of collection, comparison/ contrast, and problem/solution. In the present study, the causation structure was also the least used structure for both grade levels, but only reaching significance for grade six.

A study by Zinar (1990) with fifth grade above and below average readers suggests that the causal structure may be difficult for upper elementary readers. She found that below average readers recalled very little causal information, whether causal was implicit or explicit, in both free and probed recall. The above average readers, recalled causal information when it was explicit but little causal material when it was implicit. Zinar concluded that the better readers may have been at the stage of learning where they were dependent upon explicit clues to help with causal structures.

The results from the present study showing higher use of structure in the problem/solution pattern and lower use of the causal structure differ from the findings of Kletzien (1992). Kletzien found that tenth and eleventh graders' use of a structural strategy was higher on the causation passage than on the collection or comparison. However, the Kletzien study did not use the problem/solution structure. The

Kletzien's study differed from the present study in several other ways: the subjects were using a cloze procedure rather than the retelling of the present study; the subjects were high school students with more years of experience in the use of structure.

Meyer and Freedle (1984) found that adult subjects were less likely to use the author's structure for the problem/solution structure than the comparison, causation, and collection/description structures. Meyer and Freedle found two possible explanations for the unexpected lack of use of the problem/solution pattern. One was revealed in the comments of the subjects. Many of them believed that the solution in the problem/solution passage, dismissal of coaches for allowing water deprivation for athletes' weight control, was harsh and a poor solution to the stated problem. Another explanation that could interpret the subjects' lack of use of the problem/solution pattern was in the construction of the problem/solution passage. The problem was not explained until the last paragraph. In addition to these factors, adults in the Meyer and Freedle study had more years of experience with different expository structures than the elementary school students in the present study. The differences in strategy use for these different age levels may be additional support for the claim

that the use of structure develops at different rates for various structures.

Grade Level Differences in Structure Use

The results of the present study showed significant main effects for grade level in structure use, demonstrating that sixth grade subjects used the author's structure more frequently than those in fourth grade. The percentages of structure use--25 percent for fourth and 52 percent for sixth--reveal a sharp contrast between the two grade levels. This finding is consistent with a study by Garner and Gillingham (1987) with fifth and seventh grade subjects. Differences in grade level are not surprising because of research findings on other structures. Englert and Hiebert (1984) found that children made their greatest gains in their acquisition of descriptive structure between third and sixth grade. McGee (1982) and Taylor (1980) found that use of hierarchical structures was more related to grade level of upper elementary subjects than reading ability.

Interaction between Structural Pattern and Grade Level

Although an earlier study found an interaction between structural patterns and grade level for use of structure (Englert & Hiebert, 1984), data in the present study did not. This difference may be due to the very different tasks and the different structures used in the two studies. In the Englert & Hiebert study third and sixth grade subjects

were asked to rate the "degree of fit" for distractor statements that did not fit the top-level structure and distractor statements that conformed to the top-level structure. Their results showed no significant differences between any structures for sixth grade, but a significant difference in third grade between sequence and description structures, showing differences in the acquisition of the structures for these subjects. Problem/solution was not included in the four structures in Englert and Hiebert's study (sequence, comparison/contrast, description, and enumeration).

Interaction between Structural Pattern and Topic

Consistent with other findings, this study found an interaction between structural pattern and topic for sixth grade students in the use of structure. Horowitz (1982) and Thorndyke (1977) also reported a significant story by structure interaction. Horowitz found that when the topic was unfamiliar, text structure was of greater importance. The findings in the present study may indicate that there were differences in the familiarity of topics between fourth and sixth grade subjects, a possible indication of the differences between the two grade levels.

Number of Idea Units in Retellings

The Effects of Different Structural Patterns on the Number of Idea Units

Since different structural patterns had been shown to affect the number of idea units recalled by adults, Meyer & Freedle (1984), it was thought that younger students might show a similar pattern. In the present study subjects showed little difference in the number of idea units for different structural patterns. This finding was consistent with studies with elementary and high school subjects (Zinar, 1990; Horowitz, 1982; Meyer, Brandt & Bluth, 1980; and Swanson, 1979). Some of the differences between Meyer and Freedle's research and the present study, may be due in part to the differences in modes of presentation. In the Meyer and Freedle study subjects **listened** to the passages. It is possible that the differences in listening and reading contributed to the conflicting outcomes. During listening, the time allowed for processing the text is controlled. When reading, the subjects control the time spent. They can vary their speed or go back to review a section. Another difference between the present study and the Meyer & Freedle study is the age of the subjects. Subjects tested by Meyer and Freedle were graduate students, likely to be more familiar with these top-level structures. The subjects were

younger than Meyer & Freedle in the Zinar, Horowitz, and Swanson studies. It may be that subjects younger than those of Meyer and Freedle's lack experience that would allow them to recall a greater amount of information from the more complex patterns.

Grade Level Differences in Number of Idea Units

Consistent with the findings of McGee, (1982); Taylor, (1980); and Danner, (1976), there were significant grade level differences in the number of idea units recalled. In general, the sixth grade subjects produced more idea units in their retellings than fourth grade subjects. It is likely that the sixth grade students have had more experience in reading expository text, more experience in retelling, and more exposure to different structural patterns. This finding disagrees with the Horowitz (1982) study with ninth graders and college freshmen. She found no significant age differences. Horowitz gave two possibilities for the unexpected results. Ninth grade subjects were well above grade level and may have been similar in their reading ability to the college freshmen. In addition, both groups may have been equally good at structure use because it is possible that this strategy is mastered before the ninth grade.

Interaction between Structural Pattern and Grade Level

Although some earlier research had demonstrated a structural pattern by age interaction, there was no interaction between grade and structural pattern in the number of idea units recalled. In a study by Meyer, Freedle and Walker (1978), it was found that adults aged 61-81 recalled more from a list-like structure than from a comparison/contrast structure, differing from college and ninth grade students. College and ninth grade students recalled more from the comparison/contrast structure while sixth graders recalled more from a list-like structure. One explanation for these interactions may be the size of the age differences. The subjects in the present study were closer in age than in the Meyer et al. study. The findings in the present study agree with the findings of Horowitz (1982). She found no grade by structural pattern interaction in a study of developmental differences in the effect of different structural patterns on recall of ninth graders and college freshmen.

Interaction between Structural Pattern and Topic

No interaction materialized between topic and structural pattern in the number of idea units recalled. This finding differs from the results found by Horowitz. In her study, the structure by passage interaction suggested that while a problem/solution pattern was effective for the

"Body Water" passage, it was ineffective for the "Social Spiders" passage. The difference may have been due to the dissimilarity of the two passages. While Body Water was a more scientific passage, Social Spiders was described by Horowitz as "social-psychological" text. This evidence may give further support to the possibility that the problem/solution structure is better suited to scientific topics. In addition to subject matter differences, the two passages also varied on several measures used in Horowitz's study. Subjects rated "Social Spiders" as significantly different on the basis of every metacognitive measure used in the study--comprehensibility, difficulty, memorability, and prior knowledge.

Implications and Conclusions

Theoretical Implications

According to Meyer's (1975 and 1977) model, the top-level structure and major interrelationships are employed to guide retrieval and production of the recall protocol. It is hypothesized to be mainly a top-down retrieval search guided by the structure of the relationships. When recalling the text, the reader begins the retrieval search with the top-level structure and systematically uses the particular discourse structure to search memory. The

different types of top-level structures differentially affect recall.

Meyer's model was partially functioning for the subjects in the present study. They were able to recall and use the original top-level structure more frequently in the problem/solution structure than the other structures. However, the subjects in present study were not able to retrieve details better in one structure than another. There was little difference in the number of idea units recalled for the different structures.

Another of Meyer's theories may have been the reason for the incomplete use of Meyer's (1975, 1977) model. Meyer describes text as hierarchical with top-level structure at the highest point and details located at the bottom. The major ideas are bound together by the top-level structure. The ideas at the top of the structure are more easily remembered than those farther down. The subjects in the present study appear to have recalled the top-level structure better than the lower level information, supporting Meyer's theory. Their use of top-level structure did vary by structural pattern, suggesting a sensitivity to the top-level structural differences. It appears that, perhaps due to these subjects' developmental level and relative lack of experience with expository text, there was

little difference in the amount of lower-level information they were able to recall, a more difficult task.

Subjects' background knowledge of the different topics may also have affected the results. Previous research by Voss and Bisanz (1985) reported that low knowledge subjects recalled the major subtopics but showed only poor recall of subordinate information.

The significant structure by topic interaction for sixth grade subjects agrees with the findings of Horowitz (1982) and Thorndyke (1979). They found that particular organizational patterns can be optimal for certain topics. Structures appear to work best when there is a match between the structure and the logical nature of the argument of the passage. For example, the problem/solution structure with the topic quicksand showed the highest level of structure use for combined grades. It appears that the problem/solution structure makes the point effectively, since if you fall in quicksand you will have a problem. The topic of sound in the problem/solution structure was also high for combined grades. For grade six, however, the cause/effect structure was used more than problem/solution for the topic of sound. The cause/effects structure explains the sound passage well because the basic idea is that sound that is too loud causes hearing loss. However, fourth grade subjects used the problem/solution structure

more for this topic, probably because it is a more difficult structure.

Sixth grade subjects appear to have been more skilled at the use of structure; therefore may have discerned the differences in the suitability of a particular structure for a certain topic. Because they were more skilled than fourth grade subjects in the used of the four different structures they had more flexibility in the use of the structure. This may have contributed to the interaction of structure and topic for grade six.

The differences in structure use between fourth and sixth grade can also be seen when the means are grouped by structure. The mean level of structure use shows consistency for collection/ description, 2.3 to 2.8; for problem/solution, 2.9 to 3.8 (highest); and for cause/effect, 2.0 to 2.7 (lowest). There are inconsistencies in the comparison/contrast levels, ranging from 1.6 to 3.2. This structure may have been at a phase of development where it was easily affected by other factors such as familiarity of the topic or conceptual difficulty.

For sixth grade subjects the mean level of structure use shows more consistency for collection/ description, 3.4 to 3.6; problem/solution, 3.4 to 4.6 and for comparison/contrast, than for the cause/effect structure, 2.2 - 4.3. One explanation might be that the use of the

cause/effect structure is at a stage, similar to the comparison/contrast for the fourth grade, where its use is sensitive to other factors.

Another possible explanation for this structure/topic interaction may be found in differences in the conceptual difficulty of the topics. Zinar (1990) suggests that there may be an optimum level of conceptual difficulty for the use of text structure strategies. This level of difficulty would be not so easy that the reader infers relationships spontaneously, nor so difficult that the reader lacks the essential background for understanding. There may have been differences in the conceptual difficulty of the passages for subjects in grade four compared with grade six affecting the structure/topic interaction.

This study appears to support Zinar's conclusion that some time in the late elementary grades the better readers begin to develop a strategy for the processing of text that involves attention to text structure. Significant differences found between fourth and sixth grade subjects in the number of idea units and level of structure use indicate that students learn to use structure more as they become more experienced with expository text. The lack of interaction of topic and structure in the fourth grade subjects' use of structure variable indicates that the

differences related to different structures and topics are greater for sixth grade subjects.

Further differences between fourth and sixth grade subjects' use of different structural patterns were apparent in this study. For fourth grade subjects, the problem/solution was used significantly more than the other three structures, while sixth grade subjects used cause/effect significantly less. This difference suggests that use of the comparison/contrast and collection/description structures may increase between grades four and six. It appears that the most easily used structure for these subjects was the problem/solution, the most difficult to use was the cause/effect structure, with the collection/description and comparison/contrast between these two in level of difficulty.

Implications for Education

It has been shown that readers who use top-level structure are able to understand and remember more than those who do not (Meyer, Brandt & Bluth, 1980; Taylor, 1980). Combined with the results of other studies, the present study suggests that the problem/solution structure might be more easily used by students inexperienced in the use of text structure, and possibly easier to use with science texts. Further, this study and the results from other studies suggest that the cause/effect structure may be

more difficult to use than the other three structures. Authors and publishers of children's texts and curriculum planners for upper elementary students may use this knowledge to optimize the use of text structures in upper elementary materials.

Since it appears to be more easily used, the problem/solution structure might be introduced when students are learning to use expository text structures. For example, the problem/solution pattern could be chosen for beginning to teach retelling of science text using a text structure strategy.

General Recommendations for Educational Practice

For students who are learning to use text structure, the words to signal the structure type are useful. The signal words can help them to identify the structural pattern. The task of inferring the structure type may be too difficult when students are inexperienced with these structures.

It appears that upper elementary students are at an appropriate developmental level to learn from text structure instruction. Instruction, for those who would benefit from it, should be sensitive to the level of conceptual difficulty. Students need to be prepared for the use of structure for different learning tasks, including retelling and their own compositions. Composing in different

structures might be a particularly effective way to teach the structure strategy.

Implications for Future Research

Results from this study suggest that different structures affect the use of structure in retellings for upper elementary students. Additional studies are needed to define more fully the conditions under which text structure strategies might be utilized.

Conceptual knowledge may have played a role in the use of structure in this study. Future studies of interaction between conceptual knowledge and the use of text structure may help to explain some of the apparently conflicting findings in text structure research. There is also the possibility that some top-level structures may be highly context bound (Meyer, 1975), further suggesting the need to examine interactions between topic and structure.

In addition to the interactions between differing levels of conceptual knowledge with structure use, studies of the interactions between text structure use and different levels of text difficulty are needed for elementary students to determine conditions under which text structure is most effectively used.

An additional influence on the use of structure is the amount or saliency signaling. Developmental studies in the use of structure when those structures are implicit or

explicit would contribute to the knowledge of developmental patterns of the mastery of structure use.

The increasing amount of non-fiction literature in primary classrooms may help students become more familiar with expository structures. Replications of this study with students who had greater amounts of exposure to non-fiction reading might be likely to show positive effects on their use of expository structures.

This study examined the retellings of average and above average fourth and sixth grade subjects. Studies of text structure use with below average readers would be useful in expanding the knowledge base needed to assist these learners in the use of structure strategies.

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APPENDIX A

Means for Grades 4 and 6

Table 5: Means for Level of Structure Use in Retellings of Passages in Four Different Structures

Structural Pattern	4th grade	6th grade
Collection/description	2.43	3.51
Problem/solution	3.38	4.02
Comparison/contrast	2.41	3.53
Cause/effect	2.43	2.87

Table 6: Means for Number of Idea Units for Retellings of Passages in Four Different Structures

Structural Pattern	4th grade	6th grade
Collection/description	17.02	19.76
Problem/solution	15.38	18.25
Comparison/contrast	15.35	18.25
Cause/effect	15.97	20.28

APPENDIX B

ANOVAS for Grades 4 and 6

Table 7- ANOVA for the Level of Structure Use for Grade 4

Source	df	F	p
Structure	3	5.24	.0019
Topic	3	1.68	.1742
Structure/topic	9	0.93	.4995
Error	140		

Table 8-ANOVA for the Level of Structure Use for Grade 6

Source	df	F	p
Structure	3	6.03	.0007
Topic	3	2.04	.1109
Structure/topic	9	2.70	.0064
Error	140		

Table 9- ANOVA for the Number of Idea Units for Grade 4

Source	df	F	p
Structure	3	.07	.5506
Topic	3	2.54	.0590
Structure/topic	3	0.95	.4844
Error	140		

Table 10- ANOVA for the Number of Idea Units for Grade 6

Source	df	F	p
Structure	3	1.19	.3165
Topic	3	1.75	.1592
Structure/topic	9	1.64	.1083
Error	140		

APPENDIX C

Definitions of Predicates and Roles

Adapted from Meyer (1975) and Taylor (1978)

Predicates

1. Main - the verb of a proposition that is not subordinate to any other propositions in a passage.
Example: Bill went on a hike. He climbed to the top of Bald Mountain.

2. Specific - the verb of a proposition that is subordinate (a detail) to another proposition.
Example: Bill went on a hike. He climbed to the top of Bald Mountain.

3. Antecedent - Result--the verbs of propositions within a single sentence that state the something happens because something else happened first. Result answers "what happens next" following an antecedent introduced with "when", "if", "because", "so" or answers "why". Antecedent-result predicates may be either main or specific predicates.
Example: When Bill got (antecedent) to the top of the mountain, he saw (result) a beautiful view.

Roles

1. Agent - the person or animal causing an action that affects something else. The agent answers "who or what does something".
Example: Bill broke the window. Mary told the little girl the story.

2. Patient - the person or thing affected by the action (often animate). The action stays with the patient or comes to the patient. The patient answers "who or what is affected by the action" or "who or what does something".
Example: The cat has a yellow tail. Bill broke the window.

3. Reference - the thing or person that the action is limited to (usually inanimate). The reference is not directly affected by the action. The reference answers "what" or sometimes "whom".
Examples: Mary told the little girl a story. She gave Susie a book. He knew the answer.

4. Benefactor - a person or thing that benefits from the action. The benefactor answers "for whom or what".
Example: Jane watered the plants for Mary.

5. Instrument - the thing that helps the agent perform the action. The instrument may precede the predicate, as in the case where the agent is implied. The instrument answers "with what".
Examples: Bill broke the window with the ball.
The ball broke the window.
6. Attribute - this role answers "what kind" or "how many".
Examples: We visited a beautiful lake.
The man that lives there is Mr. Green.
Some flowers are blue.
7. Manner - this role answers "how", "how much", or "in what way".
Example: The boy ate quickly.
8. Range - this role answers "where".
Example: The bear lives in a cave.
9. Time - this role answers "when".
Example: She went to work on Monday.
10. Equivalent - this role answers "like whom or what", "called who or what", or "the same as who or what."
Examples: Some animals, like dogs, make good pets.
That yellow bird, called a gold finch, is very pretty.
Mr. Gray, my banker, lives on this street.

APPENDIX D

Rules Followed in Analyzing the Passages

1. List words separated by "and" or "or" as separate idea units.
2. Break a proposition into its predicate and roles if it is an agent, patient, reference, instrument or benefactor. Do not separate the attribute, manner, range, time or equivalent into more than one idea unit. Example: The yellow /bird/ lives/ in that big tree.
3. For the reference role do not separate infinitives telling when where, how, or that. Example: I/know/how to sail.
4. For the antecedent predicate, keep the following together as one idea unit: when, if, because, so + verb.
5. No form of "to be" stands alone as an idea unit. "Is" or "are" plus whatever follows it is all one idea unit.
Examples: Rover/is their dog.
The shoes/are in the closet.
6. "Have" is listed by itself as a predicate. The role preceding "have" is listed as reference.
7. "Use" is not listed as a predicate unless it has no other verb or infinitive following it in the sentence. Example: Bill/used/the car.
8. The implied subjects (agent, patient, or instrument) of all predicates are counted as scorable idea units. Example: Last Saturday Mrs. Gill worked in the flower garden and (she) picked blackberries.

APPENDIX E

DATA COLLECTION SHEET

PASSAGE_____

PASSAGE STRUCTURE_____

GRADE LEVEL_____

STUDENT NUMBER_____

_____

SCORING SUMMARY

Number of idea units recalled_____

Use of structure _____

Negative intrusions

_____

_____

_____

_____

_____

_____

ELECTRIC CARS--COMMON SECTION

	specific
1	WERE BEING USED
	time
2	ABOUT 1900
	patient
3	CARS
	attribute
4	ELECTRIC
	attribute
5	MANY
	specific
6	NOT GIVE
	reference
7	POWER TO TRAVEL
	attribute
8	ENOUGH
	attribute
9	AT REGULAR SPEEDS
	patient
10	BATTERIES
	range
11	IN THESE CARS
	patient
12	BATTERIES
	specific
13	WERE HEAVY
	specific
14	BIG
	patient
15	THEY (BATTERIES)
	specific
16	RAN OUT OF POWER
	manner
17	QUICKLY
	patient
18	THE BATTERIES
	specific
19	NEEDED TO BE CHARGED
	manner
20	EVERY 150 MILES
	specific
21	WERE NOT GOOD
	manner
22	FOR LONG TRIPS
	patient
23	CARS

```
     specific-antecedent
24   HAD TO STOP
     agent
25   PEOPLE
     specific-result
26   TO CHARGE
     reference
27   BATTERIES
          manner
28        TOO OFTEN
     specific
29   RAN OUT OF POWER
          manner
30        QUICKLY
     agent
31   THEY (CARS)
     specific-antecedent
32   HAVE BUILT
     agent
33   SCIENTISTS
     agent
34   ENGINEERS
     patient
35   BATTERIES
     specific-result
36   GIVE
     benefactor
37   CARS
     instrument
38   POWER
          manner
39        MORE
     specific
40   CAN TRAVEL
          manner
41        FASTER THAN EARLIER ONES
     patient
42   CARS
          attribute
43        NEW
          attribute
44        ELECTRIC
     specific
45   HAVE
          time
46        NOW

     patient
47   THEY (CARS)
```

```
     reference
48   BATTERIES
          attribute
49        SMALL
          attribute
50        LIGHT
     specific-antecedent
51   CAN BE SOLVED
     patient
52   PROBLEMS OF ELECTRIC CARS
          attribute
53        MORE
     specific-result
54   MAY REPLACE
     agent
55   THEY (ELECTRIC CARS)
     patient
56   CARS
          attribute
57        THAT BURN GASOLINE

GEOTHERMAL ENERGY--COMMON SECTION
     main
1    IS INTENSE HEAT
          range
2         DEEP INSIDE THE EARTH
     specific
3    HAS
     patient
4    HEAT
     reference
5    FORCE
          attribute
6         GREAT
     specific
7    CAN DRIVE
     patient
8    GASES
          attribute
9         HOT
          range
10        OUT OF THE EARTH
     specific
11   ESCAPES
          range
12        THROUGH OPENINGS IN THE EARTH
          time
13        SOMETIMES
```

```
     patient
14   HEAT
     specific
15   CAN BE SEEN
     patient
16   HEAT
     equivalent
17   AS HOT GASES
          explanation
18        SUCH AS STEAM
     specific
19   IS ONE KIND OF GEOTHERMAL ENERGY
     equivalent
20   STEAM
     patient
21   IT (GEOTHERMAL ENERGY)
     specific
22   IS USED
          range
23        IN ABOUT 10 COUNTRIES
          time
24        SO FAR
     specific
25   IS A GEOTHERMAL PLANT
          range
26        NEAR THE LAGUNA VOLCANO
               range
27             IN MEXICO
     specific
28   USES
     agent
29   PLANT
     patient
30   STEAM
          range
31        FROM THE VOLCANO
          SPECIFIC
32        TO POWER
     benefactor
33   GENERATORS
          attribute
34        ELECTRIC
     specific-antecedent
35   MAKE
     patient
36   ELECTRICITY
     agent
37   GENERATORS
```

```
     attribute
38   FOR HEATING
     attribute
39   LIGHTING
     benefactor
40   TOWNS
          range
41        NEARBY
     specific
42   ARE TRYING TO MAKE
     agent
43   SCIENTISTS
     reference
44   GEOTHERMAL ENERGY
       attribute
45     LESS EXPENSIVE
     agent
46   IT
     specific
47   MAY SUPPLY
          time
48        SOON
     reference
49   MORE OF THE WORLD'S ENERGY

QUICKSAND--COMMON SECTION
     specific
1    IS A MASS OF SAND
          attribute
2         DEEP
          attribute
3         FINE
               manner
4              EXTREMELY
     patient
5    QUICKSAND
     equivalent
6    ARE ROUND
     patient
7    GRAINS OF QUICKSAND
     explanation
8    INSTEAD OF JAGGED
     equivalent
9    LIKE REGULAR SAND
     specific-antecedent
10   WHEN WATER FLOWS THROUGH QUICKSAND
     specific-result
11   BECOMES
```

```
     equivalent
12   MUSHY
     patient
13   IT
     specific-result
14   CANNOT HOLD
     reference
15   WEIGHT
       attribute
16     MUCH
     equivalent
17   IS NOT ONLY SAND
     patient
18   QUICKSAND
     equivalent
19   CAN BE ANY KIND OF FINE LOOSE SOIL
     patient
20   IT
     antecedent
21   WHEN QUICKSAND IS WET
     result
22   SINK INTO IT
     agent
23   THINGS
          attribute
24        HEAVY
     antecedent
25   WHEN IT IS DRY
     result
26   LOOKS LIKE POWDER
     patient
27   IT (QUICKSAND)
     attribute
28   IS HARD TO SEE
     specific
29   FORMS
     patient
31   IT (QUICKSAND)
     range
32   ON THE BOTTOM
     collection
33   STREAMS
     collection
34   RIVERS
     collection
35   ALONG THE SHORE
          attribute
36        MAY BE COVERED WITH LEAVES
```

```
          attribute
37        WATER      (COVERED WITH)
          attribute
38        GRASS   (COVERED WITH)
     patient
39   IT
     specific
40   CAN SINK
          manner
41        QUICKLY
          range
42        INTO QUICKSAND
     patient
43   PERSON
     patient
44   ANIMAL
     specific
45   MAKING
     patient
46   IT (QUICKSAND)
     equivalent
47   TRAP
          attribute
48        DANGEROUS

SOUND PASSAGE--COMMON SECTION
     main verb
1    HAVE FOUND
     agent
2    DOCTORS
     patient
3    NOISE
          attribute
4         LOUD
          attribute
5         TOO MUCH
     specific
6    CAN BE BAD
     specific-result
7    MAY LOSE
     reference
8    THEIR HEARING
     patient
9    PEOPLE
     specific-antecedent
10   IF THEY LISTEN TO
     agent
11   SOUND THAT IS TOO LOUD
```

```
     specific
12   CAN COME FROM
     agent
13   NOISE
          attribute
14   LOUD
     force
15   MACHINES
     equivalent
16   MOTORCYCLES
     equivalent
17   JET PLANES
     equivalent
18   TRACTORS
     specific
20   IS BAD
     agent
21   NOT ONLY LOUD NOISE
     agent
22   MUSIC
          attribute
23        THAT IS TOO LOUD
     patient
24   PEOPLE
          attribute
25        WHO MUST LISTEN TO LOUD SOUNDS
               manner
26             OVER A LONG PERIOD OF TIME
     specific
27   MAY HAVE
     reference
28   PROBLEMS WITH SLEEP
     specific
29   MEASURE
     agent
30   SCIENTISTS
     reference
31   LOUDNESS
     instrument
32   IN DECIBELS
     specific
33   MEASURES
     patient
34   SOUND OF QUIET ROOM
          manner
35        35 DECIBELS
     specific
36   MEASURES
```

patient
37 SOUND OF TALKING
manner
38 40 TO 65 DECIBELS
specific
39 CAN MEASURE
patient
40 SOUNDS OF MACHINERY
patient
41 SOME ROCK BANDS
manner
42 OVER 120 DECIBELS
specific
43 CAN GIVE
agent
44 NOISE
attribute
45 AT THESE HIGH LEVELS
reference
46 HEARING LOSS
manner
47 MOST

APPENDIX G

Samples of Scoring for the Use of the Original Structure:

Sample 1: Original structure--Problem/Solution

About 1900 there were many electric cars. They had problems. The batteries were big and heavy and did not give the car much power. They needed to be charged every 150 miles. They were bad for long distances.

Scientists have found ways to improve electric cars. The batteries are smaller and can give the car a lot more power. Old electric cars were lousy, but gas burning cars pollute the air. Scientists have improved electric cars so they can be used. Gasoline cars are still used more.

(The retelling used the author's organizational pattern and one signal word. Rating = 5)

Sample 2:Original structure--Compare/Contrast

In the 1900's there were many electric being used. The batteries in the cars were too heavy and the car couldn't go very fast. They ran out of power very quickly.

Newer electric cars have been improved and they have batteries that give more power and are good for long trips. The batteries in the newer cars are lighter. Electric cars can travel faster now.

(The retelling used the author's original organizational pattern but no signal words. Rating = 4)

Sample 3: Original structure--Cause/Effect

About 1900 electric cars were being used. The batteries were too heavy and had to be charged every 150 miles. They were not good for long trips.

Scientists have discovered new ways to fix electric cars. Today the batteries in cars are lighter and have more power. They can go on long trips.

(The retelling used another organizational pattern and no signal words. Rating = 2)

Sample 4: Original structure--Collection/Description

Electric cars have heavier batteries. Scientists have made the cars more powerful. Newer cars run faster. Older cars were slower than newer cars. New electric cars have lighter batteries and they can travel farther. Electric cars are not new and have been around for 93 years.

(The retelling was randomly organized with no signal words. Rating = 1)

APPENDIX H

Scoring Guidelines

1. Scoring the idea units. The number beside of the idea unit was circled to indicate that the idea unit was found in the subject's text. Verbatim or reasonable paraphrases of the text content were accepted. Information that was found in a retelling that was not in the original text was not counted. The total number of idea units will be recorded in the scoring summary. Material that the student repeated was counted only once.

2. Scoring negative intrusions. Material that was not in the text may have been a negative intrusion (material that was irrelevant to the passage or that was false). These intrusions were marked on the subjects' recall by placing n. int. in the margin where a negative intrusion was found. The total number of negative intrusions was recorded on the summary.

3. Scoring the use of the author's top-level structure. Using the system of Meyer and Freedle (1984), the retellings were classified as using the same structure as the author if the elements of the structure were present.

-For the problem/solution structure, the problem and solution needed present and in the proper relationship.

-For the comparison/contrast structure the retelling must have shown contrast/comparison between the two subjects being compared or contrasted.

-For the description/collection structure, the retelling needed to have been organized into a pattern similar to the original, not another pattern or a random list.

-For the cause/effect structure, the retelling needs to have a clear cause and effect in the organizational pattern.

The following system will be followed, rating the subject's use of structure and the use of signal words.

Points:	Description:
5	The protocol followed the original structure and had at least one signal word from the original structure.
4	The protocol used the original structure but had no signal word from that structure.
3	The protocol had at least one signal word from the original structure but was organized the material in a different structure from the original.

2	The protocol used some other organizational pattern with or without signal words for the subject's structure.
1	The protocol was randomly organized with or without signal words.

Further considerations in scoring:
-Repeated material is scored only once.
-If the same negative intrusion is repeated, it is counted only once.

APPENDIX I

Passages in Different Structures

Collection/Description Structure

Topic: Electric Cars

This story has some facts about electric cars that you may not have heard before. Electric cars are not new. They were being used almost one hundred years ago.

About 1900 there were many electric cars being used. The batteries in these cars did not give enough power to travel at regular speeds. The batteries were big and heavy. They ran out of power very quickly. The battery needed to be charged every 150 miles. The cars were not good for long trips. People had to stop too often to charge the batteries.

These electric cars have been improved. Scientists and engineers have built batteries that give the cars more power. New electric cars can travel fast. They now have batteries that are small and light. If more problems of the electric cars could be solved, they might replace the cars that burn gasoline.

144 Words

* Bold words are signal words for text structure. Underlined words are the content material accompanying the signal words.

Problem/Solution Structure

Topic: Electric Cars

About 1900 there were many electric cars being used. These early electric cars had many **problems**. They were not easy for people to use. The batteries in these cars did not give enough power to travel at regular speeds. The batteries were big and heavy. They ran out of power quickly. The battery needed to be charged every 150 miles. The cars were not good for long trips. People had to stop too often to charge the batteries.

Scientists and engineers have worked for many years to **solve the problems** of the electric car. Many **solutions** have been found. Scientists and engineers have built batteries that give the cars more power. New electric cars can travel fast. They now have batteries that are small and light. If more problems of the electric cars could be solved, they might replace the cars that burn gasoline.

145 Words

Comparison/Contrast Structure

Topic: Electric Cars

Electric cars are not new, but they have **changed** over the years. These early electric cars were not easy to use.

About 1900 there were many electric cars being used. The batteries in these cars did not give enough power to travel at regular speeds. The batteries were big and heavy. They ran out of power quickly. The battery needed to be charged every 150 miles. The cars were not good for long trips. People had to stop too often to charge the batteries.

The newer electric cars **are very different**. They are much **easier** to use **than** the earlier ones. Scientists and engineers have built batteries that give the cars more power. **Unlike earlier** electric cars, new electric cars can travel fast. They now have batteries that are small and light. If more problems of the electric cars could be solved, they might replace the cars that burn gasoline.

149 Words

Cause/Effect Structure

Topic: Electric Cars

Electric cars are not new. About 1900 there were many electric cars being used. These early cars were not easy to use. Early electric cars **had many difficulties that caused** scientists to work for many years to improve them. The batteries in these cars did not give enough power to travel at regular speeds. The batteries were big and heavy. They ran out of power quickly. The battery needed to be charged every 150 miles. The cars were not good for long trips. People had to stop too often to charge the batteries.

Because of these difficulties, scientists and engineers have worked hard to change them. They have built batteries that give the cars more power. New electric cars can travel fast. They now have batteries that are small and light. If more problems of the electric cars could be solved, they might replace cars that burn gasoline.

147 Words

Collection/Description Structure

Topic: Geothermal Energy

On this page are some facts about geothermal energy.

There is a kind of energy that has not been used very much. It is called geothermal energy. Deep inside the earth there is intense heat. This heat has great force that can drive hot gases out of the earth. Sometimes the heat escapes through openings in the earth's crust. This heat can be seen as hot gases such as steam. Steam is one kind of geothermal energy.

Very few places are using geothermal energy today. It is used in about ten countries in the world so far. There is a geothermal plant near the Laguna volcano in Mexico. This plant uses steam from the volcano to power electric generators. The generators make the electricity used for heating and lighting nearby towns.

Scientists are trying to find ways to make geothermal energy less expensive. Soon it may supply more of the world's energy.

153 Words

Problem/Solution Structure

Topic: Geothermal Energy

The earth is running out of fuel. Natural gas, oil, and coal are being used up. Scientists are working on **this problem**.

One solution could be geothermal energy. Deep inside the earth there is intense heat. The heat has great force which can drive the hot gases out of the earth. Sometimes the heat escapes through openings in the earth's crust. This heat can be seen as hot gases such as steam. Steam is one kind of geothermal energy.

Geothermal energy is used in about ten countries in the world so far. There is a geothermal plant near the Laguna volcano in northern Mexico. This plant uses steam from the volcano to power electric generators. The generators make the electricity used for heating and lighting nearby towns.

Scientists are trying to find ways to make geothermal energy less expensive. Soon it may supply more of the world's energy.

150 words

Comparison/Contrast Structure

Topic: Geothermal Energy

Deep inside the earth there is intense heat. This heat has great force that can drive hot gases out of the earth. Sometimes the heat escapes through openings in the earth's crust. This heat can be seen as hot gases such as steam. Steam is one kind of geothermal energy.

Natural gas, oil, and coal also form inside the earth. **They are different from** geothermal energy because they are not hot. These fuels **are different** in another way. They are used **more than** geothermal energy.

Geothermal energy is used in about ten countries so far. There is a geothermal plant near the Laguna Volcano in Mexico. This plant uses steam from the volcano to power electric generators. The generators make the electricity used for heating and lighting nearby towns.

Scientists are trying to make geothermal energy less expensive. Soon it may supply more of the world's energy.

147 Words

Cause/Effect Structure

Topic: Geothermal Energy

The great heat and pressure inside the earth **cause** energy to be released. Deep inside the earth there is intense heat. The heat has great force that can drive the hot gases out of the earth. Sometimes the heat escapes through the openings in the earth's crust. This heat can be seen as hot gases such as steam. Steam is one kind of thermal energy.

The heat and pressure from inside the earth **can result in** a form of energy we can use. It is used in about ten countries in the world so far. There is a geothermal plant near the Laguna volcano in Mexico. The plant uses steam from the volcano to power electric generators. The generators make the electricity used for heating and lighting nearby towns.

Scientists are trying to make geothermal energy less expensive. Soon it may supply more of the world's energy.

151 Words

Collection/Description Structure

Topic: Quicksand

On this page you will find some facts that tell about quicksand. You may have heard of quicksand, but you may not know what is it made of, what it looks like, and why it is dangerous.

Quicksand is a deep mass of extremely fine sand. Quicksand is not only sand. It also may have any kind of fine, loose soil. Grains of quicksand are round instead of jagged like regular sand. It forms on the bottom of streams or rivers or along the shore. When quicksand is wet, heavy things sink into it. When it is dry, it looks like powder.

Quicksand is very hard to see. It may be covered with leaves, grass, or water. When water flows through quicksand, it becomes mushy and cannot hold much weight. A person or an animal can sink quickly into quicksand, making it a dangerous trap.

145 words

Problem/Solution Structure

Topic: Quicksand

If you are ever caught in quicksand, you will have a **problem**. Quicksand is a deep mass of extremely fine sand.Quicksand is not only sand. It also may have any kind of fine, loose soil. When water flows through quicksand, it becomes mushy and cannot hold much weight. Grains of quicksand are round instead of jagged like regular sand. It forms on the bottom of streams or rivers or along the shore. When quicksand is wet, heavy things sink into it. When it is dry, it looks like powder.

Quicksand is hard to see. It may be covered with leaves,grass, or water. A person or an animal can sink quickly into this quicksand, making it a dangerous trap.

There is a **solution** to the quicksand **problem.** If you lie on your back and float, you will not sink into the quicksand. Then slowly roll off the sand to firm ground.

152 words

Comparison/Contrast Structure

Topic: Quicksand

Sand is made of small parts of rocks that have crumbled away. Grains of sand have ragged edges. Sand can be found on beaches and in deserts.

Quicksand is a **different** kind of sand. Grains of quicksand are round instead of jagged like regular sand. Quicksand is a deep mass of extremely fine sand. Quicksand is not only sand. It also may have any kind of fine, loose soil. It forms on the bottom of streams or rivers or along the shore. When quicksand is wet, heavy things sink into it. When it is dry, it looks like powder.

Unlike regular sand, quicksand is hard to see. It may be covered with leaves, grass, or water. When water flows through quicksand, it becomes mushy and cannot hold much weight. A person or an animal can sink quickly into this quicksand, making it a dangerous trap. Regular sand is much **safer**.

150 Words

Cause/Effect Structure

Topic: Quicksand

Quicksand can **cause** a person or an animal to sink quickly into its loose, wet soil. Quicksand is a deep mass of extremely fine sand. Grains of quicksand are round instead of jagged like regular sand. When water flows through quicksand, it becomes mushy and cannot hold much weight. Quicksand is not only sand. It also may have any kind of fine, loose soil. It forms on the bottom of streams or rivers or along the shore.

When quicksand is wet, heavy things sink into it. When it is dry, it looks like powder. It may be covered with leaves, grass, or water. It is hard to see. **As a result,** a person or an animal can sink quickly into this quicksand, making it a dangerous trap. People or animals become covered with sand and soil. They cannot get out. Many have lost their lives by being buried in quicksand.

150 Words

Collection/Description Structure

Topic: Sound

This story will tell you some facts about sound that you may not know. Listening to noise or music that is too loud may not be good for people's hearing or for their sleep. Doctors have found that too much loud noise can be bad. People may loose their hearing if they listen to sound that is too loud. Loud noise can come from motorcycles, tractors, or jet planes. Not only loud noise is bad. but also music that is too loud. People who must listen to loud sounds over a long time also may have problems with sleep.

Loudness can be measured. Scientists measure loudness in decibels. The sound of a quiet room is about 35 decibels. The sound of talking measures between 40 and 65 decibels. Sounds from machinery and from some rock bands can measure over 120 decibels. Noise at this high level can give the most hearing loss.

148 Words

Problem/Solution Structure

Topic: Sound

Loud noise can be a **problem**. Doctors have found that too much loud noise can be bad. People may lose their hearing if they listen to sound that is too loud. Loud noise can come from machines such as motorcycles, tractors, or jet planes. Not only loud noise is bad, but also music that is too loud. People who must listen to loud sounds over a long time also may have problems with sleep.

Scientists measure loudness in decibels. The sound of a quiet room is about 35 decibels. The sound of talking measures between 40 and 65 decibels. Sounds from machinery and from some rock bands can measure over 120 decibels. Noise at this high level can give the most hearing loss.

One way to **solve** this **problem** is to stay away from loud noise. For people who must hear noise there is another **solution.** Doctors can make ear covers to block out most of the noise.

154 Words

Comparison/Contrast Structure

Topic: Sound

Some sounds are pleasing to our ears. People like to hear their favorite band or a friend's voice. **Another kind of sound may not be as pleasing**. Doctors have found that too much loud noise can be bad. People may lose their hearing if they listen to sound that is too loud. Loud noise can come from machines such as motorcycles, tractors, or jet planes. Not only loud noise is bad, but also music that is too loud. People who must listen to loud sounds over a long time also may have problems with sleep.

Scientists measure loudness in decibels. The sound of a quiet room is about 35 decibels. The sound of talking measures between 40 and 65 decibels. **On the other hand**, loud sounds are high in decibels. Sounds from machinery and from some rock bands can measure over 120 decibels. Noise at this high level can give the most hearing loss.

150 Words

Cause/Effect Structure

Topic: Sound

Loud noise can **cause** problems. Doctors have found that too much loud noise can be bad. People may lose their hearing if they listen to sound that is too loud. Loud noise can come from machines such as motorcycles, tractors, or jet planes. Not only loud noise is bad, but also music that is too loud. People who must listen to loud sounds over a long time also may have problems with sleep.

How loud does sound have to be to **result** in hearing loss? Scientists measure loudness in decibels. The sound of a quiet room is about 35 decibels. The sound of talking measures between 40 and 65 decibels. Sounds from machinery and from some rock bands can measure over 120 decibels. Noise at this high level can give the most hearing loss.

The hearing loss that **results from** loud noise can build over years of listening to loud noise. Once hearing is lost, it does not come back.

155 Words

APPENDIX J

Instructions Given to Students

For reading the passage:

You will be given a short passage to read. After you have read it you will put the paper away and write all that you can remember from the passage. You may look at it for as long as you need to. When you are finished put the booklet into the red envelope.

Here is what you will do to prepare for the retellings:

1. Read the passage carefully.
2. Practice retelling in your mind.
3. Look again at the passage if you need to.

For the retelling:

(After all had finished reading)

Has everyone put the booklet into the red envelope? Please pass in the red envelopes.

1. Now try to remember what was in the passage. Write as much as you can remember.
2. Do the best you can with spelling. There is no problem if you do not remember exact spellings.
3. You may use your own words or the words of the author for your retelling.
4. When you have finished, raise your hand so that your paper can be collected.

APPENDIX K

Cell Means for Topic/Structure Interactions

STR	TOPIC	4th	6th	4th & 6th
CD	EL. CARS	2.3	3.4	2.8
CD	GEO. ENER.	2.4	3.6	3
CD	QUICKSAND	2.8	3.4	3.1
CD	SOUND	2.2	3.6	2.9
PS	EL. CARS	2.9	3.9	3.4
PS	GEO. ENER.	3.1	4.1	3.6
PS	QUICKSAND	3.7	4.6	4.2
PS	SOUND	3.8	3.4	3.6
CC	EL. CARS	3.2	3.5	3.3
CC	GEO. ENER.	1.6	2.8	2.2
CC	QUICKSAND	2.5	4.2	3.3
CC	SOUND	2.3	3.5	2.9
CE	EL.CARS	2.4	2.2	2.3
CE	GEO. ENER.	2	2.3	2.1
CE	QUICKSAND	2.6	2.6	2.6
CE	SOUND	2.7	4.3	3.5

		LOWEST MEAN	HIGHEST MEAN
C/D	4TH GRADE	2.3	2.8
	6TH GRADE	3.4	3.6
	COMBINED	2.8	3.1
P/S	4TH GRADE	2.9	3.8
	6TH GRADE	3.4	4.6
	COMBINED	3.4	4.2
C/C	4TH GRADE	1.6	3.2
	6TH GRADE	2.8	4.2
	COMBINED	2.2	3.3
C/E	4TH GRADE	2.0	2.7
	6TH GRADE	2.2	4.3
	COMBINED	2.1	3.5

Structures
CD = Collection/description
PS = Problem/solution
CC = Comparison/contrast
CD = Cause/effect

BIOGRAPHICAL SKETCH

Carol T. Van Evera was born on November 30, 1942. She received her Bachelor of Arts degree, summa cum laude, from Shepherd College in 1964. While at Shepherd, she was selected as the State Future Teacher of the Year.

Her Master of Arts degree in Elementary Education was completed at The George Washington University in 1966. She continued her graduate studies at the University of Maryland where she completed certification as a Reading Specialist in 1968. She received a Certificate of Advanced Graduate Studies from Virginia Polytechnic Institute and State University in May, 1993.

She has been a classroom teacher and a Chapter I teacher in Frederick, Maryland, and an early intervention reading teacher in Montgomery County, Maryland. While a teacher in Frederick, she served on an implementation team for an ungraded elementary program in elementary schools. She is currently a Reading Specialist in Fairfax County, Virginia.

Her professional interests include teacher research. She was awarded a research grant from the Virginia State Reading Association. Her research has been published and presented at conferences. She has been a co-facilitator for the Fairfax County Teachers As Researchers Group.

Carol T. Van Evera