

**HEADING EFFECTS ON FIFTH GRADE RECALL
OF EXPOSITORY PROSE WITHOUT AND WITH HEADING
STRATEGY AWARENESS**

by

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B.Ed., University of British Columbia, 1964

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS**

in

THE FACULTY OF GRADUATE STUDIES

Department of Language Education

We accept this thesis as conforming
to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

August, 1993

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ABSTRACT

This study was designed to investigate whether the presence of headings in regular classroom content area reading material naturally facilitated the quantity and type of recall of expository prose by fifth grade students and whether the exposure to and use of heading strategy instructions further improved the recall of the students. One hundred thirty-one students from seven classrooms in three school districts in the lower mainland and on Vancouver Island were selected to take part in the study. Each treatment group was composed of approximately an equal number of higher, middle and lower reading comprehension ability students as determined by a Canadian standardized reading test. The treatments consisted of a control group that received no headings and no strategy instructions, an experimental group with headings present but no strategy instructions, and second experimental group that received a passage with the headings present and heading strategy instructions. All students read a four page passage from a British Columbia authorized social studies textbook and one day later, were given two posttests that involved free recall and main idea recall/formulation measures. It was found that headings and heading strategy instructions significantly aided treatment group 3 (the second experimental group) in recalling and formulating main ideas, and to some extent helped these students with overall recall. Treatment 3 did not help the students to recall subordinate (supporting ideas) or sub-subordinate ideas (details). There were no significant effects for the headings only group (headings present in text) over the control group who read the passage without headings. A similar but weaker pattern was found for each reading comprehension ability level. These results are discussed in terms of previous research. General conclusions, implications for instruction, and suggestions for further research are also made.

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ACKNOWLEDGEMENTS

I would especially like to thank:

- **Dr. F. Pieronek**, thesis advisor, mentor and friend, for her patience, enthusiasm and her helpful assistance with the ideas that form the backbone of this thesis. Her knowledge and insight on content-area reading has been invaluable.
- **Dr. H. Ratzlaff** for his great assistance with the statistical and methodological aspects of this thesis. His kindness, clarity and wisdom were much appreciated.
- **Dr. A. Lukasevich** for kindly agreeing to be the reader for this thesis.
- **Dr. T. Rogers** who helped me to understand basic statistics and to **Dr. R. Conry** for stressing the need to let the thesis problem guide the methodological choices.
- Five previous Master's students from the Department of Language Education: **Karen Coulombe, Richard Gibbs, Jo-Anne Goble, Cynthia King, and Roderick Stables** for showing the way.
- School board officials, principals, teachers and students who made this research possible.
- **Peter M. Hobbins**, my husband, who has been so supportive and helpful throughout the whole thesis process.

CHAPTER ONE

Introduction

STATEMENT OF THE RESEARCH PROBLEM

This study was designed to investigate whether the presence of headings in content area reading material naturally facilitated the quantity and type of recall of expository prose by fifth grade students and whether the exposure to and use of heading strategy instructions further improved the students' recall.

RATIONALE

The General Problem

Many students find it difficult to comprehend expository prose in school (Baumann, 1981b; Taylor, 1982). Yet, in upper elementary grades and high school, classroom tasks require the students to process increasing amounts of expository material to obtain information in their content area subjects (Baine, 1986). Beginning in grade four, the emphasis in reading shifts from narrative to expository prose (Baker & Stein, 1981) and the students need to develop new strategies to comprehend the material satisfactorily. At this time, the students must learn to sense the gist or main idea of the passage plus read for details in text material that frequently uses a hierarchical structure rather than the more familiar story structure (Baumann, 1981a; Taylor, 1982). Educators then expect students to recall the material on tests or assignments and be able to discuss or apply the concepts and information learned. Unfortunately, many students do not find the shift to expository text an easy one (Baine, 1986; Spiro & Taylor, 1987) and some children continue to have problems understanding content area reading material even in high school (Goble, 1986).

There are a variety of reasons why elementary school students find it difficult to comprehend and recall expository prose in content area textbooks. Some of these causes are text-related. One reason is the increasingly larger and more unfamiliar concept load that is found in expository rather than narrative prose. Another reason lies in a lack of familiarity that elementary students have with the organization of expository text structure. It is often hierarchical in nature with certain elements more central (superordinate or main ideas) than other supportive (subordinate ideas or subtopics) or subordinate elements (subordinate details) (Duchastel, 1982; Meyer, 1985). Students need to develop new schemata for comprehending how the parts relate to each other and to the whole. Moreover, young readers are not always aware of textual clues or text signals present in text that may aid them in comprehending the material. Yet another cause found by Baumann (1981b), Tierney, Bridge and Cera (1978-9), and Taylor, (1980) is that elementary children have difficulty identifying important information when reading expository texts. This task becomes more difficult when main ideas are not explicitly stated in the passages; a condition that is common in many of our textbooks (Baumann & Serra, 1984; Braddock, 1974).

Duchastel (1982) considers the task of selecting important information one of the central problems of text processing for any learner. "The student studying a text is thus faced with the very complex task of focusing on the important points in the text and structuring these in a coherent and memorable whole, while at the same time constantly processing new inputs that may be of only secondary importance" (Duchastel, 1982, p. 178). As a result of the difficulty of the task, many students need to develop the ability to comprehend the main ideas or the gist of passages they read in textbooks (Baumann, 1981a, 1981b, 1986a). Closely interlinked with comprehension is recall. Poor comprehension makes recall more difficult. Baumann (1984) and Taylor (1982) maintain that good main idea comprehension is an especially important aid in recall. "Since readers are faced with large amounts of text, all of which cannot be recalled, it is desirable for

readers to be able to discriminate important ideas from less important ones so that memory can be used efficiently to retain the essential information in text" (Baumann, 1984, p. 94). Whatever the reason for the students' failure to comprehend expository prose as easily as narrative prose, this difficulty clearly affects students' ability to recall passages in a meaningful manner. Studies by Bridges and Tierney (1981) and Boljonis and Kaye (1980) showed that third and fourth grade students, respectively, were better able to recall a well-structured narrative than an expository passage. Graesser (1981) says that memory research has shown that narrative prose is recalled better than any other genre, including expository prose. Yet, two of the more critical tasks to be acquired in the upper years of elementary school are learning to comprehend and recall the expository prose in content area textbooks.

Processing Aids that Help with Comprehension and Recall

To make learning from expository prose easier, textbook authors have devised a variety of processing aids in text material that are thought to improve comprehension, recall and/or retrieval of information. Organizational aids are one such group of processing aids. Examples of these are purpose questions, marginal notes, outlines, headings and topic sentences (Dee-Lucas & Di Vesta, 1980; Snavely, 1961), and advance organizers such as paragraph abstracts, (Ausubel, Novak & Hanesian, 1978; Mayer, 1979; Mayer & Bromage, 1980), enumerated sentence outlines, and true-false or completion pretests (Proger, Taylor, Mann, Coulson & Bayak, 1970; Proger et al. 1973). In addition to advance organizers, there are also concurrent and post organizers (Ratzlaff, 1970; Rickards, 1975-6). Outlines, headings and topic sentences are organizing aids that:

provide the reader with information about the texts' structure or organization. [These] . . . generic classifiers are designed to facilitate recall by making the relationships among various informational units of the text explicit, such that the superordinate ideas can be used to facilitate recall of the subordinate information. (Dee-Lucas & Di Vesta, 1980, p. 304)

One type of organizer that has received much research attention is the advance organizer. Ausubel, Novak and Hanesian (1978) say these organizers differ from summaries and overviews because advance "*organizers are presented at a higher level of abstraction, generality, and inclusiveness than the new material to be learned*" (p. 171). Additionally, they say "*the principle function of the organizer is to bridge the gap* between what the learner *already knows* and what he *needs to know* before he can meaningfully learn the task at hand . . . " (p. 171-172). The organizer does this by providing "ideational scaffolding for the stable incorporation and retention of the more detailed and differentiated material that follows in the learning passage" (Ausubel, Novak & Hanesian, 1978, p. 171-172). Advance organizers are designed to facilitate meaningful learning by relating new concepts in the reading material "to specifically relevant aspects in the learner's cognitive structure" (Ausubel, Novak & Hanesian, 1978, p. 170-171). (See MacDonald-Ross (1979) for a different opinion of advance organizers and the learner's cognitive structure.) Hartley and Davies (1976) summarize types of organizers by saying that paragraph abstract advance organizers *clarify* the task ahead, purpose questions and true-false or completion pretests *alert* students to the upcoming learning material and headings and overviews *prepare* the reader for the passage to come.

Other processing aids act as signaling devices or text signals and thus aid comprehension. Examples include preview sentences, underlined headings, logical connections (Loman & Mayer, 1983; Meyer, 1975) and pointer words (Spyridakis & Standal, 1987). "A signal is generally described as a word, phrase or statement that preannounces content and/or reveals relationships in content" (Spyridakis & Standal, 1987, p. 285). Meyer (1985) adds that "signaling is information in text that does not add new content on a topic, but that gives emphasis to certain aspects of the semantic content or points out aspects of the structure of the content . . . " (p. 76). Jonassen (1985) explains that comprehension is aided when the organization or structure is clear because the author's intent is more fully constructed by the reader (p. 59-62) and misunderstanding is reduced

(Meyer, 1985, p. 66). Spyridakis and Standal (1987) maintain that, in theory, "signals should aid a reader in instantiating the appropriate schema, in forming a hierarchical framework in which to store textual information, in deciding what information is important, and in checking the correctness of his or her integration and storage of information in memory" (p. 286).

Some types of signaling aids also act as types of access structures. In addition to linguistic cues that were discussed above, signaling devices can cue readers spatially and typographically. Jonassen and Kirschner (1982) state that "the same typographic cues that signal the structure of discourse may also function as access structures" (p. 133-134) and therefore aid the reader who is searching for information by pointing out the location. They stress that readers frequently need to search text for specific information rather than read in a start-to-finish manner and explicit signals may "provide the reader with enough information to enable them to hypothesize about material without reading it all through" (Jonassen & Kirschner, 1982, p. 133-134). At an earlier date, Waller (1979) said, "Whereas a continuous discourse assumes and perhaps enforces a relatively passive sequential reading strategy, a typographically structured text allows for more selective sampling. ... If the paragraphs are typographically signalled, they can be easily accessed and used for text selection, previewing the argument, reference, and revision" (p. 176). "The phrase 'access structures' was coined by Waller (1979) to describe a variety of features of text design that help readers to find their way around or to help gain access to complex text" (Hartley & Trueman, 1985, p. 101). Examples of access structures are headings, concept maps, content lists, glossaries and opening summaries or overviews (Waller, 1979), and these structures provide either local or global accessibility (Jonassen, 1985).

It is not too hard to see the value of access structures when we try to access text in a non-linear fashion. However, the relationship of certain signaling and organizing aids in improving comprehension and recall is not so obvious. Results from research on

processing aids have generally been inconclusive. Although many studies do indicate that the various processing aids may assist comprehension and recall, a relatively large number of studies show no significant effects (organizers - Barnes & Clawson, 1975; Jonassen, 1982a; Luiten & Ackerson, 1980; signaling devices - Meyer, 1975; Spyridakis & Standal, 1986, 1987). It may be that the processing aids are partly dependent on the learner and the subject matter. If the reading material is too difficult for the reader, then processing aids are likely to be of no help. Yet, if the learner finds the topic and content of the passage sufficiently easy to understand, s/he may not always need signaling and organizing aids (Jonassen, 1982a; Spyridakis & Standal, 1987). In addition, if students are not aware of how to use some organizational aids, these devices may not be as successful in improving the learning and retention of material (Goble, 1986; Kloster & Winne, 1989; Lenz, Alley & Schumaker, 1987). In view of the great need students have for help in comprehending and recalling expository prose, further study of processing aids is warranted.

Headings: An Important Processing Aid

According to the literature, one type of processing aid that is considered to be an organizational aid (Proger, Taylor, Mann, Coulsen & Bayuk, 1970; Snavely, 1961), a signaling device (Glover & Krug, 1988; Spyridakis & Standal, 1986; Loman & Mayer, 1983) and an access structure (Waller, 1979) is the category called headings. Titles, headings and subheadings all identify content and summarize it in a few words. Headings allow the reader to perceive the organization of the text and access information from any part (Duchastel, 1982). As a linguistic signaling device, headings announce "content before the reader encounters the actual content" (Spyridakis & Standal, 1987, p. 286). Moreover, text authors and publishers can signal status of information typographically and spatially using headings. Some examples of explicit typographical signaling of headings are varying the size of the type, or using boldface, italic and underlining to emphasize heading levels. Because of their importance as summarizers of major themes and decoders

of the hierarchical structure, headings are usually cued by means of boldface and typesize (Glynn, Britton & Tillman, 1985). (See Rennie, Neilsen & Braun, 1981, for results of typographical cueing on memory for superordinate structures in connected discourse). Access structures, such as headings, are signalled typographically and spatially "in order to be spotted by the skimming, searching, or browsing reader" (Waller, 1979, p. 184). When headings are set off spatially from the rest of the passage, they stand out. In addition, Waller (1982) has called headings a type of macro-punctuation because headings delineate or mark where a particular unit of text begins and ends as well as organizing text components into clear sequences and structures in a process called serialization. As a processing device that is thought to aid comprehension, recall and retrieval, headings seem to serve a variety of functions. Moreover, headings are a common feature in most expository textbook material. Therefore, it is important to take a closer look at headings and explore the functions that headings serve the reader, especially for the elementary school student who is just beginning to learn the content of expository text material.

Funk & Wagnalls Canadian College Dictionary (1989 edition) defines a heading as a caption or title, as of a chapter; a section or division of a subject or discourse; and as something serving as the front or top part of anything. Therefore, headings can denote any book titles, chapter titles, main headings, subheadings and running heads used in a piece of expository prose. Heading research has tended to focus on titles and headings separately. Krug, George, Hannon and Glover (1989) say, ". . . the term 'headings' refers to statements used to subdivide a text into smaller units of related information. In our view, headings are not synonymous with titles. Titles are terms or descriptive phrases designed to provide a label or organizing concept for an entire passage" (p. 111-112). Where headings have been added to text in heading research, they have usually been designed to represent superordinate concepts that subsume the information underneath or act as cues for the superordinate idea (main idea or topic) of the paragraph or passage (Coulombe, 1986; Dee-Lucas & Di Vesta, 1980; Goble, 1986; Gibbs, 1985; King, 1985; Stables, 1985).

Because this study uses actual classroom text materials, the chapter titles and main headings are both included in the passage selections. But, unlike Krug et al. (1989), Waller (1979) has suggested that chapter headings or titles function in the same manner as main headings (even though they are superordinate to headings, subheadings and contained passage contents, and have a labelling capacity). Therefore, in this study, any references to headings includes chapter titles, main headings and subheadings. Book titles, unit or section titles and running heads are not included, however.

Research on Heading Functions

Intuitively, headings seem to be a useful aid to comprehending, accessing and recalling text material but it is important to check out this conclusion empirically. Headings have not been researched extensively the way paragraph abstract advance organizers have. Yet, over the last forty years, researchers have begun to explore a growing number of different aspects about heading functions. Specifically, researchers have attempted to show that the use of headings can serve a number of functions such as:

- aiding search and retrieval of information - Hartley & Trueman, 1983; Hartley & Trueman, 1985; Kobasigawa, Lacasse & MacDonald, 1988,
- linking background information or prior knowledge with new ideas - Glover & Krug, 1988; Wilhite, 1988a, 1988b,
- aiding comprehension or text understanding - Bransford & Johnson, 1972; Doctorow, Wittrock & Marks, 1978; Kozminsky, 1977; Spyridakis & Standel, 1986,
- contributing to the awareness of hierarchical organization - Brooks, Dansereau, Spurlin & Holley, 1983; Meyer, 1984; Spyridakis, 1986,
- improving recognition memory - Jonassen, 1983; Spyridakis & Standel, 1987; Wilhite, 1988a, 1988b, 1989, and

- facilitating the recall of material - Brooks, Dansereau, Spurlin & Holley, 1983; Coulombe, 1986; Goble, 1986; Hartley & Trueman, 1985.

Various researchers and educators have described headings as an organizational aid, a signaling device and access structure and have designed a variety of experiments to explore these issues. If headings could be shown to function in all these ways, then headings would be important aids, indeed, for students using expository textbook material.

In spite of a growing body of heading research results, researchers have not been able to show with any certainty that headings are consistently useful as an aid to readers. Research instead has produced mixed results showing both significant (e. g. Dee-Lucas & Di Vesta, 1980; Doctorow, Wittrock & Marks, 1978; Goble, 1986, Hartley & Trueman, 1985; Holley, Dansereau, Evans, Collins, Brooks & Larsen, 1981; Wilhite, 1986a) and non-significant (e. g. Christensen & Stordahl, 1955; Gibbs, 1985; King, 1985; Landry, 1966; Robinson & Hall, 1941; Spyridakis & Standel, 1986; Stables, 1985, Wilhite, 1986b) effects for the use of headings as aids in expository prose. The same mixed results that were found generally for organizers and signaling aids, are found when research data for headings are analyzed.

It becomes necessary to look closer at these results to see if there are any patterns in the findings. A review of the literature revealed that certain heading functions are more clearly supported by significant results than others. There appears to be a considerable link between amount of prior knowledge and the effectiveness of headings in comprehension and recognition memory (Glover & Krug, 1988; Wilhite, 1988a, 1988b, 1989). Also, research results mostly support the access functions of search and retrieval and heading use. Hartley and Trueman (1983, 1985) carried out 15 experiments exploring the effect that absence or presence of headings had on search (with unfamiliar material) and retrieval (with previously read passages). Every experiment showed significant effects for the presence of headings except one ($p < .06$). Other researchers have had similar results (Kobasigawa, Lacasse & MacDonald, 1988; Hartley & Burnhill, 1978; Jonassen & Falk,

1980). [Note: The latter two experiments were citations by Hartley and Jonassen (1985)]. Only two experiments, (Charrow & Redish, 1980 and Jonassen, 1983) cited by Hartley and Jonassen (1985) failed to show significant effects for headings aiding retrieval.

Headings also affect comprehension when titles are used with ambiguous text (Bransford & Johnson, 1972; Dooling & Lachman, 1971; Kozminsky, 1977; Schallert, 1976). When less ambiguous or more normal text is used, the results are not so positive (Christensen, 1955; Landry, 1966; Spyridakis & Standel, 1986). Spyridakis and Standel (1986) say,

That good comprehenders select and store superordinate information hierarchically seems well established in the literature [1-4]. However, the research on whether signals facilitate this process is quite contradictory: some studies have found significant effects on reading comprehension while others have not. (p. 344)

It has been very difficult to monitor comprehension directly because it is one of those processes that goes on in the reader's brain and it is hard to comment on or verify while it is actually occurring. Therefore, some type of immediate recall or recognition measure is often substituted as an indirect way of checking comprehension and recall results become very important as a way to explore both memory and understanding.

One possible heading function with the most controversial results is the heading research on the absence or presence of headings as a facilitator of recall. This research question has been explored with adults resulting in significant (Glover & Krug, 1988) and non-significant findings (Christensen & Stordahl, 1955; Hartley, Tobin & Trueman, 1987; Robinson & Hall, 1941); with high school students resulting in significant (Hartley & Trueman, 1985) and non-significant findings (Gibbs, 1985; King, 1985); with elementary school students leading to significant (Goble, 1986) and non-significant findings (Coulombe, 1986, Hartley & Trueman, 1985; Landry, 1966; Stables, 1985). These results seem completely inconsistent. Indeed, after completing a large series of recall experiments,

Hartley and Trueman (1985) concluded that headings facilitate the immediate and long term recall of expository prose only on some passages, with some students and at some age levels (p. 136, 138).

Factors Affecting Reader Use of Headings

To make sense of the differing effects that headings can have on comprehension and recall, it becomes important to look at some factors that may influence how readers use headings, as well as ways that headings affect readers. Samuels (1983) speaks of factors external to the individual and factors internal to the individual, each needing to be "examined in order to explain why readers have success or failure in reading acquisition and comprehension" (p. 261). Pearson and Johnson (1978) have expressed similar views. Already, researchers and educators have begun to examine some possible variables that might affect the readers' use of headings as reading aids. They are:

- 1) factors in the textual material such as:
 - a) types of headings - question or statement (Hartley, Morris & Trueman, 1981; Hartley & Trueman, 1983, 1985) and amounts of headings - low, ordinary or high (Klare, Shuford & Nichols, 1958),
 - b) position of headings - embedded or marginal (Hartley & Trueman, 1983, 1985),
 - c) nature of the text - easy or hard, high or low concept load, and semi-literary or technical (Coulombe, 1986; Gibbs, 1985; Goble, 1986; Hartley & Trueman, 1985; King, 1985; Stables, 1985), and
- 2) factors relating to the reader such as:
 - a) age or developmental readiness (Gibbs, 1985; King, 1985; Stables, 1985),
 - b) background knowledge brought to task (Wilhite, 1988a, 1988b, 1989),

- c) preference for heading format (Hartley, Tobin & Trueman, 1987), and amount of heading format (Klare, Shufford & Nichols, 1958),
- d) reading proficiency and general cognitive ability (Hartley & Trueman, 1985; Hartley, Trueman & Pigram, 1984),
- e) awareness of heading functions - through experience, direct instruction or sensitization to headings (Coulombe, 1986; Goble, 1986; Holley et al., 1981; Kobasigawa et al., 1988).

Each of these factors will be discussed in chapter 2, the review of the research literature on heading research. This review provides us with clues to how headings serve readers and how, what readers bring to the reading task, affects their ability to use heading cues as aids. It may be that the level and nature of the passage, the quality of the headings, and the characteristics such as age, expository prose experience, background knowledge, reading style and interest of the reader are all influential variables in whether headings actually are used by the reader to facilitate comprehension and recall.

Non-text Factors Affecting Heading Utilization

It is crucial to take a closer look at some factors relating to the student, if teachers wish to aid upper elementary school students in processing classroom textual material. One variable that educators have to be concerned about is developmental readiness in children for school tasks. Several heading studies have addressed this concern. Stables (1985), King (1985) and Gibbs (1985) did joint studies exploring the effects of text organization and headings on grade 5 through 10 students' written recall of expository prose (Stables - grade 5 and 6; King - grade 7 and 8; Gibbs - grade 9 and 10). They found that the grade 5 and 6 students recalled fewer superordinate and subordinate ideas and were less able to organize their recalls on easy and at-grade passages than the grade 8, 9 and 10 students did on their easy and at-grade passage recalls (Stables, 1985). Parallel experiments by Goble

(1986) and Coulombe (1986) showed that the grade 5 students who received instruction on heading use as an aid to the macrostructure had significantly greater recall and better organization than the control group, while the grade 4 students in a similar experiment did not. Lastly, Hartley and Trueman (1985) did a series of experiments consisting of 14 and 15 year olds using both a hard and an easy passage, and 11 and 12 year olds using only an easy passage. Headings significantly affected recall for the older students on both passages but did not significantly affect the younger students' recall. Each of these researchers have mentioned the possibility of developmental effects. However, this may not mean that the children are cognitively unready for the tasks that are required.

Rather than being cognitively immature, failure of young children in elementary school to use headings may be the result of a lack of experience and exposure to features in expository prose. Baumann (1981b) in his work on ideational prominence has suggested that older readers with their added experience with expository prose have well-developed schemata for nonfictional prose that aids them in comprehending the material. Younger children, however, have poorly developed schemata for expository prose and yet have developed the skill to comprehend central themes in narrative prose. Baumann (1981b) concludes that it is lack of experience with the genre rather than lack of cognitive readiness for the task that affects students ability to select important from unimportant information.

The third possible factor relating to the reader is student awareness of how to use headings to improve comprehension and recall. It would appear that most researchers and teachers assume that headings in text are a self-evident feature. This author made a brief scan of recent texts (last 10 years) for teaching reading in the University of British Columbia's Educational Curriculum Library and found scant or no mention of headings in their indexes. Only one book referred to headings as part of a study strategy. Also, the investigator searched through the teacher's guides for British Columbian prescribed grade 4 and 5 reading material. There was no reference made about teaching children how to use headings. Obviously, this scan was not exhaustive. However, it does tend to suggest that

teachers might not be sensitizing children to headings in an explicit manner. (Only teachers and school librarians, who teach children how to search for information using titles of books or headings in the table of contents, have mentioned explicit instructions). The focus of headings in non-search situations seems to be on content or meaning, rather than learning to use headings as a text processing aid. It is probably true that many children eventually do learn to use headings more effectively as they mature and become more experienced with expository text. Readers may benefit from headings even if they are not consciously aware of heading functions. The question that becomes important for the teacher to ask is whether students would find it easier to comprehend and recall expository prose in their content area subjects if the students were made metacognitively aware of heading functions and strategies.

Developing Student Awareness of Heading Functions

Only a few studies have focused on direct instruction of headings and their results are mixed. Holley, Dansereau, Evans, Collins, Brooks and Larsen (1981) found that "no benefit accrued to students on the basis of training: however, limitations of this finding are discussed in terms of the amount of training provided and the time available to the students for integrating the new strategies with their existing techniques" (p. 227). Brooks, Dansereau, Spurlin and Holley (1983), on the other hand, in their second experiment, observed that the adult subjects who received instruction plus headings significantly outperformed the headings only group on essay recall and had better but not significant performances on the outlines test. Coulombe (1986) discovered that direct instruction for grade 4 students "significantly enhanced students' organization of written recall but did not facilitate an increase in the number of ideas recalled" (p. ii). Because the at-grade or above average students did best, Coulombe suspects a lack of mental maturity on the part of some grade four students in using headings. Goble (1986) found that direct instruction focusing on headings and organization of propositions in text improved scores for quantity and

organization of ideas in delayed recall amongst grade five students. In spite of the mixed results, all four researchers indicated that heading instruction would be worthwhile. In view of the difficulty upper elementary children have with main idea comprehension and their lack of familiarity with hierarchical expository structure, providing direct instruction for heading use at the intermediate grade level as part of the lessons on learning to read expository prose might be very beneficial. In any case, further research on direct instruction of headings is definitely warranted.

One direction that reading instruction has taken lately is in aiding students in becoming active readers. Rather than just teaching skills to students, educators suggest that teachers need to teach the children strategies for comprehending text. Schmitt (1990) agrees. Strategy instruction involves making students metacognitively aware of their learning and encourages the students to choose effective strategies to accomplish their reading goals. Some of the advantages of strategy instruction are that children learn to monitor their own reading, are not as teacher dependent, can transfer strategies from one text to the next and can use strategies if they are advantageous and omit strategies when they are not needed. Strategies give the students choices, or options and this leads to a sense of control over learning. Although the reading literature does not specify heading strategies, there are some comprehension improving strategies that include the use of headings and have been shown to be successful (Lysynchuk, Pressley & Vye, 1990; Pressley, Johnson, Symons, McGoldrick & Kurita, 1989; Taylor, 1982; Taylor & Beach, 1984). (Comprehension strategies that involve the use of headings will henceforth be referred to as *heading strategies*). Some of these strategies are: using headings to link with prior knowledge, making predictions about the material to be read based on scanning the main and subheadings in the chapter, using headings to help in locating the most important ideas in the passages and turning heading statements into questions to set a purpose for reading. To date, no one has studied the effects on comprehension and recall

of expository prose when students use a number of heading strategies. Therefore, the second part of this study will attempt to assess these effects.

Features of the Study

One condition that is crucial to examine is heading recall using actual content area text material. Contrived text has been shown to be simpler for students in understanding main ideas (Hare, Rabinowitz & Schieble, 1989). Kamil (1984), when discussing further trends in reading research, says that it "becomes increasingly difficult to defend reading research studies that do not have ecological validity. Educational researchers will be ever more concerned about instructional relevance in their studies of reading" (p. 52-53). This study attempts to improve the ecological (classroom environment) validity by using passages selected from actual prescribed or authorized textbook material (therefore, the content is somewhat predetermined) and by presenting tasks that teachers might assign in a classroom situation (Bronfenbrenner, 1976). Although children are involved in a myriad of tasks in their content area subjects, a read and recall type of task is commonly used. Teachers often ask children to read a number of pages from the textbook and then recall the information later when answering questions, applying information or writing an exam (Green & Nicol, 1985). Therefore, the researcher will attempt to duplicate a typical classroom activity so the findings will be somewhat generalizeable to other classroom content area reading conditions.

This study attempts to supplement two quantitative experiments: one in the controversial area of the presence of headings as facilitators of recall (Hartley & Trueman, 1985) and the other in the area of heading instruction (Goble, 1986).

Hartley and Trueman (1985) carried out a series of studies involving the presence or absence of headings in their seventeen experiments on headings. Although they found that the presence of headings significantly aided the 14 and 15 year olds in immediate recall on both easy and difficult expository selections, the 11 and 12 year olds were not

significantly affected by the presence of headings. Hartley and Trueman hypothesized that these findings suggest "a developmental trend in the ability of children to use headings to aid recall" (p. 140) and thought there was a need for similar studies at the elementary school level to confirm or repudiate their findings. Although there have been at least nine headings studies done at the elementary level (Coulombe, 1986; Doctorow, Wittrock & Marks, 1978; Goble, 1986; Hartley & Trueman, 1985; Hartley, Trueman & Pigram, 1984; Jonassen, Hartley & Trueman, 1985; Kobasigawa et al., 1988; Landry, 1966; Stables, 1985), only the Hartley and Trueman (1985) study focused solely on recall of text when headings were present or absent. Therefore, a partial replication of the Hartley and Trueman (1985) study, focusing on recall by 11-12 year old students, might be useful.

Goble (1986) did a study that showed how grade 5 students (10-11 year olds), with the aid of direct heading instruction, significantly recalled more information and organized the material better than students who read expository prose with headings but no direct instruction. Goble's study makes the developmental theory, that eleven and twelve year olds might not be cognitively ready, seem less likely and her research suggests that there might be value in directly instructing students in heading use. Therefore, further exploration is definitely warranted.

Direct instruction experiments have a number of practical and methodological problems, however. They take up a considerable amount of time which makes it hard to find willing school administrators and limits the number of classes that one researcher can handle. Classes usually must be kept intact and therefore random assignment by individual students is not possible. These kind of experiments are potentially opened to Hawthorne and John Henry effects, researcher bias and are also much harder to control for extraneous variables. In addition, it is hard to determine in advance how much instruction is necessary to teach the required concepts and there is no assurance that students will use the information they have been taught in the research test situation. (Taylor, 1982, says that strategies have to be performed really well in order to show an effect.) Therefore, it was

decided that a study, which insured that students used some heading strategies, would help to supplement the information gained from the Goble (1986) study on the value of direct instruction of headings. The second part of the present study explores students' ability to improve recall of expository prose when the students are directed to use heading strategies.

This present study will use grade 5 students because both Goble (1986) and the Hartley and Trueman (1985) experiments have eleven year olds in common. In addition, this grade was chosen because, by grade 5, most children have at least been exposed to expository prose and yet might need some sensitization to strategies for comprehending and recalling content area reading material more easily. Although headings are used in all content area subjects, social studies text material of an information-classification type was selected because this type was used in both the Coulombe (1986) and Goble (1986) studies. Catterson (1990) says, "Current social studies texts are perhaps the most common exemplars of information centred prose" (p. 557).

In summary, this study is an experiment to see if quantity and type of information recalled are significantly improved, firstly by the addition of headings, and secondly, when children are made aware of heading strategies and are asked to use these strategies when reading a selection from a British Columbia authorized social studies textbook.

PURPOSE OF THE STUDY

This study was designed to investigate the effects of three conditions:

- a) absence of headings,
- b) presence of headings, and
- c) presence of headings and heading strategy instructions

on the quantity and type of delayed written free recall and main idea recall/formulation of grade 5 students when they read an expository passage selected from a British Columbia authorized social studies textbook.

NULL HYPOTHESES

The following null hypotheses were established to study the research questions:

H₀₁: There will be no significant differences among the mean scores on the delayed written posttests for the two experimental groups (treatment group 2 - headings without heading strategy instructions and treatment group 3 - headings with heading strategy instructions) and the control group (treatment group 1 - no headings and no heading strategy instructions) on the following dependent variables:

- a - quantity of superordinate or main ideas in free recall
- b - quantity of subordinate ideas or supporting ideas in free recall
- c - quantity of sub-subordinate ideas or details in free recall
- d - total score on free recall test (a, b, and c)
- e - accuracy of main idea recall/formulation
- f - total score for free recall and main idea recall/formulation tests

H₀₂: There will be no significant differences among the mean scores on the delayed written posttests of each specific reading comprehension level (higher, middle or lower) for the two experimental groups (treatment group 2 - headings without heading strategy instructions and treatment group 3 - headings with heading strategy instructions) and the control group (treatment group 1 - no headings and no heading strategy instructions) on the following dependent variables:

- a - quantity of superordinate or main ideas in free recall
- b - quantity of subordinate ideas or supporting ideas in free recall
- c - quantity of sub-subordinate ideas or details in free recall

- d - total score on free recall test (a, b, and c)
- e - accuracy of main idea recall/formulation
- f - total score for free recall and main idea recall/formulation tests

H₀₃: There will be no significant interaction between reading comprehension ability level (higher, middle and lower) and treatment (treatment group 1 - no headings and no heading strategy instruction; treatment group 2 - headings without heading strategy instruction; treatment group 3 - headings with heading strategy instruction) on the delayed written posttests on the following dependent variables:

- a - quantity of superordinate or main ideas in free recall
- b - quantity of subordinate ideas or supporting ideas in free recall
- c - quantity of sub-subordinate ideas or details in free recall
- d - total score on free recall test (a, b, and c)
- e - accuracy of main idea recall/formulation
- f - total score for free recall and main idea recall/formulation tests

SIGNIFICANCE OF THE STUDY

This study has significance for students, educators and publishers. Firstly, if it can be shown (in this study plus replications in other studies) that headings in textbook material can act as an effective processing aid in recalling expository prose, educators and publishers would be justified in continuing and extending the use of headings on text material. Secondly, if it is further shown that headings are more effectively used when children are given heading strategies instruction, then educators might want to consider teaching upper elementary students ways to use headings that could help improve the children's comprehension and recall, thus making the textbook material more

understandable. Publishers of teacher guides to teaching reading might consider writing explicit instructions for teaching teachers how to instruct students in heading strategies use. Finally, if there are no significant differences amongst the three groups, then lack of developmental readiness must be seriously considered along with the idea that headings may simply not function as recall aids in expository prose. In any case, these results combined with similar studies, have important implications for children, teachers and publishers.

DEFINITIONS

For the purpose of this study, specific terms are defined as follows:

Access structures: A variety of features of text design that help readers to find their way around or to help gain access to complex text (Waller, 1979, cited in Hartley & Trueman, 1985, p. 101).

Advance organizers: "Material that is presented 'in advance of and at a higher level of generality, inclusiveness and abstraction than the learning task itself ", (Lenz, Alley & Schumaker, 1987, p. 54, cited in Ausubel & Robinson, 1969, p. 606).

Cloze test or inventory: The cloze technique involves deleting words from a passage at constant intervals (e.g., delete every seventh word in the text that is not the first or last sentence). The student is asked to fill in the missing words on the cloze test.. This task is viewed as one type of a comprehension test.

Cognition: The actual thinking strategies and processes used by an individual (Barina, 1989, p. 25). The thinking strategies may or may not be at a conscious level.

Comprehension: Refers to understanding text the way the author stresses the information and not to selective comprehension based on specific reader needs.

Content area reading material: The textbooks, resource books, pamphlets and handouts required to learn information in specific school subject areas such as Social Studies or Science.

Delayed recall: Recall that does not occur immediately after exposure to the reading material. The delay is usually from one to seven days later but can be as short as one intervening activity.

Discourse: Connected communication of thought. Although discourse is language that can be spoken or written, this study makes reference only to written discourse.

Expository prose: Refers, in this study, to written (rather than oral) discourse that explains, comments on or interprets subject matter.

Gist: The main idea of the paragraph or passage. The gist, main ideas or macropropositions are found at the top or superordinate levels of the text (Meyer, 1984).

Headings: Refers to chapter titles, main headings, and subheadings in connected prose.

Heading strategies: Comprehension strategies that involve the use of headings have been called heading strategies in this study because the focus is on headings effects.

Hierarchical structure: Involves a hierarchy of ideas found in expository prose. The most important or superordinate ideas are usually (but not always) located at the top of a passage. They are followed by supporting ideas and then by details (Vacca & Vacca, 1986, p. 31).

Ideational prominence: The hypothesis is that ideas most central to a text or ideas that are found in the upper echelons of a passage hierarchy are most memorable (Baumann, 1981b, p. 49).

Immediate recall: May be either free recall or cued recall performed immediately after exposure to the reading material.

Information/classification text: (Also referred to as Descriptive in Coulombe, 1986) . This is a term used by Coulombe and Goble in their 1986 studies. They define it as expository material that organizes and presents information on the attributes, specifics, explanation or settings of a particular topic. This definition was adapted from Meyer (1984). Meyer (1984) states that description relationships are one of five basic rhetorical relationships in the content structure (p. 114-115).

Information centred prose: According to Catterson (1990), information centred prose is a type of school textbook prose that is centered on information (as opposed to process or concept centered prose) in which the author's main chapter topic and subtopics are labels for categories of information. Catterson (1990) says, "Current social studies texts are perhaps the most common exemplars of information centred prose" (p. 557). Based on Catterson (1990), Coulombe (1986) and Goble's (1986) information/classification text material fits into Catterson's information centred prose text type which is one type of classification macrostructure.

Instantiating schema: A process where elements in the situation are bound to slots in relevant schema (Adams & Collins, 1985, p. 406-407).

Macrostructure: The structure of text at the level of the whole passage or series of linked paragraphs.

Main ideas: Also referred to as superordinate ideas, are those ideas that are found at the top levels of the expository prose hierarchy.

Metacognition: Cognition about cognition, knowledge about one's own thinking processes (Weinert & Kluwe, 1987, p. xi).

Microstructure: The "local level of the discourse, that is, the structure of the individual propositions and their relations" (Kintsch & van Dijk, 1978, p. 365).

Narrative prose: Passages that tell a story. Prose containing a narrative structure that includes six components: setting, initiating events, internal response, attempt,

consequence and reaction (Dishner et al., 1986, p. 235 cites Mandler & Johnson, 1977).

Organizational aids: Format features which are built into the text to facilitate reading (Vacca & Vacca, 1986, p. 31).

Prior knowledge or background knowledge: All the knowledge and understanding that a reader has in long term memory and brings to the reading task. This includes concepts, beliefs, expectations and processes.

Prose: Refers to written language that consists of sentences that are thematically connected. Discourse (written) is an alternative reference for the word prose. (Voss, Tyler & Bisanz, 1982, p. 351).

Recall: Reader's memory for text. It includes free recall where the reader is asked to remember as much of the passage as possible and cued recall where questions are asked and the reader must remember the required information from the text.

Recognition memory: Remembering due to identifying or knowing, as by previous experience or knowledge. Multiple-choice and matching tests are based on recognition memory.

Retrieval: To look for information in familiar or recently read text.

Schema: Describes a "particular class of concepts and is composed of a hierarchy of schemata embedded within schemata. The representation at the top of the hierarchy is sufficiently general to capture the essential aspects of all members of the class" (Adams & Collins, 1985, p.406).

Schemata: Schemata is the plural form of the word schema. Anderson, Spiro & Anderson (1978) define schemata as "mental structures that incorporate general knowledge ..." (p. 434) Mavrogenes (1983) discusses two types of schemata. He refers to the knowledge of rhetorical structures or the conventions for organizing text as textual schemata. Schemata can also refer to the reader's existing knowledge of real or imaginary worlds and are called content schemata (p. 197).

Search: To look for information in unfamiliar material or material that has not been read recently.

Sensitization: Sensitization refers to the teaching procedures used to increase the learner's awareness of the functions of headings (adapted from Coulombe, 1986, p. 11). In this research, sensitization will also be referred to as direct instruction.

Signaling devices or text signals: Linguistic signaling devices refer to placement of noncontent words in the passage to emphasize the conceptual structure or organization of the passage (Loman & Mayer, 1983, p. 402). Other signaling devices use spatial and typographic means to emphasize the conceptual structure of the passage.

Strategy: A flexible plan for carrying out a sequence of activities to accomplish a task efficiently as well as effectively.

Story structure: A structure found in stories which is made up of a setting, a plot and a theme (Vacca & Vacca, 1986, p. 36).

Subordinate ideas: The middle levels of the expository prose hierarchy; also referred to as supporting ideas.

Sub-subordinate ideas: The lowest levels of the expository prose hierarchy; also referred to as specific details (adapted from Niles & Catterson, 1972).

Superordinate ideas: Refers to ideas that are at the top level of the hierarchical structure and are considered to be the main or central ideas of the passage or text segment.

Text: Written discourse (aggregate of words) in printed form (Jonassen, 1982b).

Although the terms text and textbook are often used synonymously, the usage of the term text, in this study, refers to the broader definition of text as a printed discourse of any length.

Verbatim recall: When students are asked to recall a piece of text in as much detail, and as close to the author's wording, as possible.

ORGANIZATION OF THE THESIS

The thesis is organized in five chapters. The first chapter discusses the background information, the rationale, and the nature of the thesis problem. Chapter 2 reviews the relevant literature concerning three major themes: the functions of headings in comprehension and recall, factors that affect heading effectiveness, and reader awareness of how to use headings effectively. Chapter 3 describes the design and planned methodology of the study plus methodological choices and limitations. Any methodological changes in the actual study and the results of the analysis of the data are presented in chapter 4. The fifth chapter summarizes the study, presents a discussion of the research findings, recommends possible directions for future research and suggests implications of the research.

SUMMARY

The chapter opened with a statement of the research problem. This problem evolved from a more general problem found in elementary classrooms. It was shown that children in the upper grades of the elementary school have difficulty understanding and recalling expository prose information from content area textbooks. Because of the difficulty learners have in obtaining information from such textbooks, educational writers have included a number of processing aids in textbooks to assist the learner. Some of these processing devices are called organizational aids, signaling aids and access structures. One aid, headings, was isolated for further study because it seemed to have a number of processing functions and was often used by textbook authors. An overview of the available research on the function of headings was presented. Although there was clear evidence for the effectiveness of headings as access structures (search and retrieval), the evidence for heading effects on comprehension and recall were more ambiguous.

Therefore, a plan for a research study was developed in order to explore the controversial area of heading effects on recall. The chapter included the statement of the null hypotheses and definition of key terms. The review of the literature is presented in chapter 2.

CHAPTER TWO

Review of the Literature

INTRODUCTION

This chapter presents the relevant literature in heading research that has been gathered from a number of fields, especially cognitive psychology, text technology, text analysis and reading. Details of the research studies will be presented and some references will be made to the views of the researchers so that the studies will be put into a more meaningful context. Although the main emphasis in this research will be on recall, chapter 2 also discusses heading research related to comprehension. Recall, to be useful in the school setting, must involve both comprehension and remembering. Moreover, recall measures often reflect the amount of understanding that took place as well as the ability of the student to remember information. By looking at the heading research that explores either comprehension or recall, the reader should gain more insight into the nature of how headings function.

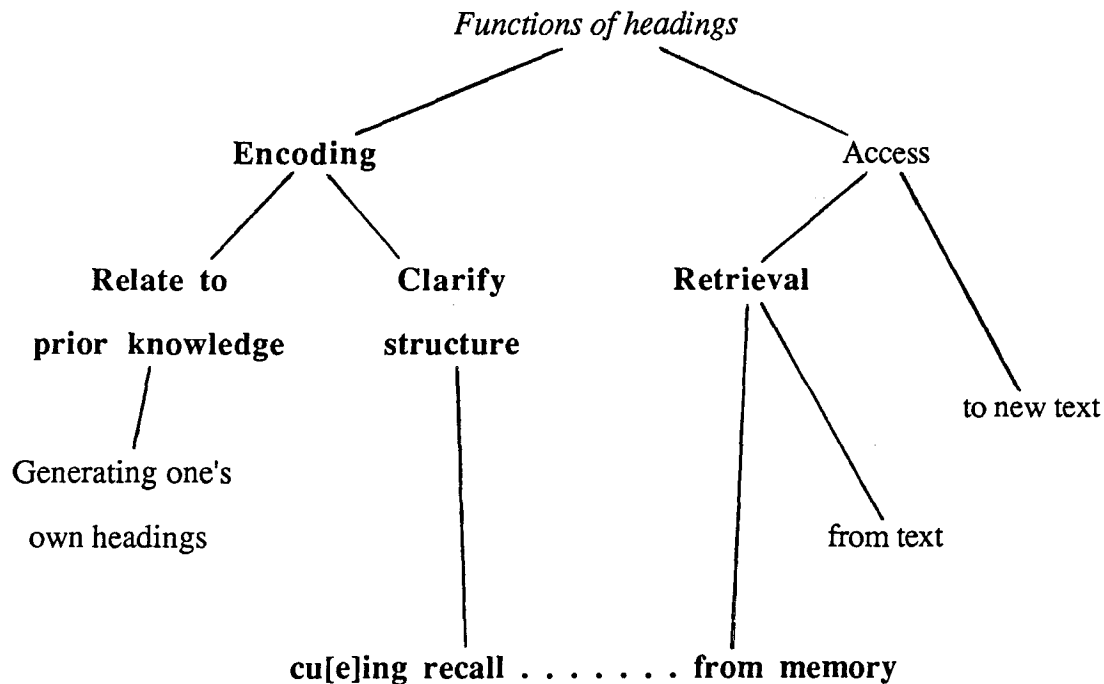
In the literature review, three major themes or issues emerged as important areas for further study. First, there was the need to thoroughly explore possible functions that the presence of headings might serve readers in their attempts to comprehend and recall expository prose. Next, it became necessary to explore heading research on reader and text factors that might explain some of the controversy that arose over the effectiveness of headings as an aid to comprehension and recall of expository prose. Finally, one factor, awareness of heading functions, was selected as a potential way to improve the effectiveness of headings as aids to comprehension and recall of expository prose. This factor was chosen as it seemed likely that headings were underutilized by grade 5 students because of their lack of awareness about heading functions. Therefore, the last theme to be

explored in chapter 2 is reader awareness of heading uses and the readers' ability to use headings effectively.

FUNCTION OF HEADINGS IN COMPREHENSION AND RECALL

Few actual studies have been conducted on the topic of heading effects at the elementary school level. This section of the literature review will present information from a larger set of heading studies that will help to shed light on the possible functions that headings might serve readers in their comprehension and recall of expository prose. Hartley and Jonassen (1985, p. 240) diagrammed possible heading functions in the following manner:

Figure 2.01 - *Graphic Heading on Information-Processing Functions of Headings*



Although Hartley and Jonassen present both encoding and access functions, the major thrust of this research is that part of the diagram shown in bold print. The encoding functions of relating to prior knowledge and clarifying structure aid comprehension. The retrieval function of cueing recall from memory is one aspect of recall. Each will be discussed separately but it is important to note that they interact with each other.

Link to Prior Knowledge

Much has been said recently in the field of reading about the importance of prior knowledge as an aid to understanding text material (Pace, Marshall, Horowitz, Lipson & Lucido, 1989; Rowe & Rayford, 1987). Headings are thought to serve as activators of prior knowledge (Brooks et al., 1983; Glover & Krug, 1988; Holley et al., 1981; Krug, George, Hannon & Glover, 1989; Wilhite, 1988b). Hartley and Jonassen (1985) state, "In order to make sense of what we read, we have to relate what we read to what we already know. Our memories contain interrelated networks of concepts (schemata or scripts) that represent objects, events, situations, and ideas. We use these networks to help us interpret and assign meaning to information in text, to make inferences, and to relate new information to previously-acquired knowledge" (p. 239). Headings are thought to function as cueing devices to provide a context for each passage that follows. Hartley and Jonassen (1985) suggest that, "Headings can activate appropriate networks (schemata or scripts) which in turn act as a context for comprehending what is presented" (p. 239).

Krug, George, Hannon and Glover (1989) are more cautious in concluding that headings aid in the activation of prior knowledge. They offer two hypotheses. Krug et al. (1989) say:

From one point of view, headings would seem to operate via a schema activation process in which the headings activate relevant content schemata. These activated schemata then guide reading and serve as heuristics for the assimilation of text material. ... Another plausible hypothesis, however, focuses not on encoding but on retrieval. That is, headings may function as retrieval cues at the time of testing. ... In this view, headings do not so

much guide encoding as they do retrieval. A contrast of these two hypotheses, however, shall require additional research. (p. 120)

In exploring the first hypothesis, Krug et al. (1989) say,

A ... difficulty with past research is the absence of a theoretical explanation for the effect of headings. The most logical accounting appears in the literature examining the effect of 'schema activation' (e. g., Rowe & Rayford, 1987). A schema can be described as a mental framework onto which a reader places ideas in a given hierarchical order. The most superordinate ideas would be placed at the apex of the schema and subordinate ideas would be placed on lower parts of the structure in relationship to their corresponding superordinate counterparts. (p. 113)

Krug et al. (1989) make a distinction between form schemata and content schemata. They say,

Form schemata are abstract in nature, in that they deal with the general form of things. For example, the form schema for a textbook would include ideas such as a table of contents, an introduction, and a series of chapters. Content schemata, in contrast, are more concrete and less abstract. A textbook's content schema, for example, could consist of the topics of the individual chapters (e. g. behaviorism). (p. 113)

Krug and colleagues (1989) considered headings a type of content schemata. They reasoned, "Since headings are presented separately, they do not inform the reader of the structure or form of the essay, but activate only knowledge relating to the specific segments of text they precede. In other words, each heading activates a content schema for the relevant segment of text" (p. 113).

In order to decide if headings function as activators of prior knowledge and thus aid comprehension of textual material, it is important to look at research that has been carried out on this topic. Glover and Krug (1988) and Wilhite (1988a, 1988b, 1989) have conducted research that explores this subject. Each study will be described in some detail.

Although Wilhite has written a number of articles (1987, 1988a, 1988b, 1989), all these articles are based on two experiments that he conducted on headings as activators of

prior knowledge. In the first experiment, Wilhite (1988b) hypothesized that, "If headings do encourage memory for passage information by activating schemas as an organizational framework for the encoding of the material ... then only subjects who possess the relevant schemas, as assessed by some measure of preexisting knowledge about the passage topic, should benefit from the inclusion of headings in the text" (p. 216). In his experiment, 116 college students who were enrolled in an introductory psychology class were asked to read a 1,760 word passage on human sexuality. Fifty-five students read a passage version with headings added and 61 students read the passage version without headings. Prior to reading the test passage, all students had completed a prior knowledge test on human sexuality that consisted of eight multiple-choice questions based on low-level detail information from the research passage. Results, using a 2 x 2 MANCOVA to obtain information on any significant differences, supported his hypothesis. Only high preexisting knowledge students significantly benefitted from the inclusion of headings. Wilhite (1988b) says that, "This finding supports the suggestion that part of the beneficial effect of headings derives from their tendency to activate relevant schemas in the reader during the encoding of the passage material" (p. 223). Furthermore, Wilhite (1988a) states:

The fact that headings did not significantly affect the performance of the subjects in the low pre-existing knowledge group suggests that other possible influences of headings in terms of promoting the interrelating of concepts and the use of the headings as retrieval cues (Brooks et al., 1983) did not operate for the subjects with low pre-existing knowledge. This possibility that headings did not encourage the interrelating of concepts and the use of the headings as retrieval cues by the low pre-existing knowledge group is consistent with the assumption that the effectiveness of headings in promoting these operations is somewhat dependent on the headings successfully activating pre-existing knowledge about the topic. (p. 3-4)

In the second experiment that was conducted on headings and prior knowledge, Wilhite improved the design of the study by eliminating the need for a prior knowledge pretest. Instead, he selected his groups in a manner that was independent of the test

situation. The high prior knowledge group consisted of 43 college students who were recruited from a psychology course on learning and memory. The remaining 51 college students were obtained from psychology courses that had not been taught any learning and memory theory to date. The results were similar to the results of the first experiment. Only those students with high preexisting knowledge were able to use headings to significantly facilitate answering main-idea retention test questions. Wilhite (1989) concludes, "The results of both experiments are consistent with the suggestion that part of the beneficial effect of headings derives from their tendency to activate relevant prior knowledge in the reader and that low-knowledge readers may thus have difficulty in using headings as organizational aids in the comprehension and retention of passage information" (p. 116-117).

The topic of headings and prior knowledge has also been explored by John Glover and Damon Krug. They designed a study (Glover & Krug, 1988) to explore the effectiveness of outlines and headings in assisting students to identify false statements in text. Glover and Krug (1988) explain, "In our view, headings in text should, like outlines, activate relevant schemata in readers and guide their comprehension of text From this perspective, students should be better able to identify false statements in texts containing headings than in texts without headings" (p. 302). Furthermore, "... headings are distributed throughout the text and seem to be more likely to activate relevant schemata at each appropriate location in text. It may be the distributed nature of headings would lead to greater facilitation of students' ability to identify false statements" (p. 303).

In their experiment, 60 students from grade 10 and 11, all of whom had shown good previous knowledge of the topic as assessed on a history test, were randomly assigned to two treatment groups. All students read a 2,500-word passage on European history in which 15 statements had been reworded to make false statements. Various further changes were made to produce several passage conditions: outlines only, headings only, both headings and outline, and the control passage with no headings or outline.

The results, using a one-way analysis of variance, indicated a significant difference among conditions ($F(3,59)=45.52$, $p<.01$, $MSe=4.52$). One of the results that the researchers found, using the Tukey HSD procedure, was that both headings and outlines significantly facilitated the students' ability to detect false statements in text. As a result, Glover & Krug (1988) surmise that, "... outlines and headings serve to activate relevant schemata. These activated schemata then serve as heuristics that guide the encoding of text information. Those segments of text that disagree with prior knowledge are discriminated from the remaining content and identified as false or at least incongruent statements" (p. 305).

Some researchers have found that headings can fail to aid comprehension even though they have activated prior knowledge. Pace, Marshall, Horowitz, Lipson and Lucido (1989) found that headings occasionally activate prior knowledge that in some way conflicts with the new material to be processed. This information then interferes with the new material that follows. Krug et al. (1989) cites Swarts (1980) who concluded that headings can sometimes be misleading and headings can "impair text processing if they were not carefully constructed" (p. 112). Although these studies show negative effects for headings, they do continue to support the hypothesis that headings do make a link with prior knowledge.

Sometimes headings fail to activate prior knowledge. The experiments of Wilhite (1988a, 1988b, 1989) consistently showed that headings were ineffective when the readers did not have sufficient prior knowledge on the topic. As a result, headings were unable to aid comprehension of text material. Brooks (1983) points out that:

... even with unfamiliar material, the content of outline/headings may trigger off prior schemata. However, it would be expected that these schemata would represent bits and pieces from a variety of higher order schemata, as opposed to a coherent framework. So, although one might certainly expect some facilitation of performance due to effects on input processes, it seems probable that the effectiveness of schematic cues with relatively unfamiliar material will depend on the acquisition and subsequent usage of the cues in further comprehension, storage, retrieval, and respondings. (p. 293)

In summary, the hypothesis that headings may function as activators of prior knowledge seems to be promising. Headings would appear to be more useful if they relate to something that is familiar in the reader's background knowledge and something that does not conflict with the reader's world view. Once prior knowledge has been activated or recalled, it can then be used to assist the reader in comprehension.

Clarifying Structure to Improve Comprehension

One way that headings were shown to aid comprehension was by acting as a link to prior knowledge. A second way that headings might improve understanding or comprehension is through clarifying the structure of the textual material that follows (see Figure 2.01). Taylor (1982) claims that, "... recent research supports the notion that sensitivity to text structure is an important component in text comprehension and text production processes" (p. 324). Englert and Hiebert (1984) agree with Taylor. They state, as a result of their study, that "... these data and those reported in other studies support the notion that knowledge of text structure aids comprehension" (p. 72). Furthermore, Englert and Hiebert (1984) say, "... the use of text structure is a necessary strategic skill in comprehending text" (p. 71). Meyer, Brandt and Bluth, (1980) also found that their data showed "a strong relationship between comprehension skills and use of the top-level structure in text" (p. 96). If being sensitive to and using the text structure are useful ways to improve ones' comprehension, then it is important to see if headings function to clarify text structure and if that, in turn, aids comprehension.

When authors write informational material, they need to organize the ideas that they wish to express in some sort of order. Moreover, they need to decide what ideas will be discussed in detail and what ideas will be mentioned briefly in passing. Authors also need to unify their ideas under a cohesive theme. In expository prose, headings are frequently used to aid authors to make their organization explicit. Meyer (1985) says that a writer changes a network of ideas into a hierarchy representing the author's perspective of the

topic (p. 65). Moreover, Meyer suggests that, "due to readers' limited capacity to remember ... everything in text and their need to selectively forget some information, writers must cue readers into viewing some information as more important to remember than other information" (p. 66). Headings are believed to help show the author's organization by signalling upcoming content that the author wishes to express and making the major and minor themes to be discussed clear. [Kozminsky (1977) discusses how the goal of the task can change a reader's focus. Throughout this thesis, it is assumed that it is the author's organizational focus that is the required task.]

In the Rationale of chapter 1, signalling aids and organizational aids have been defined. In this chapter, studies that explore headings as general organizational and signalling aids will be presented. As some heading studies examine specific aspects of text structure, these will be discussed according to Lee's classification (1965). Lee (1965) isolated three major aspects involved in the specification of supraparagraph prose structure:

- Unity: paragraphs which deal with the same thing should be placed together in the passage.
- Sequence: means that units (paragraphs) may have a logical or natural ordering and well-organized passages use an appropriate sequence.
- Hierarchy: some ideas are found at a higher, more encompassing level than others and this hierarchical structure is not always explicit.

Each of these major aspects of text structure will be considered when looking at heading studies. However, these categories will be referred to as **theme** representing unity, **order** representing sequence and **hierarchical levels** representing hierarchy.

Headings as a General Organizational and Signalling Aids

Jonassen (1985) believes that signalling the structure of the passage helps to clarify the content of the passage. He says, "... the more clearly and explicitly we indicate the overall structure of a passage, the more likely readers are to comprehend the content of the

passage. If we activate the right schemata, or scripts, in the readers, they will better follow the flow of a passage and anticipate what will come next, as well as providing ideational anchors that will help readers retrieve information that they have read and remembered" (p. 59-60). "... in order to reduce ambiguity and misunderstanding, the author needs to explicitly *signal* the structure of a passage. The intent of the signaling is to clarify the content of the passage. ... Since information high in the passage structure is better recalled, and since recall of it facilitates recall of information of lower structural importance (details), it is important to explicate the overall structure of the passage for the reader" (p. 60).

Headings are a type of organizational aid that signals information linguistically or semantically (Meyer, 1975; van Dijk, 1979) and typographically (Waller, 1979; Wilson, Pfister & Fleury, 1981). "Signaling is information in text that does not add new content on a topic, but that gives emphasis to certain aspects of the semantic content or points out aspects of the structure of the content ..." (p. 76). Meyer (1985) considers headings or titles as one kind of preview statement and she says of preview statements:

This type of signaling prematurely reveals information abstracted from content occurring later in the text. It uses the same words or paraphrasing to state information toward the beginning of a passage or paragraph that is developed more fully later in the text. It is often seen in titles and introductory sentences of passages or paragraphs. This superordinate information is abstracted out and presented prior to its discussion in detail in the text. (p. 77)

Meyer suggests that writers of informational material can use titles and subtitles to focus on main ideas and explicitly signal the structure in the following manner: "... a text with a problem/solution plan explaining how breeder reactors can solve the energy crisis should be titled 'Nuclear Breeder Reactors: A Solution to the Energy Crisis' rather than 'Fast Breeder Reactors.' " (p. 85). Wilson, Pfister & Fleury (1981) discuss headings as one type of typographic cueing device. They say, "The process in which format and layout assist the reader is often referred to in the literature as 'cu[e]ing'. Such variables as

headings and underlining, typesize, indentation, and paragraph structure all act to cue the reader on where he is in relation to the overall organization of the text, and what is of greatest importance on that page. The use of headings and underlining serves to accentuate selected elements in printed text with the expectation of improving learner acquisition and retention. Both are used to draw a learner's attention to information an author considers important for the task at hand" (p. 26).

Researchers have clearly perceived that headings should function as a general organizer and a signalling aid. However, the results from research studies on headings as organizational aids and signalling devices have not been particularly positive.

- Robinson and Hall (1941) used 205 college students who took part in this research as part of their educational psychology course. The material to be read was taken from Russian and Canadian history. One group read the Russian passage with headings included and the Canadian passage with headings removed. The second group read the same passages but the headings or lack of headings were reversed. The passages were written by the same editorial source and were considered homogeneous. The results of this experiment showed no significant effect for the presence of headings.
- Christensen and Stordahl (1955) had 9 flights of basic air-force trainees (who were randomly assigned to groups) read two passages with headings and without headings among other conditions. Using a $3 \times 3 \times 2 \times 2$ factorial design, the researchers explored 36 versions of organizational aids. On the multiple-choice posttests that were administered immediately after completion of each passage, no significant effects were found for the presence of headings at the .05 alpha level of significance. Christensen and Stordahl (1955) say, "Clearly, one can say that the organizational aids used in this experiment did not effect comprehension as measured by the comprehension tests" (p. 73).

- Landry (1966) explored the effects of headings versus no headings plus three other organizational aids with 314 grade 5 students. The students were randomly assigned to each treatment group. The headings plus the other organizational aids had no effect on general comprehension and immediate recall nor on main idea or detail concept recall.
- Doctorow, Wittrock and Marks (1978) explored generative processes in comprehension with 488 grade 6 students using both a multiple-choice test administered immediately after reading the passage and a cloze test given one week later. Two of the treatments were the presence of single and two word headings but no generative processing task. Doctorow, Wittrock and Marks (1978) say, "The treatments with the inserted paragraph headings, R_1 and R_2 , produced greater comprehension and recall than did the reading of the same stories without the paragraph headings ($p < .01$) on every respective test used in the experiments with the high-ability readers and with the low-ability readers. These results provide support for the hypothesis that cues for the retrieval of relevant information can facilitate comprehension and recall of text" (p. 117).
- Spyridakis and Standel (1986) examined the effects of headings, previews and logical connectives (three signalling devices) in two experiments with 368 university students who were at the pre-entry level to Engineering and read competently. The results for both experiments (using an easy passage and a hard passage) showed no significant effects for headings.
- Spyridakis and Standel (1987) compared three signalling devices (headings, previews and logical connectives) using 371 pre-engineering university students that were sophisticated readers and had good technical prior knowledge. The results showed no significant effects for headings on overall multiple-choice responses when the students read four technical passages of varying length and difficulty. Main effects for headings were only found to be significantly effective

for students reading the passage of greatest difficulty (longest and hardest) while answering the inference questions. Significant interactions among headings, previews and logical connectives on the passage of shortest length and medium difficulty, and between headings and logical connectives on the passage of greatest difficulty were also found.

The experiments, involving the organizational and signalling aids, that are listed above are not very supportive of headings functioning as an aid to comprehension as shown by multiple-choice questions and other comprehension measures. However, part of the difficulty may be the researchers' inability to truly measure comprehension. There is some question whether researchers will ever be able to measure comprehension. The methodological problems in comprehension research have been discussed by Baine (1986), and Kintsch and Yarbrough (1982). Kintsch and Yarbrough (1982) say:

It is clearly false to assume that comprehension is an ability that can be measured once and for all, if only we had the right test. Instead, "comprehension" is a commonsense term for a whole bundle of psychological processes, each of which must be evaluated separately. Only a collection of different tests, each tuned to some specific aspect of the total process, will provide adequate results. To construct such a collection will require the guidance of a fairly sophisticated theory of prose comprehension. (p. 834)

Baine (1986) discusses the problem of separating understanding from remembering and suggests testing students' comprehension "in the presence of the reading material" (p. 141). This would eliminate the problem of confusing recall with comprehension. Other comprehension measures that avoid the problem of memory are eye moment studies and metacognitive approaches where the subjects discuss their thoughts moment by moment. Neither of these approaches are feasible or useful for all types of comprehension research. Most researchers in this area have chosen to consider recognition tests (multiple-choice and matching), cued recall tests and an assortment of other types of tests that are administered immediately upon completion of the reading of passage as comprehension measures. Free

recalls, commonly used in heading research, are generally considered to be memory checks rather than comprehension measures because the student is specifically asked to recall as much information as he or she can. Yet, immediate free recalls can also show aspects of comprehension such as arrangement of ideas and the level of understanding exhibited and therefore, are sometimes considered comprehension tests as well. Rather than measure comprehension in a general overall fashion, some heading researchers have chosen to use more specific comprehension focuses. Studies that relate to theme, order and hierarchy will be reviewed in the following sections.

Exploring Thematic Function of Titles

One type of heading considered in this research is the title. It contains the most superordinate level of information and usually reflects the theme or topic of the passage that follows. A number of experiments explored whether supplying the reader with relevant context knowledge in form of a title (or statement) before reading would affect the readers' understanding and/or recall of the passage. These experiments use both ambiguous and regular narrative and expository prose.

Dooling and Lachman (1971) attempted to show that knowledge of the theme of a passage aids retention of its words. In Experiment 1, half the 120 university psychology students involved in the study (as part of a course credit) received a thematic title for the material they were to read. The material was manipulated in a variety of ways (random words, random phrases and intact sentences) to make the two passages ambiguous without the thematic title. The dependent variable was free recall. An analysis of variance on words correctly remembered (free recall) showed significant effects for thematic titles. In the recognition test, under two speeds of timed conditions, the students had to decide if the words on the cards had appeared in the passage or not. The results showed only slightly more mean correct recognitions with a thematic title and the analysis was not significant. However, when a crude correction was applied to the recognition data (each subject's

errors were subtracted from the total number of correct responses), there was a significant main effects for thematic title. When the words were analyzed as high thematic, low thematic, and function words, only the high thematic words yielded significant effects for thematic title. This is evidence that the thematic title has a semantic effect on retention.

One of the most frequently cited pieces of research in the area of ambiguous prose and comprehension, is the work done by Bransford and Johnson in 1972. They showed, in a number of experiments, "that relevant contextual knowledge is a prerequisite for comprehending prose passages" (p. 717). In Experiment 1, Bransford and Johnson (1972) used a picture to provide the context for understanding an ambiguous narrative passage. In Experiment II, III and IV, a topic (sentence) provided the semantic context. Both the picture and the topic that was presented before reading significantly affected the comprehension and recall of the subjects in the four experiments. Bransford and Johnson suggest that the critical role of the topic "appears to be in helping subjects create contexts that can be used to comprehend the passages in the first place" (p. 724). If the topic does not do this, then knowledge of topic alone is not sufficient for optimal comprehension of the passage as was seen in Experiment 1. Bransford and Johnson (1972) say, "If a passage does not provide sufficient cues about its appropriate semantic context, the subject is in a problem-solving situation in which he must find a suitable organization of his store of previous knowledge" (p. 721). However, if the preceding statement of topic provides the contextual prerequisites for understanding, comprehension and recall is definitely improved.

Bransford and Johnson used topic sentences to convey the semantic context. However, the same information could have been converted into a title and it would have provided the same context (e.g., "The paragraph you hear will be about washing clothes." (Bransford & Johnson, 1972, p. 722) could have been written as Washing Clothes). Therefore, it is reasonable to assume that titles that clearly present the theme or topic, can provide the semantic context for ambiguous prose.

Dooling and Mullet (1973) noticed that one of the findings of Bransford and Johnson (1972) was that the effect of the thematic topic was at the encoding end of the process rather than after the passage had been read. Therefore, the focus of Dooling and Mullet's (1973) research (using similar materials and procedure to the Dooling and Lachman, 1971) was to explore the locus of effect for thematic titles before reading the material, after reading the material and when no title was provided. The results confirmed the Bransford and Johnson results. The locus of effect for thematic titles is at the time of initial input into memory storage. The effect for a thematic title before reading was $F(2, 66)=10.8, p<.001$). The group that read the title after reading the passage and the control group (no title) did not differ significantly. Moreover, the general effect of the thematic title was also significant.

Bransford and Johnson's 1972 research is also the precursor to Schallert's work in 1976. Schallert (1976) thought that "Bransford and Johnson provided strong evidence that context can increase the amount of information remembered from prose" (p. 621). She adds, "Context not only may make vague passages perfectly comprehensible, it also may affect the interpretation of messages which have two or more meanings"(p. 621). So, Schallert focused her investigation upon the biasing effect of context on the readers' comprehension of prose. For her study, Schallert constructed paragraphs that were ambiguous, not because they were vague or had unspecified referents as in Bransford and Johnson (1972), but because they allowed two different semantic interpretations. Schallert (1976) hypothesized "that subjects are likely to remember whatever semantic representation [that] is formed during the comprehension stage" (p. 622). Therefore, she continues:

It seems reasonable to expect similar contexts effects in the comprehension and memory of ambiguous paragraphs: Recognition performance should reflect the interpretations assigned to the paragraphs during the comprehension process. Thus, readers in the present study who were primed to perceive one meaning of a paragraph by the presence of a particular context were expected to choose more alternatives on a multiple-choice test which were consonant with this meaning than alternatives consonant with the other meaning. (p. 622)

Furthermore, she reasoned, "If context is assumed to improve memory by accessing previously acquired cognitive structures to serve as anchor and framework for new information, only readers who are processing the paragraphs meaningfully will be influenced by the content of their primed existing knowledge" (p. 623). Schallert (1976) used a 4 (task) x 2 (duration) x 3 (context) mixed design with repeated measures on the context variable with eight groups of 18 subjects who were randomly selected from a pool of university undergraduate student volunteers. Two of the tasks were semantically meaningful and two tasks were not. The contexts were a strong-meaning title (each title was six words long), a weak-meaning title and no title at all. The retention measures were a recall measure followed by a multiple-choice recognition test. The results verified Schallert's predictions. Schallert (1976) says, "Results clearly indicated that context in the form of titles predictably influenced the comprehension and memory of prose passages" (p. 629). She thought that titles served the function of determining which cognitive framework became accessed depending upon title content. However, her research showed that if the task that followed was not meaningful, then the titles were not effective in recall or recognition tasks. She notes though, unlike the research of Bransford and Johnson (1972), Dooling and Lachman (1971), and Dooling and Mullet (1973), who found that providing subjects with titles or short phrases describing content significantly affected recall, her subjects showed no improvement in amount of recall or recognition, only effect by context or interpretation. Schallert attributes this to her prose being less ambiguous than the prose of other researchers.

Pichert and Anderson (1977) conducted research that provides further evidence that perspective has an effect on comprehension and recall. In their experiment, subjects were given differing perspectives for the same paragraphs instead of titles. The researchers describe perspective as imposing a schema on text. Pichert and Anderson (1977) predicted that text elements to be learned would vary according to perspective. It is well documented

that people generally recall more of the top level information in a passage than low-level material. However, Pichert and Anderson (1977) hypothesize that:

... structure is not an invariant property of text, but rather that it depends upon perspective. If, for whatever reason, people take divergent perspectives on a text - that is, impose different high-level schemata - the relative significance of text elements will change. Elements that are important on one view may be unimportant on another. By definition, an important element "fits in" to an organized structure of information and is thereby, we hypothesize, more learnable. Furthermore, readers are more likely to pay careful attention to and deeply encode important elements. Hence, we predict that the likelihood a text element will be learned varies according to perspective.

Perspective may have further independent effects on the accessibility of text elements that have been learned. A high-level schema can serve as a retrieval plan, so to speak outlining the questions one should ask of oneself. The schema is bound to provide implicit cues for important elements but is less likely to do so for unimportant ones. Therefore, among those idea units that are stored, the important units will be more accessible and, it is predicted as a consequence, better recalled. (p. 309)

The results clearly showed that perspective influenced comprehension and recall.

Pichert and Anderson explain that their study:

found that people learn more of the important than the unimportant ideas in stories. What the present study demonstrated in addition is that the importance of an idea unit depends upon perspective: *It was an idea's significance in terms of a given perspective* that influenced whether it was learned and, independently, whether it was recalled. The first conclusion is that it is inappropriate to speak as though the importance of an idea unit were an invariant structural property of text. (p. 314)

The results are explained in terms of schema theory.

The same year that Pichert and Anderson were exploring the effects of perspective on comprehension and recall, Kozminsky (1977) obtained similar results using biased titles to alter text comprehension. Kozminsky focused on the one type of superordinate contextual information: titles in text. Kozminsky says:

If a title assumes the role of an anchoring point or superordinate context around which the text is organized, then biasing titles may alter the

comprehension of text. They may provide different interpretations to context elements in the text, or alternative organizations of the ideas in the text. Ideas that were central for one title may be less important when another title is used, and information that does not fit a biased organization of the text may be overlooked, as was shown by Schallert (1976). (p. 482)

In his research, Kozminsky uses immediate free recall as his measure of variation in comprehension depending on conditions. The free recall is scored on protocols patterned after the model of Kintsch (1974). Forty-five university students participated in this experiment as part of a course requirement. The students read three passages that were about 300 pages long. For each text, three titles were constructed: Two titles were biasing and one title was a compilation of the first two titles. The results showed that the main interaction between the titles and the theme-relevant propositions was significant ($F(2,72) = 5.92, p < .005$) but the effect of titles on overall recall was not. Kozminsky says:

Text comprehension is in part a selection process which is guided by advance information about the text in the form of title. This conclusion is suggested by both the differential recall of theme-relevant propositions and the lack of difference in overall recall and reading times of the texts as a function of the biasing titles. (p. 487)

He summarizes by saying "... a biasing superordinate context in the form of a title can alter text comprehension in two ways: by guiding the construction of a biased text base, and by rendering sets of propositions unconnected to it. Both ways can explain the differential recall of theme-relevant propositions" (p. 489).

Schwarz and Flammer (1981) continued the research on effects of thematic titles on various kinds of text structures: coherent, slightly disorganized and unstructured text. In their rationale, Schwarz and Flammer say:

... most readers are eager to find out the author's own schema in order to "understand him." For understanding a coherent text and storing and later recalling the important ideas out of it are processes that cannot work without grasping the general message or the schema that embraces the complete text. Orderly presented texts normally allow the reader to get out the general schema by himself. Nevertheless, this takes time and may be completed

only when parts of the text are already forgotten. A *thematic title* is expected to select and activate a schema from an already existing repertory of schemata and thus, to provide the reader with the general schema at the beginning, to protect the elements from being dismissed before their contribution to the whole is understood. Therefore, a title should enhance free recall even with a regularly structured and comprehensible text. The support of a title is likely to be more valuable, when the text is slightly disorganized, because it suggests suitable hypotheses for the reorganization of the material (Dooling & Christiaansen, 1977). However, there may be a point beyond which disorganization cannot be compensated by a title, at least with normal reading time (Schwarz & Flammer, 1979). (p. 61)

For Schwarz and Flammer, thematic titles consisted of at least one or more words that point to the main contents of the discourse. (In actuality, the title was a long detailed subordinate phrase.)

In Experiment 1, 48 college and first year university students volunteered to take part. The material chosen was a 247 word Norwegian fairy tale that was used in several ways: intact with the completely regular structure group, with its theme moved to the end for the slightly disorganized group, and with the theme randomly rearranged for the unstructured text. A 2 (title present or absent) x 3 (text structures) factorial fixed-factor design was selected. The dependent variables were comprehension ratings and free recall. The free recall was administered after a 10 minute distracter item. This was followed by the comprehension rating activity. The results on the free recall were significant for the title and for the structure. In addition, the interaction between titles and structure was also significant. In the comprehensibility rating, the only effect was for structure. In discussing these results, Schwarz and Flammer say:

A thematic title raised the free recall scores for the text with regular structure and the text with slightly disturbed structure, but not for the text with random sentence structure. The first two effects confirm the expectations derived from theoretical reflections. But they do not substantiate the suspicion of Schallert (1976), who on the basis of her results suggested a ceiling effect in the case of easily understandable texts. [The title aided recall in the structured passage almost equally, when the researchers had expected the slightly unstructured text to benefit the most from a thematic title]. The fact that titles have no effect under S- [unstructured text] limits the generalization one can draw from earlier studies by Dooling and Lachman (1971), Bransford and Johnson (1972) and Dooling and Mullet

(1973), that is, that titles typically help under difficult-to-read conditions. Texts may just be too difficult, even with titles. (p. 64)

Experiment 2, that involved only eight subjects in the final cell size, explored the unstructured condition under different time and title (present and absent) conditions. Schwarz and Flammer hypothesized that if the students had more time to study the passage with the title and the unstructured text, they would then find the title effective in improving comprehension and recall. The results showed a significant title and reading time effect. The comprehensibility rating was only significant for the reading time, not the title. The results confirm Schwarz and Flammer's main expectation. They say, "Prolonging processing time allows the thematic title to raise free recall of the text that was presented in random sentence order. This may be interpreted as the title suggesting a relatively suitable hypothesis for the reorganization of the material" (p. 65). In their general discussion, Schwarz and Flammer say:

Text titles facilitate recall of well-structured and perfectly comprehensible texts. Thus, even if a text is well comprehensible, thematic titles not only serve as text labels or attractors for readers, but are effective facilitators of encoding, storing, and later recalling the text, as they are for badly comprehensible, ambiguous texts. Thematic titles seem to affect the activation of cognitive structures and thus, to operate as an anchor point. Yet, the thematic title also increased free recall if text structure was slightly disturbed. In this case the title may also have operated as a cue in grasping the whole sense of the total text. On the other hand the thematic title did not lead to superior free recall, if text material was unstructured. This floor result suggested that texts may just be too difficult even with titles. Only prolonging reading time allowed the thematic title to raise free recall even of a completely disorganized text in suggesting relatively suitable hypotheses for the reorganization of the material. Thus, the effect of titles on recall of a scrambled text seems to depend on the time subjects have to read the text. Text structure and title both support understanding, encoding, and recall. They seem to be able to compensate one for the other.

Generally speaking, it seems as if a coherent text normally requires the reader to construct a sense of the total text. This requires time resources (Kintsch & van Dijk, 1978) which are not available for the encoding process. Giving the thematic title in advance relieves the reader of most of this task and therefore leads to better recall. (p. 65)

The focus of the study of Duin, Roen and Graves (1988) is not central to the theme of this thesis. They have become concerned with the effect that headings can have on readers if the headings represent the biases of the publishers. Their experiment, though, is one more piece of evidence that shows that headings can have an effect on the readers' comprehension and recall. The researchers gave students a passage to read with one of two headings. One heading had a positive bias and one version had a negative bias. The results of the written recall and attitude survey showed no significant differences between the two groups but there were significant effects for biased headings on delayed recall. Therefore, Duin, Roen and Graves conclude that although headings did not affect the processing during encoding, their data was "consistent with the position that the titles generated schemata which influenced what was remembered at retrieval, quite possibly by providing a retrieval plan to guide memory search" (p. 249). Moreover, headings can have a delayed effect on the attitudes towards regular text material. Duin, Roen and Graves say:

The most immediate educational implication of the existence of such an effect may be an emphasis on the importance and potential salience of headings in textbooks. ... texts sometimes contain headings which do not accurately reflect the content they precede. The present study supports the contention that such mismatches can indeed mislead subjects. ... although many people may read the same text, different people's perception may be altered by the publisher's choice for a headline. We found that evaluative headlines may not influence initial recall and attitudes, but they definitely can influence readers' later attitudes toward the contents of a text. (p. 249)

A number of researchers have commented on these studies that explored the effects of thematic title or statement.

Mayer and Bromage (1980) compare research on advanced organizers to title biasing studies. They thought it was necessary to use more natural materials such as textbooks in their study than the metaphorical or ambiguous materials used in the title studies. However, they liked the way some of the title studies did not rely totally on overall retention measures but instead analyzed individual idea units (Pichert & Anderson,

1977; Schallert, 1976). Mayer and Bromage found that conceptual ideas and relations in the text were mainly effected. This research also showed an locus of effect on the encoding end.

Wilson, Pfister and Fluery (1981) think headings have to be constructed carefully "because they influence a reader's perception of the text that follows" (p. 26). This idea is substantiated by Swarts, Flower and Hayes (1973), and Bransford and Johnson (1973).

Wright (1983) states, "... there are reports that headings can be unintentionally misleading (Swarts, Flower & Hayes, 1980) as well as facilitative (Schwarz & Flammer, 1981)" (p. 330).

Hartley and Jonassen (1985) agree that headings serve a contextual function. They say:

... headings cue the recall of appropriate knowledge structures which then aid comprehension. The context that is activated will determine the meaning that is assigned to the text. The more familiar the context, the more networks that are interrelated and available, the better a passage will be comprehended and remembered (Anderson, Spiro & Anderson, 1978). This theory provides a conceptual rationale for using headings. Nonetheless, the research that supports it employs intentionally ambiguous prose. The effectiveness of headings needs to be affirmed with natural, less ambiguous prose. The question is whether or not headings serve the same contextual function for prose that is well-organized and meaningful. Few studies have examined this question posed in this particular form. Schwarz and Flammer (1981) did find, however, that titles helped Swiss university students to recall Norwegian fairy tales. (p. 240-241)

Krug, George, Hannon and Glover (1989) say, "The influence of titles on students' memory for prose has been investigated in detail (e.g., Bransford & Johnson, 1972; Pichert & Anderson, 1977). In general, titles may help make ambiguous text more comprehensible and help readers establish a point of view to guide the encoding and retrieval of text" (p. 112).

In summary, headings in the form of titles or statements that provide contextual knowledge significantly affect the interpretation of material that is read. Titles and

contextual statements also aid comprehension and recall if the passage is ambiguous but do not necessarily aid comprehension and recall if the text is clearly written. Titles are not effective with reading material that remains meaningless in spite of the information provided by the title. These experiments also show that there is a clear effect for titles at the encoding stage of reading. However, some caution should be taken with the results in this section. Some of the research was conducted on narrative prose and not all results with narrative prose are applicable to expository prose.

Order

The second way that headings might function to clarify text structure is related to order or sequence of ideas. Struck (1983) says "(sub)heads mark definite divisions of a subject and should provide a reasonable clue to the contents of the text [Hence] Headings subdivide and organize text" (p. 340). Miles (1987), in his "Design for Desktop Publishing", said, "Subheadings can perform two functions. They can serve to break up a long text and make it seem less forbidding and they can make clear the relationship of one piece of text to another" (p. 44). When a writer develops textual material he must decide not only the themes and subthemes but the order in which ideas will be presented. As headings and subheadings break text into smaller sections and preview content for each section, headings (and subheadings) help to show the order of the author's ideas as one reads. Because headings are also typographically signalled (headings at the same level are cued with the same print type or features), the reader knows which concepts are related and the order in which the author presents these ideas.

If text is read in its presented order from beginning to end, the reader will probably focus on the interaction between the heading and the subtext that follows rather than by interrelating a series of ideas (Brooks, Dansereau, Spurlin & Holley, 1983). Therefore Brooks and his colleagues speculated that the inclusion of an outline plus headings would help readers process text more effectively. Brooks et al. (1983) thought:

... outlines may provide the reader with global information about the structure of a passage, whereas embedded headings may aid the reader in discovering the relationships between global information presented (outline) and detailed information presented in the passage. If these assumptions are correct, it would be expected that the headings/outline combination would be the most beneficial, since this combination would presumably provide both sources of information. (p. 249)

This would imply that Brooks et al. (1983) assume that readers will process text in consecutive order. In the survey phase of SQ3R (Robinson, 1970), one reading strategy has long been advocated. This strategy is to read all headings before the main body of the text is read. If this procedure is carried out, then the order that the author has subdivided the text in becomes clear and acts like an outline for the text. Therefore, studies involving headings and outlines will be reviewed.

Brooks et al. (1983), in their first experiment with 132 university psychology students, compared the effects of headings that were embedded in text to the effects of intact headings (outlines) using a series of immediate and delayed test measures (essay, outline, and multiple choice). All immediate test results were non-significant for the four treatment conditions (control with no intact or embedded headings; intact headings only; embedded headings only; intact and embedded headings combined). The only significant effects were in the delayed test situation suggesting that the effect of headings and outlines is during retrieval from memory rather than as a processing aid.

Krug et al. (1989) carried out three experiments involving 178 college students. In their first and second experiments, they found that students who received both headings and outlines outperformed (on an immediate recall test) the groups that received either outlines or headings. Outlines only or headings only groups outperformed the control group who received neither aid. In their third experiment, Krug et al. (1989), "examined the effects of headings and outlines on readers' ability to reorder statements taken from the text" (p. 111). They did this specifically to find out if headings influence knowledge of

text organization. "Students who read outlines prior to the text performed significantly better on the reordering task than students in any of the other conditions. Headings apparently had no effect on readers' ability to reorder statements taken from text" (p. 111). They concluded that outlines seem to provide readers with knowledge of text organization while headings did not. Headings were thought to activate only knowledge relating to specific segments that they precede.

More research is required to find out if headings are read before the text, do they act like an outline and aid comprehension by making the author's order or sequence of ideas explicit.

Hierarchical Levels

A third way that headings are thought to clarify text structure is by making the author's hierarchy of ideas explicit. Authors' accomplish this by using headings to highlight different levels of superordinate information (Goble, 1986; Meyer, 1985; van Dijk, 1979). Headings have the advantage of signalling the top levels of expository prose linguistically (Meyer, 1975) and typographically (Waller, 1979). Baine (1986) notes that typographic cueing can increase the chance that the cued material will be recalled, increase the reader's awareness of the underlying structure of prose and direct the reader's attention to important content (p. 168). Baine (1986), and Rennie, Neilsen and Braun (1981) think that if the content of headings summarizes the topic of the information that follows, then headings, that can make use of underlining, bold-face type, italics and larger sized print, all of which isolate and focus attention on the headings, then the effects should be more beneficial. Rennie, Neilsen and Braun (1981) found, in a series of experiments, that there was a relationship between cueing, reading achievement and familiarity with the text (the less familiar, the more useful the cueing). Poor achievers on unfamiliar text benefited from the main ideas being cued.

Meyer (1977), who has studied the structure of prose extensively, says:

The top-level information in the content structure is similar to what educators have identified as the main ideas of a passage and the interrelationships among these ideas. The top levels of the structure appear to carry the central message of a passage. In contrast, the low-level information in the content structure corresponds to ideas identified as detailed information. The low-level information in the content structure is not part of the central message of a passage although it often supports various aspects of the message; instead, the low levels of the structure appear to contain information peripheral to the central message of a passage. (p. 330-331)

Meyer (1977, 1987) points out a number of advantages that a reader has if the top level of text is signalled and, therefore, noticed. The top level structure "shows an author's perspective on the relative importance of the content related in his passage" (Meyer, 1977, p. 313). Meyer (1987) says,

... the purpose of the author can be identified by examining the content and relationships at the extreme top levels in the content structure; the idea units at this level of the structure embody the author's message. Thus, the top-level structure leads readers directly to the main idea of the text. (p. 61)

In addition to the main ideas of a text, top level structure can also show the type of expository text that is being used by the author. Meyer (1987) identifies four types of major rhetorical patterns of top level organization: problem/solution, comparison, causation and description. Lastly, Meyer (1977) thinks that, "In ... many learning situations the most efficient learning strategy is to use the writer or speaker's schema - the top level of the content structure of a passage - to organize the information presented for storage in memory" (p. 333).

A necessary component to the effective use of headings is the understanding of the categorization process that underlies hierarchical structure in text. Contee and Gerhard (1986) say, "Ideas are organized in a hierarchy of related categories moving down from the title, through chapter headings, main headings, subheadings, to paragraphs.

Comprehension of textbook material is not possible without understanding relationships among the different levels of ideas" (p. 1). Gerhard (1983) explains:

Expository text comprehension consists of integrating at least three structures: the written text, the concepts underlying the text, and the concepts or schemata already in the mind of the reader to which unfamiliar ideas can be related. These three structures are related through the categorizing process, which, in expository text, usually takes the classical form. This form defines attributes and sees items in a group as equivalent in some way. This implies the need to bring into the student's conscious range their own strength as categorizers in daily life, and then help them use this ability to perceive categories in text. (p. 1)

Gerhard (1983) says, "If structural cues or signals are seen, then the words are chunked, or grouped, into units with particular inner relationships. Each inner relationship can then be more minutely processed by syntactic, semantic, or cohesion methods If the cues are not seen, hundreds of separate pieces of information must be processed" (p. 5).

Gerhard (1981) concludes that "it is clear that an understanding of the categorizing process is absolutely essential" (p. 147). He explains, "Making sense in part is creating order through categorizing" (p. 142). "At the same time, seeing information in structural groups improves the chances of understanding and therefore of remembering it" (p. 146).

Experiments Related to Hierarchical Levels - A number of studies that explore heading function in terms of hierarchical levels of information have been carried out. These will be presented below in chronological order except when researchers have carried out several studies. Some other experiments that relate to the understanding of hierarchical information will also be presented. In these studies that focus on hierarchical levels of comprehension and recall it is important to stress that the reader is being asked to read for general understanding. Kozminsky (1977) cautions, "A distinction between reading for comprehension vs. reading for other goals may redirect the question of the locus of effect of a superordinate context to task variables" (p. 489).

- Lee (1965) used headings and subheadings as part of the way to make the hierarchy of the passage explicit to naval officer candidates. He then tested for number of main ideas, number of details and rote learning. His results showed that main ideas of a passage "are learned best if the hierarchy is rather painstakingly pointed out in the passage ..." (p. 142).
- Waters (1978) carried out two experiments on superordinate-subordinate structure in semantic memory. The first experiment involved 224 subjects from three age-based teaching groups - third grade, sixth grade, and college. She found that there was superior recall for top-level information and this result was found across all age groups and with differing materials. Moreover, all subjects recalled higher levels of information more than lower levels irrespective of comprehension strategies. In her second experiment, using 18 college students, Waters found that, "More recalled subordinate propositions were associated with recalled superordinate propositions than would be expected by chance at every level of superordinate-subordinate structure" (p. 595). These results support the hypothesis of Kintsch [based on Kintsch, 1974, 1977] "that recalled superordinate propositions cue the recall of associated subordinate propositions through their commonly shared arguments" (p. 596) and, therefore, "that the differential recall of higher-order propositions reflects fundamental structural properties of the representation of meaning in memory" (Waters, 1978, p. 592).
- Gibbs (1985), King (1985) and Stables (1985) each carried out a study involving the same research questions at two grade levels. However, each researcher used students from different grade levels. (Stables-grades 5 and 6; King-grades 7 and 8; Gibbs-grades 9 and 10). When the studies are considered together, the reader can compare the results for grade 5 to grade 10 and one has a better chance to see patterns or spot developmental

changes. King (1985) says, "Written recall was used as the method of obtaining a measure of comprehension of the passage because it provides for a purer measure than do questions (Clark, 1982)" (p. 11). [As these experiments involve both comprehension and recall, they will be discussed in both sections.]

From a larger sample population that completed an at-grade and below-grade (grade 4 readability) passage, 50 subjects from each grade were randomly assigned to heading present and heading absent groups. The researchers explored the number of ideas recalled at the superordinate and subordinate level, the organization of the recall and the format of the recall on a written free recall test. The results for numbers of ideas recalled and the organization of the recall generally showed no facilitating effect for headings present at either the superordinate or subordinate level and occasionally headings even had a negative effect (grade 10 students in Gibbs, 1985, found that headings had a significantly detrimental effect on superordinate recall and grade 8 students, who were good readers [over the 50th percentile on the Gates-MacGinitie comprehension test], in King, 1985, found headings had a detrimental effect on their recall of subordinate ideas from both the below-grade and at-grade passages). Over all the grades, headings had a significant positive effect on the recall of superordinate ideas only on the easy below-grade passage (Stables, 1985, found that headings had a positive effect on the number of subordinate ideas recalled on the below-grade passage by poor grade 5 readers [under 50th percentile on a Gate-MacGinitie comprehension test])). The presence of headings significantly affected format in that it led to a greater number of headings being used in the free recalls. Stables (1985) concludes that, "... it appeared that students in this study did not have the higher level skills to make use of headings in the writing of their passage recalls" (p. 103). King (1985) and Gibbs (1985) agree.

- Spyridakis (1986), commenting in a dissertation abstract, discussed the results of his experiment using college students with good comprehension skills on several long and difficult expository passages. He said:

The results showed that readers of signaled texts are aided by signals; signals facilitate readers in building a hierarchical framework in memory with which to accept incoming information. Specifically, headings and previews appear to help readers design the superordinate level of the framework, and logical connectives appear to help readers fill the lower levels. Moreover, headings and previews do not seem to produce additive effects, and headings and previews, functioning at the superordinate level, interact disordinally with logical connectives, functioning at the subordinate level. With relatively long, difficult expository texts, good readers will be aided by signals. (p. 4346-A)

These results seem to be in direct contrast to the work of Spyridakis and Standel written in the same year.

- Spyridakis and Standel (1986) in two experiments, explored the effects of headings and two other signaling aids (previews and logical connectives) "individually and together to test the hypothesis that one signal type or some combination as measured by tests designed to assess subjects' ability to recall subordinate and superordinate information, to make inferences from it, and to apply that knowledge in a posttest" (p. 346). Experiment 1, which involved a fairly simple passage, used 118 pre-engineering students and Experiment 2, which used a fairly difficult passage, had 250 similar students. The dependent measure, that was used in both experiments, was a multiple-choice test containing 10 questions (5 at the superordinate level and 5 at the subordinate level). The results, using a 3-way ANOVA, were not significant for headings effects in either experiment. The researchers hypothesized that headings, a type of signaling aid, should announce content before the reader encounters the actual content and therefore, help a

reader more clearly identify superordinate content. The results showed, however, that there were no significant effects for headings in either experiment. Spyridakis and Standel (1986) report that, "Of the three signal types examined, headings may be more of a closed issue in terms of comprehension. They serve a function for a reader, but it simply may not relate to helping a reader identify superordinate content" (p. 353).

- In 1987, Spyridakis and Standel undertook a longer and more complex study to explore the effects of three signaling aids. Using 371 pre-engineering students, the researchers had students read, over the school term, four technical passages that varied in reading difficulty from easy to hard. Versions of each passage were created with and without signals and various combinations of signals. Immediately after reading each passage, the students were given a 10 question multiple-choice test with 5 questions on the superordinate or implicit relationship level and 5 questions at the subordinate level. Only in the very hard passage, at the superordinate level were there significant effects for headings. In their discussion, Spyridakis and Standel (1987) say, "It appears that the grade level had quite an effect; if a passage is easy enough for its readers, then signals may be of little value" (p. 293). However, they conclude, "... the likelihood of demonstrating strong and consistent results increases when one uses passages of some length and difficulty on unfamiliar topics. Previews, headings, and logical connectives all appear to aid readers in their comprehension of expository prose" (p. 293).
- Wilhite (1986b, 1988a, 1988b, 1989) conducted a series of headings studies that partially focused on whether headings significantly affect students' memory for superordinate or subordinate level information.

The first experiment was discussed in Wilhite (1986b). He used 64 college students who were enrolled in psychology courses for course credit. Thirty-two students were randomly assigned to the headings present group and 32 students were assigned to the headings absent group. Two types of delayed multiple-choice retention questions were designed and given one week later. The posttest consisted of an equal number of main idea and detail questions. The results showed that the headings present group significantly outperformed the heading absent group but there was no significant difference in performance of the headings present group for main ideas or detail questions on the posttest. Commenting on the results of the 1986 experiment, Wilhite (1988b) says that he concluded that, "headings may produce a general enhancement in the availability of both high and low information in the passage" (p. 216). He thought that, "... it was of interest to determine if the same result could be obtained in a study employing a different prose passage. The factor of hierarchical importance was also included in order to determine to what extent this tendency of headings to promote memory for both main-ideas and details might depend on the reader's pre-existing knowledge about the topic" (p. 216). In Wilhite (1988b, 1988a, 1989), he explores this factor. [The details of these experiments were written up in the section on prior knowledge so only the results will be discussed.] In Wilhite (1988b), he found, "The facilitative effect of the headings for subjects with high preexisting knowledge was clearly specific to the main-idea information in the passage segments. The high preexisting knowledge subjects in the headings-present group significantly outperformed the high preexisting knowledge subjects in the headings-absent group on the main-idea retention test items but not on the detail retention test items" (p. 224). The second experiment reported in Wilhite (1989) found the same results. Wilhite (1989) said, "The findings in this experiment that the facilitative effect of headings on multiple-choice test performance was limited to subjects with relatively high levels of prior

knowledge of the topic confirm those of Wilhite (1988b) in a situation in which any potentially distorting effect of a pretest was eliminated and in which a different prose passage was used. The results of both experiments are consistent with the suggestion that part of the beneficial effect of headings derive from their tendency to activate relevant prior knowledge in the reader and that low-knowledge readers may thus have difficulty in using headings as organizational aids in the comprehension and retention of passage information" (p. 116-117).

Summary

Much has been written on the effects that headings potentially have on clarifying the structure of text and thereby, improving comprehension and recall. Research in this area has explored heading effects both generally (as signaling aids and organizers that aid comprehension) and specifically (improved comprehension through headings that represent the author's theme, show the author's sequence of ideas, and highlight the top-level information in text). The research results have been far from positive. Comprehension seems to be most affected by headings that clarify the author's theme or central idea. The research results involving headings as general organizers and headings as highlighters of superordinate structure were entirely non-significant, occasionally negative, or positive only under certain conditions. It is to the variety of conditions that affect whether headings function significantly as aids that one must look at if any sense is to be made of the results. These factors will be addressed later in chapter 2.

Heading Effects on Recall

Introduction

In the last section, the research studies showed that headings can function as aids to comprehension and it is crucial for people to comprehend what they read. However, it is also very important to retain the information in memory and be able to recall it at some later

date when the information is needed. Therefore, the focus of this section is to see, by reviewing the literature, whether the presence of headings functions to aid recall.

It has been found that comprehension usually effects recall because information that is understood is more likely to be recalled than meaningless material unless the incentives are very high for recalling the latter. Van Dijk and Kintsch (1983) say, "... the process of comprehending a discourse creates conditions that are very favorable for remembering. The well-structured, multilevel, coherent textbase that is the result of the comprehension process quite naturally functions as an efficient retrieval system so that just reading or listening to a text assures a respectable level of recall" (p. 364). Yet, van Dijk and Kintsch (1983) also state, "Comprehension and recall are correlated only up to a certain point ..." (p. 364). Furthermore, Trabasso warns psychologists about the attitude of assuming that "comprehension is practically synonymous with memory" (cited by Santa and Hayes, 1981, p. 5). Indeed, a number of heading studies use recall measures to discuss comprehension issues. Yet Baker & Stein (1981) say that although there is empirical support for the notion of a relationship between comprehension and recall of passage information:

... one should be cautious in concluding that something has not been understood because it was not remembered. A reader may have good comprehension during reading, but may not be able to remember the material later. Moreover, memory tests of comprehension are plagued with the possibility of a production or response bias. That is, the index of comprehension is based only on the subject's overt responses; it is possible that something will be comprehended at the time of the reading, and remembered at the time of testing, but excluded in the subject's response. (p. 10)

Although there is a link between comprehension and recall, in this study the terms are not used synonymously. The emphasis is focused on attempting to find out what the students are able to understand about a passage when recalled over time.

Recall is defined by Mandler (1989) as "the conscious construction of information retrieved from memory in response to some demand or requirement" (p. 90). Researchers, in headings studies, have tended to use a variety of recall measures that can be uncued or cued to lesser or greater extent. One frequently used uncued recall measure is free recall that involves asking the subjects to recall everything they can remember. (See chapter 3 for a discussion on the benefits of free recall.) Another uncued type of recall is gist recall where the student or subject is required to produce a short description of the gist or main idea of a piece of prose. Some cued types of recall measures are essay questions (with very little cueing), short answer questions, and cloze tests. Voss, Tyler and Bisanz (1982) note that short answer questions, which give a part of an item from a passage that has previously been read and request the student to supply the rest of the item, are especially helpful in research with children (p. 375). In addition to types of recall measures, recall effects may also be explored over different periods of time. Heading research has been carried out using both immediate (upon completing the reading task) and delayed recall. Delayed recall, for research purposes, can be any length of time as long as one intervening task has occurred before the subjects are required to recall information (Baumann, 1984). One to seven day delays are common in heading research. Goble (1986) theorized that "when recall is delayed, the effects of organizers seem to be more apparent" (p. 4). Anderson & Pearson (1984) have also commented on this effect. Therefore, when research is compared, differences in the type of recall and the time frame of the measures should be noted (cued, uncued, immediate or delayed) for each represent a different set of conditions.

Recall is only one type of remembering that is involved in output processing of previously read material. A different kind of remembering is recognition memory. Mandler (1989) considers that recognition memory has its basis on familiarity and the ability to recognize a link amongst information. The readers must decide if they have seen or heard the information before. This presented material activates its representation.

Sometimes, however, the reader is asked to choose among alternatives as to what seems the best choice. In multiple-choice tests, the information is embedded in distracter material. What is remembered in recognition memory might be quite different than what is remembered on a recall test. Because of this, it is important to specify the type of remembering that is being asked for and to avoid comparing the different types of remembering as if they are equivalent. (See Graesser, 1981, for a detailed discussion of different results in memory studies that use both recall and recognition measures.) This research explores the effects of the presence of headings on recall. Therefore, when considering recall, all heading studies that used recognition measures will be excluded. It is interesting to note that the heading studies, as shown in Tables 2.01 and 2.02, that use recognition measures exhibit the same mixed pattern of both significant and non-significant effects for the presence of headings.

Heading Studies

The influence of headings on recall is not clear (Hartley, Tobin & Trueman, 1987; Krug, George & Glover, 1989). Research studies show both non-significant and significant effects for headings on recall. However, a meta-analysis carried out by Hartley and Jonassen (1985) calculated an effect size for the presence of headings on recall at 0.27 or "one-quarter of a standard deviation higher than the mean of the control groups" (p. 242). In order to review this contradictory research on headings and recall, the different studies are grouped in three age categories and presented in order from earliest to the most recent studies. A number of research studies compare the effectiveness of headings plus other organizational aids but do not isolate the effect of the presence of headings (e. g. Lee, 1965) and therefore they will not be reviewed. The studies presented here all have one condition where the effect of the presence or absence of headings on recall is explored.

Table 2.01
Heading Effects on Immediate Recognition Memory

Study (date)	Exp. #	Type of Task	Statistical Significance
Christensen & Stordahl (1955)		multiple choice	-
Klare, Shuford & Nichols (1958)		multiple choice	-
Doctorow, Wittrock & Marks (1978)		multiple choice	+
Dee Lucas & Di Vesta (1980)		matching	+
Brooks et al. (1983)	Exp. 1	multiple choice	-
Jonassen (1983)	Exp. 1	multiple choice	-
	Exp. 2	multiple choice	-
Spyridakis & Standel	Biomedical passage	multiple choice	+ (Superordinate level)
(1987)	Biomedical passage	multiple choice	- (Subordinate level)
	Algae passage	multiple choice	-
	Nitrate passage	multiple choice	-
	Corrosion passage	multiple choice	-

Table 2.02
Heading Effects on Delayed Recognition Memory

Study (date)	Exp. #	Type of Task	Statistical Significance
Christensen & Stordahl (1955)		multiple choice	-
Brooks et al. (1983)	Exp. 1	multiple choice	+
Brooks et al. (1983)	Exp. 2	multiple choice	-
Wilhite (1984)		multiple choice	+
Wilhite (1986a)		multiple choice	-
Wilhite (1986b)		multiple choice	+

Studies at the Adult Level - By far the greatest number of studies of headings effecting recall have been carried out using subjects at the adult level, especially university students. In the following studies the researchers had significant results for heading effects on recall:

- Dee-Lucas and Di Vesta (1980) carried out a study involving 133 female university students enrolled in Education Psychology. Although the main thrust of the experiment was to explore learner-generated organization aids, there also was a 'heading only' condition. They found that, in a free recall test, the use of headings produced significantly greater immediate recall of subordinate text information than two non-heading groups (topic sentence context and unrelated sentence context). Dee-Lucas and Di Vesta (1980) say:

As predicted, of all the treatments the heading context resulted in the greatest recall of the topic-attribute pairings. This result must be attributed to more than the emphasis of the heading context on the topic information per se, since according to the results of the hierarchy test, the learners in the topic sentence conditions recalled the passage topics at least as well as the heading learners. The readers apparently *used* the topics as organizing concepts and actively search for relationships between the headings and the information (attributes) in the body of the paragraphs. (p. 310)

- Holley, Dansereau, Evans, Collins, Brooks, and Larson (1981) conducted a heading study using 95 students who were recruited from university psychology courses. There were 4 groups: control (no headings and no training), headings only, and two groups that received headings and training. The results showed no significant differences between the two groups who received headings and training and the group that received headings only, so the three heading groups were collapsed and combined to compare with the control group. The three groups that had headings

recalled 11% more information on an immediate recall test and 44% more information on a delayed recall test. Holley et al. (1981) found that the presence of headings facilitated recall in nonnarrative text especially when recall was delayed and therefore they suggest that headings are "more useful as retrieval aids than as comprehension aids, particularly when students have limited prior knowledge of the subject matter" (p. 234).

- Schwarz and Flammer (1981) had positive results for the presence of a heading (in the form of a thematic title) on free recall when they used narrative rather than expository material. The study has been discussed in more detail in the previous section on comprehension.

All the studies listed above have indicated that the presence of headings affected the ability of their subjects to recall information in a positive way. Not all heading recall studies have found significant effects. The research studies listed below did not find evidence that headings had aided the recall of their subjects:

- Robinson and Hall (1941) involved 205 university students from educational psychology courses to explore the effects of headings on comprehension and speed. They used Russian and Canadian history materials. One dependent measure used to assess comprehension was an immediate cued recall test. Their results showed no significant effects for headings. Robinson and Hall (1941) conclude, "The average college student apparently does not take advantage of one of the most useful devices in the study of textbook material" (p. 252).
- Jonassen (1983), who was focusing on text technology, compared different types of headings with passages that were blocked in a similar way that headings were but with space or horizontal lines as the dividing mark between sections of text. In the first experiment, 40 undergraduate students from two reading education courses at the university were placed in three

groups: text divided into sections using horizontal markers, text divided only with a space, and text divided with marginal headings. The results showed no main effects for any group on a probed recall test (multiple choice) and on a topic recall test given immediately after reviewing the passage. Jonassen thought that headings may benefit only younger, less skilled learners. However, because the passage was highly meaningful to the students and well instantiated (on teaching methods), Jonassen also noted that headings might be more helpful with less meaningful, more ambiguous or less organized prose. In Experiment 2, that involved 45 undergraduate students who were taking educational psychology courses, he examined the effects of 4 conditions: continuous prose, a content marker version (with labels telling the type or function of content), semantic markers (headings), and a version with questions in place of headings. The results were not significant for the heading group on topic recall. The only positive result was that headings reduced the amount of verbosity.

Jonassen hypothesized that older, more developed learners prefer to use their own organizational strategies in comprehending a passage.

- Hartley, Tobin and Trueman (1987) conducted a heading study, involving 24 blind adults whose ages ranged from 17 to 80, to explore whether the presence of headings made a difference in immediate oral recall after reading a passage in Braille. Although there was a tendency towards headings having an effect, the results did not show a significant effect for the presence of headings.

A few heading recall studies had mixed results from their research. These studies are listed below:

- Brooks, Dansereau, Spurlin and Holley (1983) explored the effects of headings on text processing using 238 college students from psychology

classes in two experiments. Two passages were chosen from scientific material and the passages were considered to be relatively unfamiliar to the students. In Experiment 1, there were four groups: headings and outlines combined, headings only, outlines only and the control group without headings or outlines. The three types of dependent measures were immediate and delayed multiple choice tests (the results of the multiple choice tests are listed in Tables 2.01 and 2.02), immediate and delayed essay recall (organized summary of passage), and an outline test (students were asked to create an outline after looking at a sample). The results of Experiment 1 showed no significant difference in the four groups on immediate essay recall (or any of the other measure). However, on delayed essay recall, the headings only group significantly outperformed the control group. In Experiment 2, there were three groups: headings and instruction, headings only, and no headings with no instruction. The same dependent measures were used. Unlike the first experiment, in this experiment, the headings only group did not outperform the control or instruction group on any measure. The researchers found these results "somewhat puzzling in light of the findings of the first experiment, which showed a relatively strong positive effect for embedded headings without explicit instructions at [the] time of delayed testing" (p. 300). Because this experiment omitted the immediate tests and a questionnaire on heading use, it was thought by the researchers that the students in the first experiment were sensitized to headings and therefore, the primary effect of instruction was to sensitize the students to the headings.

- Krug, George, Hannon and Glover (1989) conducted an experiment to look at the effects of outlines and headings on the readers' recall of prose. Four conditions were explored: control (no headings and no outline), headings

only, outline only, and headings combined with an outline. In the first experiment (n=62 undergraduates) using artificial material and second experiment (n=56 undergraduates) using regular text material, Krug and his colleagues found that headings had a significant facilitative effect on the subjects' free recall that followed immediately after each student had finished reading the essay. The combination of headings and outline was significantly higher than both the outline and headings only groups. A third experiment (n=60 undergraduates) was carried out to find out if headings or outlines facilitated the students' ability to reorganize paraphrased text statements in the order of the text that they appeared in the text. Headings did not aid the readers' recall to the text material while outlines did.

As suggested in chapter 1, the presence of headings showed mixed results on the recall of adult subjects. However, in studies where free recall was assessed, the statistical results showed that adults consistently found headings helpful in aiding their recall.

Studies at the High School Level - A number of studies have been carried out at the high school or the comprehensive school level exploring the effect of headings on recall.

- Hartley, Kenely, Owen and Trueman (1980) explored heading effects on recall with 175 high school students (in their second year of a comprehensive school). A four hundred word passage was prepared with four versions: control (no organizational aids), a passage with a title, a passage without a title but with underlined headings in the form of a statement, a passage with underlined headings in the form of a question. The results show that headings in the form of statements or questions significantly outperformed the title only group and the control group. Hartley et al. (1980) state that, "The headings had a marked effect - and this

occurred in prose which is not normally considered suitable for headings. (Headings generally appear in more technical writing than in English Literature.) The findings suggest the value of including headings in light non-fiction as well as in technical prose" (p. 306).

- Hartley and Trueman (1983) conducted a study on the effects of headings on recall, search and retrieval using 1,270 participants from a fourth year comprehensive school (14 and 15 year olds). The researchers used a 1,000 word passage that was considered slightly difficult for the age level (more suited to 15 or 16 year old students. The results from a series of experiments (Experiment 1, 2 and 7) showed a significant effect for headings on immediate short answer recall questions.
- Hartley and Trueman (1985) carried out 17 further experiments exploring heading effects at both the high school level (with 14 and 15 year olds) and at the elementary school level (age 11 and 12). In addition to studying recall, search and retrieval, Hartley and Trueman also explored types of heading (statement or question headings) and position of headings (marginal or embedded). Three experiments explored, among other aspects, the effect of headings on recall. Both Experiment 1, with 170 fourth level comprehensive students, and Experiment 2, with 155 students at the same school level, subjects read a fairly difficult expository passage (as determined by the Flesch Reading Ease scale). In Experiment 12, subjects who were 14 and 15 years old, read an easy passage. The results of all three experiments with 14 and 15 year old students, who read either a fairly difficult passage or an easy passage, consistently showed that headings had a significant effect on short answer recall. Because the researchers have carried out a series of experiments using several passages, they think that

their conclusions "are much firmer than those obtained in previous 'one-off studies" (p. 152).

- Gibbs (1985), King (1985) and Stables (1985) conducted parallel studies on the effects of headings on written recall and organization of expository text in the grades 5 to 10. Each researcher conducted research at two specific grade levels and then compared their results over the six grades. At the high school level, King explored heading effects with grade 8 students and Gibbs studied heading effects with grade 9 and 10. The focus of this combined research was absence and presence of headings and number, organization, and format of superordinate ideas recalled. The results showed no significant effects for the presence of headings on the number of superordinate or subordinate ideas recalled in a free recall test for grade 8, 9, and 10 students when they used very easy (low readability) reading material and grade level reading passages. Going to the opposite extreme, in one sample the headings present group did significantly worse than the group without headings. Moreover, the headings did not improve the students' ability to organize superordinate or subordinate levels of recall. The only partial effect found for headings was an improvement in the format of the written recall of the students. Generally, these results on recall, organization and format were found at all grade levels in the three parallel studies with the following exceptions. In grade 8, the higher reading ability group with headings scored significantly lower on the free recall than the group without headings on both the low readability and grade level passage.

Once again, the research with high school students showed mixed results. Free recall measures showed less of a heading effect with this age group than in studies with adults while high school students found cued recall more affected by headings.

Elementary School - Only a few studies have been carried out at the elementary school level exploring the effect of headings on recall. As these studies involved a similar age group to those in the present research, each study will be examined in more detail than previously discussed studies with older subjects.

- Landry (1966) researched the effects of organizational aids using 314 grade 5 students. Landry randomly assigned the students to four treatments: group 1 was the control group that read a passage with no organizational aids, group 2 read a passage with the addition of an introductory section stating a problem or questions relating to the passage, group 3 read the passage with the introductory statement or question plus a summary, and group 4 read the passage with all the previous aids plus headings. The students were given a recall test as soon as they finished reading the selection. Seven days later, the subjects received the same test again. Landry found that none of the organizational aids (even the headings) significantly effected either immediate or delayed recall.
- Stables (1985), who carried out parallel studies with King (1985) and Gibbs (1985), conducted research at the grade 5 and 6 level using a posttest only with control group design with 50, per grade, of regular, non-streamed students from three school districts in the Lower Mainland of British Columbia. In this study, one of his objectives was to explore the ability of grade 5 and 6 students to use headings to facilitate recall at the superordinate and subordinate levels using the descriptive form of expository prose. (Some other objectives were discussed previously in the comprehension section.) This objective was explored using the following question (Stables, 1985, p. 2-3):

In a written recall task, are more superordinate or subordinate ideas recalled when the prose to be recalled has headings or no headings:

Within each grade level?

Within each grade level by reading level?

Over grade levels 5, 6, 7, 8, 9, and 10?

Stables, at the grade 5 and 6 level, found the presence of headings did not significantly effect the number of superordinate or subordinate ideas recalled within each grade on at grade or below grade passages. However, he did find that poor readers (those with Gates-MacGinitie Reading Comprehension Test scores below the 50th percentile) found headings were a significant help in recalling subordinate ideas from the easy, below grade level passage (The Parrot). If the results of all grades in the joint studies are compared, there was a significant effect for headings in the recall of superordinate ideas on the Parrot passage (rated at the grade 4 level of difficulty). However, these results were not significant at the grade 5 and 6 level.

- King (1985) carried out part of her experiments using 50 grade 7 students randomly selected from three regular non-streamed classes. She followed a similar procedure to Stables and Gibbs and explored the same question (see Stables above) using one passage at the grade 7 level and one easy expository passage. Kings' results showed no significant differences ($p < .05$) in free recall of superordinate or subordinate ideas with or without headings on either the easy or grade level passage.
- Hartley and Trueman (1985), who conducted a series of experiments with 14 and 15 year olds (see reference in high school section above), replicated their experiments with 11 and 12 year old students using a different passage. This textual material was approximately 1,000 words and was rated as fairly easy on the Flesch Reading Ease scale. The passage that was used for the 11 and 12 year old subjects contained more narrative parts and

fewer facts than the television passage used with the 14 and 15 year old students. Six versions were prepared. Four versions contained the passage with headings that appeared as embedded and marginal statements, embedded and marginal questions and two versions contained the passage without headings but different layouts. Hartley and Trueman then carried out two experiments using different combinations (the results of some of these combinations will be discussed in a later section under *Types of Headings*). Experiment 10 consisted of 100 subjects who were eleven or twelve years old while Experiment 11 involved approximately 190 students of the same age. As soon as the students had completed reading their version of the passage carefully, they wrote a short 10 question recall test. The results of both experiments showed no significant effects for the addition of headings to the passage material. Hartley and Trueman concluded that younger pupils were not able to gain from the presence of headings on an easy passage.

Summary - The results of the reported research studies on the absence or presence of headings and their effect on recall have been summarized in Tables 2.03 and 2.04. As stated previously, the results are conflicting. Delayed recall measures have been suggested as being more effective (Goble, 1986; Holley, Dansereau, Evans, Collins, Brooks and Larson, 1981). Unfortunately, there are not enough studies that have been carried out with delayed recall to draw any conclusions. One pattern that does seem to emerge, regardless of whether the recall was immediate or delayed, is an age effect. The younger students (at the elementary level) did not seem to be able to use headings to improve their recall in any experiments whereas older students (high school level) and adults seemed to be more likely to use headings effectively. However, even high school and adult subjects were not able to consistently use headings to improve recall.

Table 2.03
Heading Effects on Immediate Recall

Study (date)	Exp. #	Type of Task	Statistical Significance
<i>Adult level</i>			
Robinson & Hall (1941)		cued recall	-
Dee-Lucas & Di Vesta (1980)		free recall	+
Holley et al. (1981)		free recall	+
Brooks et al. (1983)	Exp.1	essay recall	-
Jonassen (1983)	Exp. 1	topic recall	-
	Exp. 2	topic recall	-
Hartley et al. (1987)		oral recall	-
Krug et al. (1989)	Exp. 1	free recall	+
	Exp. 2	free recall	+
	Exp. 3	recall order	-
<i>High School Level</i>			
Hartley et al. (1980)		cued recall	+
Hartley and Trueman (1983)	Exp. 1	cued recall	+
	Exp. 2	cued recall	+
	Exp. 7	cued recall	+
Hartley & Trueman (1985)	Exp. 1	cued recall	+
	Exp. 2	cued recall	+
	Exp. 12	cued recall	+
Gibbs (1985)	Grade 10	free recall	-
	Grade 9	free recall	-
King (1985)	Grade 8	free recall	-
<i>Elementary School Level</i>			
Landry (1966)		recall test	-
Hartley & Trueman (1985)	Exp.10	cued recall	-
	Exp. 11	cued recall	-
King (1985)	Grade 7	free recall	-
Stables (1985)		free recall	-

Table 2.04
Heading Effects on Delayed Recall

Study (date)	Exp. #	Type of Task	Statistical Significance
<i>Adult Level</i>			
Holley et al. (1981)		free recall	+
Brooks et al. (1983)	Exp. 1	essay recall	+
	Exp. 2	essay recall	-
<i>High School Level</i>			
Hartley et al. (1980)		cued recall	+
<i>Elementary School Level</i>			
Landry (1966)		recall test	-

In this first section on the functions of headings, it has been shown that headings can and sometimes do affect comprehension and recall. However, the results are not consistent. In the second section of chapter 2, other factors that might exert an effect on the usefulness of headings are explored.

POSSIBLE FACTORS THAT INFLUENCE HEADING EFFECTS

Introduction

In the first section of chapter 2, the effects of the absence or presence of headings on comprehension and recall were explored. The results have been very contradictory. Yet, enough studies have been carried out on the effect of headings that one can have little confidence in statements that suggest that headings do not serve any function in improving comprehension or recall. As discussed in chapter 1, there are a number of textual factors that are thought to influence the effectiveness of headings. In addition, there are a number

of factors that the reader brings to the text that possibly might affect whether headings are useful. In this section, other factors that might affect whether headings are useful or not will be explored.

Textual Factors that Might Influence Heading Effectiveness

There are a number of factors in the text that have been explored by heading researchers as possible influences on heading effectiveness. These factors are type of headings, position of headings, the frequency of headings and the type of text that accompanies the headings.

Type of Headings

Researchers have looked at several aspects about the type of headings that have been used. These aspects are the form, the length, and the content of the headings.

Form of Headings - The aspect that has received the most attention concerns the form of the headings, probably because results have been conflicting. The researchers have explored quite extensively whether headings in the form of statements or headings in the form of questions are most effective in improving comprehension and recall of low-ability students.

Several studies showed that headings in the form of questions were more effective than headings as statements. Hartley, Kenely, Owen and Trueman (1980) found that question-type subheadings were significantly more effective with low-ability students. Hartley and his colleagues thought that this study should be replicated to see if similar effects occurred. Consequently, Hartley, Morris and Trueman (1981) further explored whether headings written as questions were more effective with low-ability students than headings written as statements. Their study involved 21 high school remedial reading students (with reading ages of 7-10 years of age) and matched them on reading age and IQ. The results showed that headings

written in the form of questions were 15% higher for the same passages than headings in the form of statements when immediate cued recall questions were asked. The same significant results were found a week later when the students were retested with the same questions. Lower-ability students benefitted from headings written in the form of questions.

Conversely, a number of researchers have found that headings in the form of questions are not significantly more effective than headings in the form of statements. The first study that examined this factor was that of Christensen and Stordahl in 1955. They used 2 passages (technical and philosophical) with 36 versions (12 with headings as questions and 12 with headings as statements) on adult air force trainees. Their results showed no difference for headings as questions or headings as statements. Much later, Hartley and Trueman, in 1983, carried out three experiments (7, 8, and 9) comparing headings as questions and heading as statements, and they found that there were no significant differences between the two types of headings. In 1984, Hartley, Trueman and Pigram continued to explore the effects of headings written as statements or questions using low-ability students. This time three studies involving large sample sizes were conducted. In the first experiment, approximately 190 students between the ages of 11 and 12 were included. In the second experiment, 110 lower-ability pupils aged 14 to 15 years old were involved, and in the third experiment, approximately 140 low-ability students aged 14 to 15 were involved. Each pupil read a 1,000 word passage with either question headings or statement headings and when they had finished this, the subjects completed a factual recall test. The first and second experiments had a fairly easy passage with a Flesch reading ease score of 84 while the third experiment contained a passage that had a Flesch reading ease score of 55 which is considered fairly difficult. Unlike the earlier studies, no significant differences were found in favour of headings written as questions or headings

written as statements with these low ability students. They account for this difference by saying that the earlier studies had small sample size (10 or less in each group) and short text (approximately 350 words) and different ratings for low-ability. In the third study, Hartley et al. (1983), used a longer passage but again, they used a small sample size. Hartley, Trueman and Pigram (1984) say, "One particular problem with all of our studies so far has been that our definition of low-ability has been both inconsistent and somewhat crude (largely because low-ability has been a side issue). So far we have usually accepted the schools' designation of low-ability (and this can vary - and has indeed varied - in different schools)" (p. 4). In this study, large sample sizes were used and each pupil completed a cloze-type reading test after they finished answering questions on the 1,000 word passage. In their conclusion, Hartley, Trueman and Pigram (1984) say "In these three studies, with larger sample sizes and with better measures of ability we have failed to find any significant difference between the recall of low-ability pupils reading text with headings in the form of questions and low-ability pupils reading the text with headings in the form of statements" (p. 6). However, they note that in five of six comparisons the group with headings in the form of questions did slightly better but not significantly than the group with headings in the form of statements.

Finally, Hartley and Trueman (1985) carried out a series of experiments concerning types of headings. The results of experiments are summarized by Hartley and Trueman in the following way:

Headings as questions were directly compared with headings as statements in Experiments 7, 8, 9, 11, 15, 16 and 17, and the last three of these used low-ability participants. None of these experiments, however, produced significant differences Experiments 15, 16 and 17 which focused on the recall of low-ability participants failed to replicate earlier findings which suggested that low-ability pupils profited more from headings in the form of questions than headings in the form of statements. A meta-analysis of the results of all the studies considered in this article also indicated that there was little to choose between the effectiveness of

headings written in the form of questions and headings written in the form of statements. The average effect-size was 0.14. (p. 151-152)

Heading Length and Nature - Another aspect of heading type concerns the nature of headings combined with the length. Doctorow, Wittrock and Marks (1978) conducted an experiment that involved 488 students who were 10 to 12 years old and in sixth grade. One treatment group received one word headings in the form of the noun that was used most frequently in the paragraph that followed. Another treatment group received two word headings. These headings included the noun used in the first treatment group and a descriptive word that represented the theme of the paragraph. These one and two word headings were also used in combination with generative processing treatments. The results showed that two word headings were more effective than the one word headings when in separate treatment groups and when combined with other features. They did not question whether using a theme centered word was more effective than picking a noun subject word.

Spyridakis and Standel (1986) compared the effects of previews with headings and logical connectives. They found that the previews aided literal and inferential comprehension while headings and logical connectives did not. They say, "One could speculate that the real difference in a reader's perception of these two signals is that the previews are actually headings phrased in sentence form, i.e., accompanied by a subject and a verb. It may be that the addition of a subject and a verb (the sentence form itself) logs into the reader's memory more permanently than does a phrasal heading. Indeed, much readability research discusses the merits of clauses over phrases" (p. 353). It is notable that Spyridakis and Standel found that previews improved the comprehension of technical expository prose in their subjects whereas headings and logical connectives did not. As headings and previews both act as signaling agents that preannounce content, they were surprised to find that headings were not effective.

Little has been researched about the length of the heading. It may be that the content is more important than the actual length of the heading in having an effect on comprehension and recall.

Heading Content - Eggen, Kauchak and Kirk (1978) found the use of hierarchical headings provided to grade 4, 5, and 6 students, when reading a thousand word passage in the area of mathematics, helped the hierarchical heading group to significantly outperform the control group that did not have hierarchical headings on comprehension and production subtests. Hartley and Jonassen (1985) have "suggested that hierarchically-structured headings may aid recall if the text structure is more complex" (p. 246).

Numerous studies have examined the influence of headings on comprehension (see the previous section on Headings as a Comprehension Aid). Hartley and Jonassen (1985) say that headings can be misleading in nature when they do not reflect the text structure. They say, "Swarts, Flower, and Hayes (1980) showed that inappropriate headings in bureaucratic documents prevented readers from being able to predict information included in any section, thereby hindering comprehension of the document" (p. 244). Moreover, Duin, Roen and Graves (1988) found that publisher's choice of headings can influence readers' later attitudes and this can be unfortunate if the publisher's biasing headings do not support the factual material presented in the text material. However, it was also seen that the content of headings can provide a perspective or a theme that readers find helpful (Bransford & Johnson, 1972; Schwarz & Flammer, 1981).

Position of Headings

A number of researchers have explored whether position of headings influences their effectiveness. In 1983, Hartley and Trueman carried out six experiments comparing headings that were embedded in the text and headings that were placed in the margin.

None of these experiments showed any significant differences between embedded headings and headings in the margin on recall, search and retrieval. In 1985, Hartley and Trueman carried out six experiments to explore heading position using over one hundred 14 and 15 year old high school students in each experiment. The results were not significant for any experiments so Hartley and Trueman ceased exploring this variable with this age group. The researchers then replicated their experiments with 11 and 12 year olds using a different passage that was more appropriate for younger students. Once again, headings that were placed in the margin were no more effective than headings that were embedded. These results tend to suggest that either position for headings is equally effective for elementary and high school readers. No experiments were found at the adult level and it may be unlikely that adults would find one heading position more effective than another if younger, less experienced readers were found to be equally adept at using headings in either position.

Frequency of Headings

Klare, Shuford and Nichols (1958) examined the question of heading frequency with 1,175 adult airmen at a training base. There were three arrangements of format. One group had a high level of headings (major headings plus headings for every paragraph), a second group received an ordinary amount of headings (2 major side heads, 1 general run-in heading, and 5 run-in headings for groups of related paragraphs) and the subjects in the third treatment group had a low level of headings (no headings but had 17 paragraph divisions) when reading a 1,206 word technical, expository passage. There was no main effects for heading frequency but there was a significant interaction effect: The high aptitude group receiving a high level of headings was able to outperform all ability levels receiving other versions (ordinary and low levels of headings) on an immediate multiple-choice comprehension test. The researchers attempt to account for this by saying that the

highly technical and complex nature of the text material might have caused only the more able students to use the headings to improve comprehension.

Type of Text

Technical Versus Semi-Literary - In 1955, Christensen and Stordahl used 2 different types of passages (technical and philosophical) with 36 versions on adult air force trainees. The technical passage presented elementary principles of aerodynamics and was 2,600 words in length while the other passage was 3,800 words in length and discussed the ideology of international communism. No significant effects were found on the two immediate and the two delayed comprehension tests on any of the versions using either type of text at the .05 alpha level of significance.

The next study produced different results. Klare, Shuford and Nichols (1958), as a result of their research (see Klare et al. in the previous section on Frequency of Headings) make the following comments on their findings of an interaction of high ability with high levels of headings when using highly technical text:

It seems possible to the writers that the highly technical, and therefore complex, nature of the material used here may at least partially account for this; the subject-matter was clearly more technical than that used in the previous studies. This notion gains credence from a consideration of the different types of material readers may encounter. Fiction, the least technical type, is least likely to have headings; the same is true for light non-fiction. As the material becomes more complex, and especially as it reaches the rather technical level of the college textbook, headings become more common. In other words, the results of this study seem to be in general agreement with the approach that writers have come to adopt over the years on empirical grounds. (p. 44-45)

Ambiguous Text - Bransford and Johnson (1972) conclusively showed that an unambiguous title (one type of heading) could significantly affect comprehension results when the subjects were asked to read rather ambiguous prose.

Difficulty of Prose - Jones (1986) suggests some aspects of texts that make them easy or difficult. He says texts can range in difficulty from "very easy (simple, short, explicit, familiar, concrete) to difficult (complex, long, implicit, unfamiliar, and abstract) ..." (p. 9).

Hartley and Trueman (1985) showed that 14 and 15 year old students who read text with headings on a fairly difficult semi-technical passage and a fairly easy semi-literary passage (both as judged by the Flesch Reading Ease Scale) found headings aided search, retrieval and recall over a series of experiments. It has been noted that the harder passage was on a topic (television) that the students probably had a high degree of experience about whereas the easier text might have been less familiar (Louis Braille). However, this aspect was not discussed by the researchers.

Baumann (1986a) found that if inconsiderate text was made considerate, then grade 5 students' main idea comprehension improved. Content area prose was made more considerate by rewriting the textbook material to make the headings cue the main ideas, making the main ideas explicit and having them appear at the beginning of the text. All grade 5 students that received the considerate text versions were able to recall and write significantly more main ideas for the paragraphs. Moreover, some of the children were able to compose significantly more passage ideas. This tends to indicate students are more able to use headings to aid comprehension and recall of main ideas when the text material is considerate rather than inconsiderate.

Spyridakis and Standel (1987) found that the three signaling aids (headings, previews and logical connectives) that they were exploring were most effective in improving comprehension on material that was neither too easy or too difficult. They say, "It appears to us that the likelihood of demonstrating strong and

consistent results increases when one used passages of some length and difficulty on unfamiliar topics" (p. 293).

A number of studies presented their subjects with passages reported to be at grade level and below grade level (Coulombe, 1986; Gibbs, 1985; Goble, 1986; King, 1985; Stables, 1985). Gibbs (1985), King (1985) and Stables (1985), when they compared the overall means from grade 5 to 10, found that headings seemed to positively affect the amount of superordinate ideas recalled from the easy, below grade passage (grade 4 level). They did not find this effect for the at-grade level passage (Stables, 1985, p. 87)

Kintsch and Vipond (1979) discuss the problems of reducing readability of passages to a single score. They say, "readability is not somehow an inherent property of texts but is the result of the interaction between a particular text (with its text characteristics) and particular readers (with their information-processing characteristics)" (p. 363). Kintsch and Vipond suggest that there are numerous factors that make a text hard or easy for people to read. Graesser (1981) also discusses ease or difficulty of a passage in terms of the ratio of inferred information to explicitly stated, and based on the amount of structure a passage has.

Relating heading effects to difficulty of text material is obviously not an easy matter and so far, no heading studies have examined this factor as a major focus of their research.

Factors of the Reader that Influence Heading Effectiveness

Headings have been shown to positively effect the readers' comprehension and recall on some occasions and not on others. In the last section, some text factors were shown to influence the effectiveness of headings. In this section, the focus is on factors that the reader brings to the task that affect whether s/he will be able to use headings to aid comprehension and recall. Some factors, such as interest in the reading material, attention

to the task and the reader's mental state, are very important to all reading comprehension and recall but these factors have not been specifically isolated by heading researchers as factors that might directly affect the usefulness of headings. Researchers have chosen to explore the following factors in conjunction with the effectiveness of headings: age, sex, reading ability, background knowledge, preference about headings and the amount of awareness the reader has about how to use headings.

Age

Heading research has been carried out on three main age groups. The most extensive number of studies have been carried out using adults who were either university students or students in some form of training program. A fair number of heading studies have used high school students, especially at the 14 and 15 year old level. A small number of studies have used upper elementary students. If one examines Table 2.03, the research to date seems to show mixed results for heading effects on recall in the high school and adult samples used in the research studies but no significant effects for headings at the elementary level on either immediate or delayed recall. Therefore, the factor of age might influence heading effectiveness.

A number of studies have compared two age groups or have carried out parallel studies that compared the results of a series of age groups. Hartley and Trueman (1985) compared the results of 11 to 12 year olds and 14 to 15 year olds using a fairly easy (84 on Flesch Ease Scale) passage (approximately 1,000 words) on recall, search and retrieval. They found that the 14 to 15 year old students were able to use headings to significantly improve recall, search and retrieval while the 11 to 12 year olds were only able to use headings to significantly improve search and retrieval but not recall. The 14 to 15 year old students were also able to use headings to improve recall when reading a more difficult passage. Hartley and Trueman suggest that age and experience was a factor in the differing results.

Interestingly, Hartley and Jonassen (1985) summarize their overview of heading research by saying, "It is possible that headings will be of particular benefit to younger, less-capable, and less-developed learners. Learners who are less-capable of organizing and structuring materials may gain more from headings which provide the necessary structural cues" (p. 249). Maybe Hartley and Jonassen needed to specify what they meant by younger. It should be noted that Hartley, Kenely, Owen and Trueman (1980) found that 12 to 13 year old students in the first year of a British comprehensive school were able to use headings to significantly improve both immediate and long term (14 days) recall.

In Canada, Stables (1985) using grade 5 and 6 pupils, King (1985) using grade 7 and 8 pupils, and Gibbs (1985) using grade 9 and 10 subjects, in parallel studies, examined heading effects on levels of recall and organization. Their overall results showed no effects for headings on subordinate or superordinate recall. Stables concludes, "... it appeared that students in this study did not have the higher level skills to make use of headings in the writing of their passage recall" (p. 103). However, the three researchers noticed a developmental trend by age or grade level. Older students tended to recall more superordinate and subordinate ideas on the easy reading passage (approximately grade 4 level) than the younger students. The three researchers found that certain grade levels fit into one of two categories. The mean scores of the grade 5 and 6 students made up the lower group and the mean scores of the students in grade 8, 9 and 10 made up the higher group. The grade 7 students varied and, as individuals, fitted in either the lower or higher group. Stables, King and Gibbs speculate that Piaget's theories of the preadolescent phase at 11 to 12 years of age and the adolescent stage at 14 to 15 years and older stage might explain their findings. When the number of ideas recalled at the superordinate and subordinate level using at-grade level passages were compared, there were no significant differences.

Sex

A number of studies statistically analyzed data concerning whether boys or girls found headings more effective. This was not found to be a significant factor in heading effectiveness. Hartley and Trueman (1985) conclude, "... the differences between the sexes have not shown themselves to be important" (p. 133).

Reading Ability

It has been found that reading ability affects the comprehension performance of subjects (Baumann, 1984) and generally affects the subject's recall performance (higher reading ability students outperform middle reading ability students who outperform lower reading ability students). Therefore, research subjects in many of the studies have been first divided into two (e. g., below the 50th percentile and above the 50th percentile) or three reading ability groups (high, middle and low reading groups) and then randomly assigned to treatments (creating an equal number of high, middle and low reading ability students in each type of treatment) so that the results are somewhat controlled for reading ability. By setting up their studies in this controlled fashion, researchers are then able to examine their results to see if one ability group benefits more from headings than any other groups.

Hartley and Trueman (1985) examined the effects of headings and ability in their first fourteen experiments. They say:

In all cases groups defined as "high-ability" did significantly better than groups defined as "low-ability", and in all cases except one there were no significant interactions between the presence/absence of headings and ability. Experiment 12, which provided the exceptional case, involved the older pupils reading the easier text. In this case it could be argued that the high-ability groups had no room for improvement on their test scores (with or without headings) but no room for improvement on their test scores (with or without headings) but that the headings clearly assisted the less-able readers. (p. 151)

Coulombe (1986) found, in addition to a general ability effect in recall, that the above-grade readers also organized their free recalls better than the average readers who organized their free recalls better than the below-grade readers.

Doctorow, Wittrock and Marks (1978) in their research on generative processing with grade 6 students, found that low-ability children, as determined by a reading placement test, used fewer paragraph headings to generate elaborative sentences than did the high-ability children in the two groups that generated an elaborative sentence and had one or two word headings on the passages that they read. The researchers found that "paragraph headings added to the generative instructions increased comprehension more for the high-ability readers than for low-ability readers" (p. 118).

Stables (1985) in his post hoc analysis of interrelationships of research variables, using data from his study and the two parallel studies (Gibbs, 1985; King, 1985), found that, "Reading ability did not have a high correlation with any of the measures but there was a moderate positive correlation between reading ability level and the number of subordinate ideas recalled from the grade level passages" (p. 102).

Researchers have also explored whether reading ability factors interact with certain text factors. One such question involved headings as statements and headings as questions. The work of Hartley, Kenely, Owen and Trueman (1980) and Hartley, Morris and Trueman (1981) showed that low-ability groups benefited by having headings written in the form of questions rather than statements. Hartley and Trueman (1983) carried out more experiments on this question using a longer passage but a small sample size. Their results showed a trend in the same direction as the first two studies but their results were not significant. However, subsequent studies by Hartley and his colleagues (Hartley, Trueman & Pigram, 1984; Hartley & Trueman, 1985) using longer passages and a larger sample size did not find this effect significant.

It can be seen that reading ability has a very large effect on comprehension, recall and the ability to organize recall. Once reading ability is controlled for (by placing an equal

numbers of high, middle and low reading ability students in each type of treatment) then headings and ability group interactions are more isolated.

Prior Knowledge

Like reading ability, the amount a person knows about a subject can greatly effect his comprehension and recall. Mandl and Ballstaedt (1986) say, "Increase in learning after reading the material is related to prior knowledge: A person who is well informed about the subject matter also can integrate new knowledge more effectively" (p. 869). Stables (1985) found that grade 7 students on their grade level passage "scored higher than any other grade and significantly higher than grade 6 and 8 students in recalling superordinate ideas" (p. 95). He tentatively attributes this result to the connection of the content of this passage on Haida Indians to part of the curriculum for grade 7 students when they study North American Indians.

There is some evidence that headings may be more helpful when the reader does not have extensive prior knowledge and less helpful when the reader has less need for headings when he has extensive knowledge of a topic. Regarding concept familiarity, Brooks, Dansereau, Spurlin and Holley (1983) found that headings used on fairly unfamiliar subject matter (less than 20% familiar) improved delayed test performance in Experiment 1. In the reverse situation, Jonassen (1983) did not find that headings were effective as semantic markers in facilitating probed and free recall. These students (Educational Psychology students at university) were reading material at their general reading level that was very interesting, on a topic that was very familiar and comprehensible to them. So, there may be a point where information in the text is so familiar that headings are not needed to aid comprehension and recall.

The results of two Wilhite studies represent a different point of view. Wilhite (1987, 1988b) found, when using 116 college students who read a 1,760 word passage from a psychology text, that only the high pre-existing knowledge subjects were able to use

headings to significantly improve main-idea retention questions whereas headings were not effective in improving main-idea retention of the low pre-existing knowledge group. Similar results were obtained by Wilhite (1989) using 94 college students who read a 4,840 word passage on organization in memory. The high pre-existing knowledge group were selected from students enrolled in a college course on human memory and the low pre-existing knowledge subjects consisted of subjects who had never taken a course on memory. Once again, headings facilitated the answering of a main-idea retention test by only the high pre-existing knowledge group. Wilhite (1988b) says, "... the results suggest that headings facilitate recognition memory by activating schemas and that such an organizational effect of headings is more likely to benefit main-idea information than detail information" (p. 215).

It would seem that prior knowledge is an important factor to consider when examining heading research.

Preference

Klare, Shuford and Nichols (1958) examined the question of preference for headings using adult airmen at a training base (see this research discussed earlier in the section entitled Frequency of Headings). Using split versions, it was found that the subjects significantly preferred high level of headings and those having an ordinary amount of headings when reading a long technical passage to low levels of headings (no headings but had 17 paragraph divisions). The high level of headings and the ordinary level of headings were not significantly different although there was a trend in favour of the high level of headings. Klare et al. (1958) suggest that this study shows "a definite increase in reader acceptability (pleasantness) for more highly organized material as compared to less highly organized material" (p. 44). This feature is potentially important for voluntary reading.

Charrow and Redish (1980) carried out a study of headings on warranty information. The headings did not improve retrieval time or accuracy but 90% of the subjects reported that they preferred warranty information with headings over the information without headings.

Hartley, Tobin and Trueman (1987), when they examined the effects of headings in Braille text with 24 blind subjects, found that although headings had not significantly affected recall, the subjects perceived headings to be useful and this finding was significant.

Awareness of Heading Functions

This factor is especially critical to assess when carrying out heading research projects with elementary school children and will be discussed in more detail in the next section.

Summary

A number of reader factors and a number of textual factors have been discussed in terms of their influence on the effect of headings. Although some factors have shown little effect (e.g., the position of headings), other factors seem to have a large effect. Therefore, it is not surprising that heading research results for the presence or absence of headings are so contradictory. When researchers carry out their studies, they need to be more specific about what set of conditions they are really dealing with and decide whether they wish to control for these conditions or clearly identify the factors that might be operating in their research and report on their findings about the effects of these various factors.

READER AWARENESS AND ABILITY TO USE HEADINGS EFFECTIVELY

Introduction

No studies to date have explored the actual relationship of heading awareness to effective use of headings as an aid to recall. It has been assumed by some educators that, over time and with experience on expository prose, the reader will intuitively come to understand the function of headings and will naturally use headings to aid comprehension and recall (as discussed in Hartley & Jonassen, 1985). Hartley & Jonassen (1985) say, "One might expect at first that children would be unaware of the significance of headings, but that they would gradually become more aware of their significance ..." (p. 244). Proof for this view is offered in the results of heading research that have had a positive effect for the mere presence of headings (see comprehension and recall studies described in the first section of this chapter) even though there have been no controls on whether the subjects have had any previous instruction in heading usage. Other researchers suggest that their results might have been different if instruction and practice had been provided (Christensen & Stordahl, 1955; Gibbs, 1985; King, 1985; Robinson & Hall, 1941). Educators, as well, have recommended that students be taught how to use headings effectively (e.g., Catterson, 1990; Niles, 1965; Robinson, 1961, 1970) which suggests that having headings present may not be enough if the reader is not aware of various heading functions. Although there have not been any studies exploring what heading awareness subjects naturally acquire, there have been a number of research studies that examined the comprehension and recall of those students who have received direct instruction in headings use and those subjects who have not been exposed to direct instruction. These studies are discussed below.

Because this research evolved from the general educational problem of elementary students having trouble comprehending and recalling expository prose (see Rationale in

chapter 1), any ways in which teachers can instruct elementary students and thereby improve their ability to understand and remember what they read, are of interest. Elementary school children have had little experience reading non-narrative material. Yet, from grade 4 onward, students are expected to learn from their textbooks. Therefore, this section of the literature review will discuss both the problems and some of the possible solutions to the amount of awareness the students, especially those at elementary school, bring to reading tasks in content area subjects.

Problems with Young Students' Awareness of Heading Functions

Coulombe (1986) has suggested a number of reasons why children might lack sensitivity to text structure and to headings. Elementary students have had limited exposure to expository material so they have had less experience with the conventions of this type of prose (Baumann, 1984). Moreover, it has been noted that there are developmental trends related to age and cognitive development that might make it harder for younger children to use headings effectively. Lastly, children might need direct instruction to make effective use of headings. These aspects are explored below.

Developmental Readiness

A number of researchers have found that there are definite signs of developmental patterns in children's ability to use headings effectively when they carried out research using subjects from different grade levels.

Hartley and Trueman (1985), in their series of experiments, found that the 11 and 12 year old students were not able to use headings to improve recall while 14 and 15 year old students were. They suggested that this might be a consequence of age and experience and "that there might be a developmental trend in the ability of children to use headings to aid recall" (p. 140).

Stables (1985) noticed a developmental effect when he compared his results of grade 5 and 6 students with those of older children in the parallel studies. The grade 5 and 6 students generally recalled fewer superordinate and subordinate ideas when reading the easy passage at the grade 4 level than the students in grade 8, 9, and 10. Stables suggested that there might be a change in reasoning strategies from concrete to more abstract thinking around 11 to 12 years of age. Therefore he recommends that study skills be taught at the grade 6/7 level.

Kobasigawa, Lacasse and MacDonald (1988) found that "both younger and older students demonstrated the evidence of efficient use of the headings as locational aids when explicitly instructed on how to use them, spontaneous use of the headings as a research strategy was observed in approximately one half of the grade 4 and grade 6 students and a majority of grade 8 students" (p. 50).

These results tend to indicate that there is a developmental pattern operating in respect to headings in text. It seems likely that as children mature they become better able to use organizational aids in expository prose. However, Goble (1986) suggested that the failure of fifth and sixth grade students to use headings effectively may not be entirely developmental as suggested by some of the researchers. Goble hypothesizes that it "may represent a lack of training and instruction rather than a lack of cognitive maturity or readiness" (p. 6).

Lack of Maturity Versus Lack of Experience and Knowledge

One way to solve the question of whether children are developmentally unready to utilize headings at the elementary level of school is to expose elementary school children to heading instruction and see if they respond by using headings more effectively. If they do, then it is more likely that the children do not have enough experience with headings and expository prose or do not know how to use headings effectively than a lack of cognitive readiness for the task. Direct instruction of headings as organizational aids at the

elementary level has been suggested by a number of researchers (Coulombe, 1986; Goble, 1986; Snively, 1961; Stables, 1985). However, the question of whether headings would be used more effectively if the subjects had received instruction is not confined just to the elementary level.

Research Studies on Direct Instruction of Headings

Only a few heading studies have explored heading effects after a period of instruction on the use of headings had been carried out. These will be presented in chronological order in two age groupings: High School/Adult Level and the Elementary School Level.

High School/Adult Level

Holley, Dansereau, Evans, Collins, Brook and Larson (1981), in one facet of their experiment, compared training in the use of headings with no training using 95 university students recruited from a regular psychology course when they were asked to read two long passages from geology and biology text material. There were 4 treatment groups: control with no headings and no instruction, headings only, input training with headings, and output training with headings. The dependent measures were immediate and delayed recall. The input training group read strategy instructions that encouraged the students to attend to the embedded headings during input processing and then tried the strategies out on a practice passage. The output processing group read the practice passage and then used the topic outline to recall information and finally memorized the outline. The groups that did not receive instructions used their usual study methods to read and study the practice passage. Using multivariate procedures, Holley and his colleagues found that there were no significant differences between input training and output training. These two groups were then collapsed and combined to compare training with no training. The two groups who received training were not able to recall significantly better than the group that had

headings and no training. The researchers offer several possible reasons for this. They thought the new procedure might conflict with the students' regular strategies for reading nonnarrative material. Moreover, the training, which was thought to be small and of short duration, might not have been extensive enough to be effective.

Brooks, Dansereau, Spurlin and Holley (1983) in their second experiment involving 106 university psychology students, compared headings and instruction versus headings only, and no headings and no instruction. In this experiment the researchers combined input instruction with output instruction from the Holley et al. (1981) experiment. The researchers reasoned that the "separation of processing may have allowed the 'input' group to store the information effectively but did not give them adequate procedures for retrieving information effectively. The opposite scenario may have occurred with the 'output' group. If this were the case, instruction participants on both input and output uses of headings should lead to improved performance" (p. 298). The headings plus instruction group outperformed that control group that had no instruction and no headings on the essay and the outline tests. The same group also did better than the headings only group but the results were not significant. Brooks et al. (1983) suggest that these results show that instruction in the use of headings is beneficial.

Elementary School Level

Taylor (1982) carried out 2 experiments in which 11 and 12 year old students were taught how to use a summarization strategy involving headings. The results for this training were positive for the first experiment but she was not able to replicate this result in the second experiment. Taylor found that the students in the second experiment had showed less mastery of the study strategy than the students in the first experiment and this affected how well the subjects remembered text. Taylor says, "Seven practice sessions occurring over a 7-week period may have been insufficient for the students in this group to learn how to generate the summaries independently" (p. 338). Taylor suggests "that

students must be able to perform the study strategy reasonably well before it will markedly improve recall" (p. 323).

Coulombe (1986) carried out a direct instruction experiment using 141 grade 4 students from 6 paired classes. The intact classes were matched on the basis of estimated reading ability and socio-economic status and then were randomly assigned to the control or experimental groups. The experimental group (containing low, average, and above average reading ability students) were given 9 (half hour to one hour lessons) by the experimenter on the organization of information /classification prose and on the use of headings as recall aids using easy-to-read material rated at the 3.1-3.9 Fry readability level. The control group (also with low, average and above average reading ability) used the same reading materials and had the same length of lessons but were given regular question and answer lessons by their classroom teachers. Both groups received the same pretest and a posttest. The results showed that the experimental training procedures significantly enhanced the students' organization of written recall but it did not facilitate an increase in the number of ideas recalled.

Coulombe attempted to interpret the failure of the experimental group to recall more information in a number of possible ways. First, she suggested that the students may have concentrated on remembering headings at the expense of recalling the associated details. Coulombe noted that the training procedures caused the experimental group to use considerably more headings in their recall protocols but quantity of headings was not rewarded in her scoring procedure. Secondly, Coulombe wondered if the multiplicity of the training tasks were beyond the capabilities of grade 4 students to carry out independently of the instructor. During the training sessions, under the guidance of the researcher, the students had successfully recalled "impressive" amounts of information. This would suggest that grade four students need considerable time to integrate instruction on the use of headings or they will not be able to use headings to increase recall. An alternative explanation is that grade 4 students are not developmentally or cognitively

mature enough to benefit from heading instruction. Stables (1985) has suggested that study skills could be taught more effectively at the grade 6 or 7 level. When the results of the ability groups were examined average and high ability groups seemed better able to use organization instruction than low ability students. However, more research at the grade 4 level involving heading instruction is necessary to clarify the issue.

Goble (1986) carried out a parallel study to the Coulombe (1985) research using 168 grade 5 children from three school districts in the lower mainland area of British Columbia. The classes were matched, once again, on estimated reading ability (above average, average and low) and socio-economic status and then randomly assigned to treatment groups. The experimental group received 10 sessions of instruction on heading use and text organization (9 sessions were taught by the experimenter) similar to the lessons taught to the grade 4 experimental groups in Coulombe's study. The control group read the same passages as the experimental group but this was followed up by questions and discussion. All of control classes were taught by the regular classroom teachers although the material was prepared by the researcher for the teachers so the control groups would receive identical instruction. The posttest was analyzed by using an analysis of covariance procedure and an alpha level was set for the .05 level. The results showed that the experimental group significantly outperformed the control group on both the amount of recall ($p < .001$) and the organization of ideas ($p < .001$) on the delayed free recall posttest. Goble concludes that sensitizing grade 5 children to headings and the structure of text can lead to higher recall scores. Moreover, the reading ability groups were equally affected by the experimental treatments. Goble suggests, "Perhaps findings in earlier studies, showing students at this level to be unable to use headings, resulted from a lack of training" (p. 72).

Both the Coulombe study and the Goble study used the same pretest, posttest and teaching passages although a few variations in instruction occurred.

Summary of Direct Instruction Heading Research

The few studies described above tend to suggest that instruction in the use of headings is beneficial in improving recall for most age groups of students if the training time is appropriate for the age of student. The grade 4 students were unable to improve the amount recalled after instruction but there is some suggestion that longer time would have been necessary for the grade 4 students to absorb and apply all that had been learned in the practice lesson. The studies with adults that produced non-significant results for instruction were probably the result of too short a training period (one lesson and one practice session) as suggested by Holley et al. (1981) than indicating that the use heading can be just as easily learned intuitively.

Type of Direct Instruction

There are three types of direct instruction that can help the reader to be aware of headings. These are on-going teacher guidance, direct skill or knowledge instruction and strategy instruction. Some of the advantages and disadvantages of each will be considered.

On-Going Teacher Guidance

Although there is little information that instructs teachers how to teach students to use headings effectively, teacher guides for content area textbooks, of late, have sometimes suggested that teachers draw the students' attention to the headings before they read the text information. Both authorized grade 5 social studies textbooks in British Columbia ask the teachers to direct student awareness to the headings when they begin a chapter. This teacher guidance is intended to be helpful to the students in understanding the selected material for that session. The advantages of this way of instructing students are the short amount of time that needs to be devoted to the process and the immediate effects. However, the benefits of this kind of teacher direction is not likely to have any influence when students read expository prose on their own. Moreover, even with attention focused

on headings, the students may not understand the functions of headings. McKeachie (1988) says, "In general, educational activities are teacher-directed and students learn to conform to the teacher's directions without any conscious thought about why the teacher directs them to carry out certain activities" (p. 5).

Direct Skill or Knowledge Instruction

Direct instruction of heading functions is designed to have the reader develop an awareness of heading functions as organizational, signalling and accessing aids and learn to use headings to improve comprehension, recall, search and retrieval when needed. The advantages of direct skill or knowledge instruction, if the information is carefully and thoroughly taught, are a real understanding of heading functions and an ability to automatically use this knowledge when approaching headings. However, teaching this knowledge can take awhile to be taught. It appears that it might be better to teach different aspects over several years when children are cognitively ready. Although there are distinct advantages to having a deep understanding of some of the concepts involved in the presence of headings, there seems to be little evidence in teacher guide books that students receive direct instruction of headings as organizational and signally aids in text. Only the accessing functions of headings seem to be taught to elementary students and this is usually by the librarian.

Rosenshine (1986) and Winograd and Hare (1988) consider that effective direct instruction involves the following procedures (based on Rosenshine's model): review previous work; introduce the new lesson in a series of sequenced and manageable steps; supervise student practice; provide feedback and corrections; set up independent student practice; and organize periodic reviews. Rosenshine (1986) says that direct, systematic teaching is particularly applicable to explicit reading procedures and less applicable for areas in which concepts are fuzzy or entangled such as teaching composition or reading comprehension. Resnick (1984) adds:

If knowledge is constructed rather than recorded, it does not make sense to think of instruction as directly conveying knowledge or skill. Rather, we must think of instruction as setting in motion learner's natural processes of knowledge construction and providing external information that is likely to be used productively. (p. 431)

Thus, Resnick (1984) suggests that we need a broadened definition of direct instruction that is:

in keeping with the constructive character of learning. Direct instruction is any deliberate attempt to intervene in learning so that the outcome of the learner's processes will be a particular form of knowledge or skill. Psychologists or educators interested in direct instruction should look for forms of explanation or demonstration, and forms of practice, that set in motion the learning processes which lead to expert performance. They should not seek to engage novice learners in performances of experts. (p. 443)

The studies of Coulombe (1986) and Goble (1986) used direct skill and knowledge instruction plus generative processing tasks to train students to understand how headings function in expository prose. Their instruction included word sorting and categorizing activities, and a variety of main idea and detail activities. Categorization and main idea/detail understanding are two related concepts that are helpful for the understanding of headings and text organization in expository prose. Although both concepts are very important for readers of content area text material, they are also difficult for young people to understand.

Finding the Main Idea - In expository prose authors organize their ideas under a series of headings and subheadings (Taylor, 1992). Headings often represent part of the main idea for a series of paragraphs in a passage. Learning how to find the central thought or gist or main idea of a passage is considered important to teach because children at the elementary level find this skill difficult. Two studies carried out by James F. Baumann confirm this.

Baumann (1981a), using 83 grade 3 students and 89 grade 6 students, had the children read two passages in two sittings from their regular classroom social studies text material. Then he assessed their ability to get the gist or main idea of the passage. The results indicated that the children were not able to find the gist of the passage or its main ideas as gauged by a cued written recall after the first passage was read and by three measures after the second passage was read. These measures were a gist statement recognition test, a multiple choice test and a main idea/detail recognition test. Baumann concludes,

... elementary students who read expository (textbook) prose tend not to comprehend either the gist of an entire passage or its main ideas with great skill. This can be stated with a reasonable level of confidence because the level of ecological validity for this experiment was high. ... Thus, it would be unwise for elementary or middle school content teachers to assume that their students will be inherently skillful at main idea comprehension. (p. 9)

Baumann recommends that educators continue to teach students how to comprehend main ideas, especially with content area material. Taylor (1992) agrees.

In 1984, Baumann experimented to see if direct instruction in finding or constructing the main idea would be effective in improving awareness of main ideas and whether general recall would be improved if he compared a group receiving direct instruction to a group receiving basal instruction in main ideas and a control group receiving alternate vocabulary instruction. Baumann's experiment involved 66 grade 6 children that were blocked on achievement and randomly assigned to treatment groups. The instruction period consisted of eight 30 minute sessions. Baumann found significant effects for the group that received the strategy of direct main idea instruction in improving their ability to recognize implicit and explicit main ideas but no significant differences in general recall. Baumann (1984) says,

"the power of the treatment effects favoring the Strategy group indicates strongly that main idea skills can be taught effectively when instruction is direct and systematic, which is consistent with prior successful direct instruction comprehension studies ..." (p. 103). A detailed explanation of Baumann's strategy for direct skill instruction of main ideas can be found in Baumann (1986c).

Actively teaching main idea comprehension skills has been recommended by Aulls, Winograd & Bridge, and Hare & Bingham, in Baumann, 1986b, and by Baumann, 1984, 1986c. Carver (1987), however, disagrees. Instead, he suggests that teachers should spend their time "getting students to read more" (p. 125).

Categorizing - The ability to categorize and understand levels of information is related to main ideas and details in text.

George Lakoff (1987) in his volume on Women, Fire, and Dangerous Things: What Categories Reveal About the Mind suggests that children begin at a very early age to classify or categorize the world they see around them. However, the classifying that takes place by young people is usually at the basic level (e.g., dog or chair) and not at a superordinate level (animal or furniture) or subordinate level (retriever or rocking chair). As children grow, they become more aware of finer divisions and hence their knowledge at a subordinate level increases. Lakoff says that the work of Rosch and her associates (Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976) have shown that superordinate categorization abilities develop later. As headings tend to reflect information at the superordinate level, it can be more difficult for children to understand their organizing capacity. To be able to use headings effectively, the reader should be aware of hierarchically levels and be able to group information at a number of levels. Therefore, particular assistance may be necessary to help the reader understand the overriding superordinate level of information on their topic.

Contee and Gerhard (1986) think that the categorizing process is "the base for understanding the structure of ideas in most textbooks. The ideas are organized in a hierarchy of related categories moving down from the title, through chapter headings, main headings, subheadings to paragraphs. Comprehension of textbook material is not possible without understanding the relationships between the different levels of ideas" (p. 3).

A number of educators have recommended that categorization and main idea understanding be taught by direct instruction. Aulls (1978) developed ways to teach categorization, topic, main idea as well as outlining skills. Contee and Gerhard (1986) developed a thinking skills program involving headings and categorization. Santa (1988) devised a very simple but effective way to help students understand main ideas and levels in a hierarchy using the game of Power Thinking, and categorization activities relating category labels to power levels.

Although direct skill or knowledge instruction is time consuming, thoroughly learning major concepts needed to successfully learn from reading materials (such as categorizing and the understanding of main ideas and details) can be worthwhile. Jones (1986) offers a word of caution though. He says that one should be "careful to avoid fragmentation of instruction, teaching isolated skills as ends in themselves, and excessive testing" (p. 8). Tierney and Cunningham (1984) add:

However the brain functions, the experience of reading has all the components of art and experience. To date our comprehension instruction has tended to emphasize the systematic, sequential, and piecemeal at the expense of the aesthetic, experiential, vicarious, and the wonder of reading. (p. 634)

Strategic Instruction

In addition to the direct teaching of skills, numerous educators are now suggesting that students should be taught to be strategic readers (Brown, Campione & Day, 1981; Jones, Palincsar, Ogle & Carr, 1987; Monahan, 1990; Paris, Lipson, Wixson, 1983; Symons, Snyder, Cariglia-Bull & Pressley, 1989; Winograd & Hare, 1988). This reflects the new way that cognitive psychologists think of the learner. Reynolds, Wade, Trathen, and LaPan (1989) say "the reader was seen as passive and without any real input into the learning process. More recently, cognitive psychologists ... have proposed that readers are really active, strategic participants in the learning situation. This recent approach has encouraged prose learning researchers to investigate the types of strategies that learners employ in different contexts, particularly as they attempt to learn and recall information from long, expository texts" (p. 161). Flood and Lapp (1990) say that the educator needs to "acknowledge the student's role as the meaning-maker in the reading act" (p. 492). They think that contemporary comprehension instruction should be based on constructivism principles. Flood and Lapp (1990) explain:

Constructivism calls for an understanding and implementation of the notion that the student takes ownership for learning and the teacher provides appropriate direction and support. It requires a form of collaboration between teachers and students in which teachers and students work together to ensure that students internalize rules and strategies for making meaning. (p. 492)

In spite of this new wave of thinking, McKeachie (1988) notes that, "Students seldom get directed training and practice in developing study strategies. Rather, they stumble upon effective strategies only when, by chance, they vary their approach and find that one method works better than others" (p. 5). Instead, Pressley, Forrest-Pressley and Elliot-Faust (1988) suggest that effective strategic instruction should not only introduce the learner to useful strategies but should show the student how, when, and where the strategies can be used.

Definitions for strategies differ in the literature but Kail and Bisanz (1982) say several prototypic features of strategies have emerged. These are as follows:

First, a strategy is a sequence of activities rather than a unitary event. Consequently, a strategy may be characterized both by its component processes and by the organization of these processes into a coherent whole. Second, strategies are considered to be more modifiable and flexible than 'reflexive' in nature. ... Certain components of a strategy may be automatic, but the overall procedure is presumed to be flexible and, at least in principle, can be modified to become more adaptive. (p. 230)

Resnick (1984) says some processes in skilled reading occur automatically and are not usually conscious. Other processes are open to manipulation by the reader. These processes are often called "strategies". Resnick notes that:

Strategies have a heuristic and flexible character. The adoption of a strategy is influenced both by variations in the reader's purpose and by the features of a text. Strategies also allow the possibility of conscious control and are potential objectives for instruction - a set of procedures that can be taught to learners as a way of improving general reading performance. (p. 435)

Duffy and Roehler (1989) agree saying, "Unlike routine procedures associated with skills, strategies are flexible plans that readers adapt to the comprehension demands of the text" (p. 133). Yet they claim that there are subtle differences between skills and strategies. Duffy and Roehler (1989) say, "... while skills are uniformly applied in all situations, strategies may be applied procedurally in highly familiar text situations but are more often reflectively adapted to fit situations" (p. 141). Van Dijk and Kintsch (1983) add that it is not merely important to reach a goal, but one should also consider reaching it with optimal efficiency.

It has been noticed that successful readers use strategies to help them cope with textual material. Jones (1986) says that, "the effective learner uses a repertoire of specific thinking and study strategies to interact with the instructional materials before, during, and immediately after reading ... Novices and poor readers apparently do not develop this

repertoire of strategies spontaneously ..." (p. 7). This flexibility is one of the keys to strategic thinking. In order to be flexible, it helps if the reader is metacognitively aware. Tierney and Cunningham (1984) say, "Metacognition research findings suggest that successful readers are more aware of the strategies they use during reading than less successful readers. On the basis of this finding an argument can be made for heightening the reader's awareness of task demands" (p. 632). Strategy instruction attempts to help less successful readers become aware of more effective ways to learn and assists students in eventually being able to carry out these strategies independently. Jones, Palincsar, Ogle and Carr (1987) say:

The goal of strategy instruction is to foster independence on the part of the learner.

To achieve this goal, it is important that students acquire several dimensions of information about the strategies they use. Clearly, students need to know what the strategy is (*declarative information*), how to apply it (*procedural knowledge*), as well as when and where to use the strategy (*conditional knowledge*). (p. 41)

The advantages of strategic instruction are that tasks can be monitored by the reader and used or not used at the reader's discretion. Information that is learned strategically allows the reader to apply the same instructions as those given in on-going teacher guidance, but it is totally independent of the teacher once the strategies are understood, learned, appreciated, and applied.

Although there are many advantages to teaching strategies, especially if the teaching is well done, not all teaching of reading tasks should employ strategic instruction. It is not a quick process teaching cognitive, metacognitive and motivational aspects of strategies and providing sufficient practice. Moreover, in order to deliberately use strategies, the learner must understand them (Pressley, Forrest-Pressley & Elliot-Faust, 1988). There seems to be a developmental aspect to metacognition. Usually, as children grow older they are more able to learn metacognitive strategies. Pressley, Forrest-Pressley and Elliot-Faust, (1988)

also caution teacher from using too many strategies in an isolated fashion. They recommend using multiple strategies in a coordinated way. Pressley et al. (1988) say, "Many real-world educational tasks require several types of processing. For, instance, prose comprehension often includes modifying how readers preview an article, read it, and review it. ... Reflecting this need, many contemporary interventions include multiple strategies" (p. 103). Lastly, Paris, Wasik, and Van der Westhuizen (1988), in their review of metacognition research, warn that there is "a dangerous imbalance in which the enthusiasm and prescriptions far outstrip the empirical database" (p. 163). All aspects of strategy instruction, including the metacognitive components, need to be based on a sound database.

Summary

In this section, a number of types of direct instruction have been discussed. There are advantages and disadvantages to each type of instruction. In a classroom, all three types of instruction would be used. In the case of headings, a teacher would ideally use both direct skill instruction plus strategy instruction to help the reader become aware of the functions of headings and use this knowledge to aid their comprehension and recall of textual material. Pressley, Forrest-Pressley & Elliot-Faust, 1988, cite an experiment by Graves, 1987, that showed that the combination of direct instruction and self-monitoring training produced more main ideas than direct instruction or self-monitoring training. In this research, a series of heading strategies has been chosen. It is hoped that this will compliment the work of Goble (1986) who showed that direct instruction was effective in improving the free recall of grade 5 students in her sample. In the next section, some reading comprehension strategies that focus on headings are discussed.

Heading Strategies for Improving Comprehension and Recall

There are a number of activities that are presently being carried out under teacher guidance using headings that are designed to improve comprehension. These activities have potential for being taught as strategies instead. If this is the case, the benefits that only are directed to the immediate reading situation in the teacher guided experience, can instead be carried out over to many reading situations by the student who has successfully learned to use heading strategies. Some suggested strategies using headings that can be carried out before and after reading are:

Prereading Strategies

- *Before reading a passage, skim the passage for headings and subheadings and read these first.*

If a student reads a heading and then the text, the student can use the heading to aid his comprehension of the section that follows immediately after. If a reader reads all the headings first, they form an outline of topics to be discussed and provide an overview for the whole text to be read.

Krug, George, Hannon and Glover (1989) found that reading an outline before reading the text, then reading the text with embedded headings (drawn directly from the outline) significantly improved the free recall of 118 undergraduate college students in two experiments over the headings and no outline group or an outline but no headings group. Both the outline only group and heading only group recalled significantly more than the control group that received no outline and no headings with the reading passage. If the student uses the strategy of reading all headings and subheadings before beginning their normal reading of a passage, this will act as an outline and the reader has the benefit of both an outline before they read and headings as they read. Krug et al. (1989) thought that outlines (headings in outline form) could assist students in seeing the text's organization (Experiment 3

involved reordering statements from text and only outlines or outlines and headings combined aided the students in this task). These experiments tend to show that reading the headings in a passage before reading the full text is a useful strategy.

- *Use headings to link with prior knowledge.*

A typical guided reading practice is to have the students look at a heading and tell the teacher what they know about the topic (Flood & Lapp, 1990; Santa, 1988). Although the teacher is not there to fill in information if the students have little background information, just stopping and finding what one knows about a topic could help students access what information that they already have.

- *Use the headings to predict what the passage might be about.*

This strategy is suggested as part of Santa's (1988) Pre-Reading Guide; from Ogle's (1986) K-W-L method for active reading of expository text; by Jones (1986) in cognitive instruction; and by Contee & Gerhard (1986) as part of their thinking skills program.

- *Notice how the text is organized by looking at the size and type of print used for the title, the headings and the subheadings.*

This presupposes that the student understands something about different levels of information and the way text is organized [see categorization under direct instruction].

- *Use headings to set a purpose for reading.*

In this strategy, the student turns headings that are statements into questions to set a purpose for reading. Teaching students to turn a title or heading into a question can lead to the student finding the answer explained somewhere in the text. This links and strengthens the impact from both the heading and the text. This heading strategy is adapted from typical reading and study strategies (Flood & Lapp, 1990; Taylor, 1992).

Postreading Strategies

- *When the reading is finished, the readers can attempt to answer the questions that they made up based on the headings?*

This will serve the purpose of reviewing information in the chapter and helping the students to think that they made up the questions for some reason.

- *The reader can check his or her predictions and see how closely they compare to the authors ideas.*

The reader should note the differences but not think that it is essential to know ahead of time what the author might say.

- *If the text information must be recalled in great detail, reread the headings and try to recall the main ideas that were discussed under each heading.*

If detailed information is linked to headings and the reader remembers the headings, there is a much better chance that he or she will recall more information from the text.

The strategies discussed above are all ways to help readers interact with the reading material in an active fashion. Because these are strategies and not automatic procedures, the reader can make decisions about which strategies to use in different situations. Some of the choices revolve around the following questions: How hard is the text to understand? How well do I have to understand and recall this material? What is my purpose for reading this material? What strategies seem to work best for me? The student not only needs to be taught the strategies, but then needs to be shown when and how to use them in an independent fashion. If the time is taken to teach the reading strategies thoroughly and the student is given practice choosing and using these strategies in meaningful (to the student) situations, it is possible for these strategies to remain a permanent part of the student's reading repertoire when reading informational material.

SUMMARY OF THE CHAPTER

In the review of the literature, numerous studies related to heading research have been presented. The first major theme that was explored was the functions that headings play in comprehension and recall. The literature suggests that headings are sometimes effective in aiding comprehension by providing a link to prior knowledge, and clarifying the theme, order and hierarchical levels in text structure. Moreover, headings sometimes aid retrieval from memory as in the case of different types of recall.

However, the research does not consistently show that headings perform these various functions. If the broad picture is focused on and all these studies are considered, then various patterns begin to emerge. There are a number of factors in text and reader factors that seem to have an impact on how effective headings are at aiding comprehension and recall. Heading studies that are concerned with these factors were discussed as part of the second major theme.

The last theme involved the exploration of one reader factor: the reader's awareness of headings and ability to use them effectively. At the elementary school level, the presence of headings alone in expository text has not been shown to significantly affect the pupils' comprehension and recall. Several possible explanations have been offered. The students may not be cognitively mature enough to use headings effectively, or they may not have the experience to use headings effectively yet. If the latter is the case, instruction in the use of headings might be feasible. The Goble (1986) study suggests grade 5 students benefitted from direct instruction in the use of headings. Therefore, this present study attempts to explore whether grade 5 students would be helped by using heading strategies on the quantity and type of delayed written recall when the students are using a regular classroom social studies textbook passage. Chapter 3 presents a detailed discussion of the planned methodology for this research.

CHAPTER THREE

Methodology

INTRODUCTION

Plan of the Chapter

The third chapter presents the planned methodology of the research project. This chapter contains information on the choice of design, sampling technique, and characteristics of the population. The chapter also discusses the materials and instruments to be used in the pretest, treatments and posttests as well as the experimental procedure. The chapter concludes with information on data analysis and delimitations of the study.

Restatement of the Thesis

This study was designed to investigate the effects of three conditions:

- a) absence of headings,
- b) presence of headings, and
- c) presence of headings and heading strategy instructions

on the quantity and type of delayed written free recall and main idea recall/formulation of grade five students when they read an expository passage selected from a British Columbia authorized social studies textbook.

DESIGN OF EXPERIMENT

The design chosen for this study was an Experimental Pretest-Posttest Control Group Design (Wiersma, 1986, p. 110-111) and this design is diagrammed in Table 3.01.

Table 3.01

Diagram of the Experimental Pretest-Posttest Control Group Design

R	O ₁	---	O ₂	R = random assignment to treatments
R	O ₃	X ₁	O ₄	Os (odd numbered) = pretests
R	O ₅	X ₂	O ₆	Os (even numbered) = posttests
				X = experimental treatments
				--- = control group treatment

A stratification variation was added to improve the reliability and validity of the results. The students were to be stratified into three equal sized groups based on rank ordered scores from a standardized reading test. The three groups (higher, middle, and lower reading ability) would then be randomly assigned to one of three treatment groups (a control and two experimental groups). [Random assignment was later changed to systematic counterbalanced assignment.] It was thought to be important to ensure an approximately even number of students with higher, middle and lower reading abilities because it is hypothesized that reading ability has a strong relationship to the treatments and the dependent variables.

The independent variables in this study were reading ability (higher, middle, and lower) and treatments (Treatment #1 or control group - no headings present and no heading strategy instructions; Treatment #2 or experimental group 1 - headings present but no heading strategy instructions; Treatment #3 or experimental group 2 - headings present and heading strategy instructions). The main dependent variables in this study were the quantity of main ideas or superordinate ideas, subordinate ideas and sub-subordinate ideas on the first posttest in written free recall, and accuracy of main idea recall/formulation on a second posttest. Both of these posttests were to be administered after a one day delay.

Table 3.02
Factorial Design with Emphasis on Distribution of Subjects in Cells

		B			
		(Reading comprehension ability)			
		higher (H)	middle (M)	lower (L)	dependent variables
A (Treatments)	T ₁	n = 20	n = 20	n = 20	60
	T ₂	n = 20	n = 20	n = 20	60
	T ₃	n = 20	n = 20	n = 20	60
AB		60	60	60	N = 180
					a,b,c,d,e,f

N = number of subjects in study

n = number of subjects in cell

A and B - Independent variables

AB - Interaction of variables

T₁ = Treatment 1 - no headings, no heading strategy instructions

T₂ = Treatment 2 - headings but no heading strategy instructions

T₃ = Treatment 3 - headings and heading strategy instructions

a = quantity of superordinate ideas in delayed free recall

b = quantity of subordinate ideas in delayed free recall

c = quantity of sub-subordinate ideas in delayed free recall

d = quantity of ideas recalled from the delayed free recall (a, b, c)

e = accuracy of main idea recall/formulation after a one day delay

f = total from a, b, c, and e

Additional dependent variables were the total quantity recalled on the free recall test, and the totals on the free and main idea recall tests. Because of the number of variables involved in this study, a 3 x 3 factorial design was chosen to explore main effects and interaction effect of the independent variables. This factorial design is shown in Table 3.02.

The experimental pretest-posttest control group design has a number of strengths. According to Borg and Gall (1989), this design controls for eight threats to internal validity and is open to only one threat to external validity (p. 674). However, this study does not seem to be strongly affected by any of the internal threats to validity originally identified by Campbell and Stanley and added to by Borg and Gall (Borg & Gall, 1989, p. 644-649 and p. 674) nor is it affected by the one threat to external validity to which this design is sometimes susceptible wherein the pretest affects the results of the treatments. The study involves students representative of three school districts which improves its population validity. In addition, ecological validity is particularly strong because this research uses reading materials that are selected from an authorized textbook used in many grade 5 social studies classes in the province and involves the students in treatment and posttest conditions that are normal activities in the classroom.

POPULATION AND SELECTION OF SUBJECTS

Sample Size

In a study using a 3 x 3 factorial design, there are nine cells to be filled. Each cell contains a different combination of independent variable levels and it is important to have enough subjects in each cell to adequately carry out the experiment while keeping the number of subjects manageable. Borg and Gall (1989) have suggested that in "experimental research, it is desirable to have a minimum of 15 cases in each group to be compared" (p. 233). In this study, it was thought that a larger sample size would be helpful because a small effect size is anticipated. "If small samples were used, the larger standard errors of the sample statistics could obscure small but important differences" (Borg & Gall, 1989, p. 234). Therefore, it was decided that there would be 20 subjects in each cell making a total of 180 subjects needed for the experiment.

Research Population

The target population for this study was fifth grade students who were enrolled in non-streamed classrooms, could read at or above the grade 4 reading level as determined by the norms presented in the Gates-MacGinitie Reading Test, Canadian Edition, Level D, Form 1, and were using the British Columbia authorized text, Canada: Building Our Nation in their social studies classes.

Selection of School Districts

A number of conditions needed to be met in order to carry out this study using classroom text materials and a regular standardized reading test:

1. The school districts had to be within reasonable proximity to the researcher's two residences (Burnaby and Courtenay).
2. The school district had to have some social studies classes that were using the alternate authorized text called, Canada: Building Our Nation.
3. The school district could not have a district-wide policy where all Grade Five students would be given the Gates-MacGinitie Reading Test, Canadian Edition, Level D, Form 1.
4. The students had to be part of a non-streamed grade five social studies classroom.

As a result, five school boards were contacted and four school districts met the conditions. The names of the four districts were put on identical sized name cards, the cards were mixed and three names were drawn randomly. These districts were Courtenay, Delta, and Coquitlam. The name that was not chosen in the random draw, the New Westminster school district, was eliminated. Comparative information about the three school districts from the British Columbia Regional Index, 1989, is listed in Table 3.03.

Table 3.03**A Comparison of School Districts on Enrollment and General Economy**

School District		Public School Enrollment	General Economy
#43, Coquitlam	1987-88	21,675	primarily a residential suburb, with some manufacturing.
#71, Courtenay	1987-88	7,175	staffing and services for the Canadian Forces air base, forestry, agriculture, fishing and tourism.
#37, Delta	1987-88	17,463	major residential suburb with people employed elsewhere, some manufacturing, farming, tourism, and fishing.

Population validity was thought to have been improved by the inclusion of students from three school districts in two different areas of the province rather than one school district in one location. These school districts contain some rural and urban schools, and a large number of suburban schools.

Classroom Selection

Each school district was canvassed to find the names of the schools and classrooms that met the criteria listed above. Once the list of possible non-streamed grade five classes was established for each district, a decision would be made whether to use a random sampling of classrooms (the intermediate unit in a type of multi-stage sampling, while eventually the primary unit of sampling would be the individual student) or whether it was preferable to use the most representative classrooms in schools that were suggested by district supervisors. An example of the latter might be a case where some schools had a very large number of recent immigrants who did not speak English and the district supervisor did not think these schools would be representative of the whole district.

Once a number of classes have been chosen from each district, the teachers would be asked for permission to use their classes in this study. If any teachers refused, other classrooms would be selected using a table of random numbers or classes that were deemed to be the next most representative. This would continue until at least seven classrooms had been found to take part in the main study and one class for the pilot study. Since the researcher did not know in advance the current size of each class and how many students would need to be eliminated (because they are unable to read with understanding or they are outliers, or their parents would not let them take part), it was deemed advisable to include the eighth class. This would provide a pool of students who could be held in reserve, to be used as spares in case of attrition in the initial sample. Attrition was expected to be small because of the short length of this study.

Selecting and Classifying Subjects into Reading Ability Levels

Once the appropriate number of classes have been obtained, the actual sample would be selected. To do this, the potential students from each of the selected classrooms would be given a standardized reading test called the Gates-MacGinitie Reading Test, Canadian Edition, Level D, Form 1. All scores (a total of both vocabulary and comprehension scores) would be scanned and the pupils who had a score that fell below the grade 4.0 level would be eliminated. [In this experiment, it was essential that the students were able to comprehend most of the material that they would be asked to read. If children score at less than the grade 4.0 level, there was a good chance that they were having trouble decoding the text or did not have sufficient English to understand what they read. In either case, this could provide spurious results. Baumann (1981b) also suggests excluding less capable readers "in order to prevent confounding word identification ability with comprehension ability" (p. 50).] Next, all students who were able to perform at the grade 4.0 level or above on the standardized reading test would be pooled, arranged in alphabetical order and assigned a research number. Then, using a table of random

numbers, 180 students would be selected to be subjects in the study. The remaining students would be randomly ordered using a table of random numbers and placed on a waiting list to be used only in the event of attrition of sample subjects or removal of outliers. The 180 students in the sample would be rank ordered on the basis of their standardized reading test scores and the list would be divided into three groups: the top third of the rank ordered scores would represent the **higher** group; the next third would be designated the **middle** group; and the bottom third would represent the **lower** group. A plan was devised for handling the wait-listed students so that they were available for each reading ability group in a randomly selected order.

Classification of Subjects into Treatment Groups

Subjects from each reading ability group or stratum would be randomly assigned to one of three treatment groups using a table of random numbers until each cell was filled with the 20 required subjects. The rest of the students on the waiting list would also be randomly assigned to treatment groups. Then, if any subjects dropped out of the study, the first randomly assigned wait-listed student from the same reading ability group and the same treatment would be used as a replacement. Only the extra students who were used as replacements would have their posttest results marked and included in the study.

Effect of Classroom Conditions on the Research Design

It was planned that the experiment would take place in the eight separate classrooms under the direction of the same researcher. Because the treatments would be presented in a written format, all three treatments could take place at the same time in the same classrooms. This feature had some distinct advantages. It would allow the researcher to pool the students from all eight classes before placing the subjects in reading ability groups and randomly assigning them by strata to the treatment groups. Therefore, it moderated the effects of uneven reading abilities in each class and allowed different combinations of the

treatment to take place. In addition, the simultaneous treatments allowed for variation in the classroom and therefore the unit of measurement could be the individual student instead of the class. Both these features strengthened the research design greatly. Lastly, no group would receive special attention. Hence there was not likely to be a John Henry effect and each group would be equally affected by any Hawthorne effect.

TESTING INSTRUMENTS

In this study, the testing instruments included both standardized and nonstandardized test materials. The standardized test materials were used as a pretest, a measure to compare groups using analysis of covariance, if necessary, and as a measure to aid in the selection of different reading ability groups. The nonstandardized materials were used in the treatments and in the posttests.

Standardized Test Material

Pretest material should correlate highly with posttest material. Ability to read and comprehend is thought to have a large correlation with reading a passage, and understanding and recalling the passage.

Test Selection

The Gates-MacGinitie Reading Tests, Canadian Edition, Level D (Grades 4-6), Form 1, includes both vocabulary and comprehension subtests. The comprehension subtest was selected to be used to rank order the students and then divide them into three groups consisting of a higher, middle and lower level of reading comprehension ability. These groups would then be randomly assigned to treatment groups. The total scores from the two subtests, vocabulary and comprehension, were chosen to act as a second set of pretest scores in judging how similar the three treatment groups were in general reading

ability if the stratifying of students on reading comprehension ability and random assignment to treatment groups did not sufficiently equalize the different treatment groups.

The Canadian Edition of the Gates-MacGinitie Reading Tests was selected for a number of reasons:

1. It is one of the more recent group survey tests that focuses specifically on reading assessment.
2. It uses Canadian and international content and has been normed using Canadian students. The test was designed to provide a general standardized assessment of an individual student's reading achievement as compared with a representative group of students throughout Canada. It provides a number of derived scores (percentile rank, T-scores or Stanines) that enable us to compare the control and treatment groups plus make comparisons with other research studies that have used this test.
3. All versions of the Gates-MacGinitie Reading Tests have received good reviews when used for the purpose of comparing children on the same level and form. The Gates-MacGinitie Reading Tests, Canadian Edition, are based on an American version called The Gates-MacGinitie Reading Tests, Second Edition, 1978. Both versions of this test have received generally good reviews in the Buros Institute's Ninth Mental Measurements Yearbook, Volume I, (Mitchell, 1985) even though Borg and Gall (1989) note that these reviews are generally critical in nature (p. 294). The following quotes represent summaries made by the reviewers of the Canadian version of these tests:

The Gates-MacGinitie Reading Tests, Canadian Edition, appear to be worthwhile tests of reading progress ... (Dreher, 1985, p. 597).

The Canadian Edition of the Gates-MacGinitie Reading Tests has similar strengths and weaknesses as the U.S. Edition.

The use of more appropriate content and the development of Canadian norms provide a much improved battery of reading achievement tests for use in Canadian schools over the U.S. Edition. These characteristics outweigh any disadvantages in paper quality and slightly lower reliability evident in the Canadian Edition. (Pflaum, 1985, p. 599)

In reference to the American version, The Gates-MacGinitie Reading Test, 2nd edition, 1978, one reviewer, Robert Calfee, 1985, said:

... this battery is a prototype of the contemporary standardized reading test. ... All things considered, the Gates-MacGinitie is quite adequate for a wide array of uses—program evaluation, special education, grade placement, and research, among other things (Calfee, 1985, p. 593).

The Gates-MacGinitie has a long history, going back to the Gates Reading Tests of 1926. The present edition, as noted at the beginning of the review, reflects the features both positive and negative of contemporary standardized tests of reading. When used for the purposes for which it was designed, this battery should prove quite serviceable; it can't do everything, but it isn't designed for that. Nonetheless, the Gates tests are quite an achievement ... (Calfee, 1985, p. 595)

The second American test reviewer had this to say:

This edition of the Gates-MacGinitie Reading Tests is a marked improvement over the first edition. The authors have given attention to past criticism and in most instances have made recommended changes. The teacher's manual is more comprehensive and better written than the manual for the first edition. As a measure of students' reading ability for evaluation purposes the Gates-MacGinitie would function well. (Rupley, 1985, p. 596)

Main suggested weaknesses suggested by a Buross reviewer (Dreher, 1985, p. 597) were:

- No Technical Manual for the Canadian Edition is available so some information has to be gathered from the American edition.

- Reliability information exists only for the subtest scores and not for the total score.

A more serious source of criticism for the second version of the American Version of the Gates-MacGinitie Reading Tests is an article by Britton and Lumpkin (1982). In the article, the authors raise serious concerns about readability levels in the Gates-MacGinitie Reading Tests. However, even these researchers suggest "that this instrument can best be utilized for making comparisons between groups using the same forms and levels of the tests and in the same sequence" (p.208-209). As this is the exact purpose needed for this research, once again the choice of the Gates-MacGinitie Reading Tests seemed acceptable.

In 1989, the third edition of the American Gates-MacGinitie Reading Tests was published. Most of the improvements that have taken place are at the prereading and beginning reading stage although poetry has been added to the fiction and nonfiction that appeared on previous editions. Reliability remains quite high and content validity is addressed although Cooter (1989) thinks that the matter of construct validity has not been addressed. This test is reviewed by Robert Cooter and Suzanne Curry in the Assessment section of The Reading Teacher, December, 1989. Once again, the reviews are generally favorable. Both recommend that this test be used mainly as "an overall screening measure of reading achievement" (Cooter, 1989, p. 257) or a measure of "*general* reading achievement and progress" (Curry, in Cooter, 1989, p. 258).

The generally positive nature of all the reviews on the three editions of the Gates-MacGinitie Reading Tests, for the purpose of comparing groups, greatly increases the confidence of the researcher in choosing this test. Although the third edition of the Gates-MacGinitie Reading Tests is

much more recent, it is normed in the United States. Therefore, the less current but more appropriate Canadian version is still the test of choice for this study. (The new Canadian version of the Gates-MacGinitie Reading Test has just recently been published. However, the older version of the test was purchased and used before the researcher was aware of the new version.)

4. This test has several administrative advantages. The testing time is short for both items: vocabulary - 20 minutes; comprehension - 35 minutes. This is most important when a researcher must get permission to carry out a study during class time. The test seems very well laid out and the teacher's manual contains clear detailed instructions. (The hand scoring booklet version was chosen because it was thought that the answer booklet would be easier for the students to use than the separate answer sheets.)
5. The comprehension subtests of the Gates-MacGinitie Reading Tests, Canadian Edition, have been successfully used as a covariate in the following heading studies: Stables, 1985; Gibbs, 1985; King, 1985; Coulombe, 1986; and Goble, 1896.

Specific Test Information

Standardization - The norming for the Gates-MacGinitie Reading Tests, Canadian Edition, was carried out in 1978-1979. A total of 46,000 Canadian students were used to develop norms for all levels of this test and between 3,000 to 4,500 students were sampled from each grade level. Students came from all 10 provinces and the Yukon. (Only schools in which the majority of instruction was given in English were selected.) Using population and school enrollment figures published by Statistics Canada, a sample was drawn from each province that proportionally represented the total school enrollment. Due to considerable differences in types of

school systems across Canada, each province's population was stratified according to city size and population of rural areas. A randomly selected sample was then selected from appropriate proportions of students in each defined stratum. Next, the Canadian score distributions for each grade were compared with equivalent score distributions from the 1977-78 U. S. standardization (MacGinitie et al., 1980, p. 57). Dreher (1985) states that the sample appears to have been carefully selected to be representative of Canadian students (p. 597).

Reliability - Kuder-Richardson Formula 20 reliability coefficients for the Canadian Edition, Level D, Form 1 range from .87 to .90 for vocabulary and .87 to .89 for the comprehension section of the test. At the grade 5 level of the test level D, Form 1, the reliability coefficient is .90 for vocabulary and .89 for comprehension.

Validity

Content validity - In developing the Canadian version of the Gates-MacGinitie Reading Tests, a number of steps were taken to make these tests valid for most Canadian reading programs:

- Items for each test were reviewed by a group of Canadian educators and were accepted, discarded or modified on the basis of their recommendations. Test items reflect an international character and include authors from Canada and other countries. Topics were expected to be within the experience of the many diverse groups in the country. Consultants from minority groups examined and eliminated any items that were considered biased or might be offensive. The use of the indefinite pronoun "he" was avoided as much as possible and edited out of passages that were used. Both male and female characters from a variety of ethnic backgrounds are represented in the comprehension passages (MacGinitie, 1980, p. v in the Teacher's Manual).

- Vocabulary was developed using 16 common reading series and from recognized lists of word frequency. Vocabulary was also chosen for its usefulness.
- Content of comprehension passages was selected to include a specified amount of narrative and content area subject matter from the fields of the humanities, the natural sciences and the social sciences. The passages at this level were comprised of approximately 40% narrative-descriptive material and 60% expository content area material (Social Sciences, 27.5%; Natural Sciences, 27.5%; The Arts, 5%). (Mixed text type is very common in both grade five B.C. authorized textbooks and therefore, a comprehension test that reflects both narrative and expository text type is appropriate for this grade. The larger percentage of expository text is especially useful for this study which has its focus on expository text material.)
- Passages for the older students were written to represent a wide variety of materials that the students might encounter. All material is written in standard written English.
- Approximately twice the number of items needed for the final tests were developed. From this pool, the most appropriate and the most useful items were chosen.
- Canadian spelling was used throughout the tests.
- Type styles that represent styles in most Canadian readers were used (MacGinitie, 1980, p. iv, Teacher's Manual).

Construct validity - None of the standardized group tests surveyed by this researcher tested reading in a broad spectrum way. Vocabulary is taken out of context and only short passages are used in comprehension sections.

Rowe and Rayford (1987) discuss the problems with tests that are "composed of a series of brief, unrelated texts that proceed linearly, with little regard for the order of content. In order to comprehend the series of passages presented on reading tests, students must activate a different network of background knowledge as they encounter each new text. This variation in content creates conditions that are quite different from most 'real-world' reading tasks" (p. 162). Finally, reading ability is assessed using only a multiple choice question format.

Test Content - There are forty-five vocabulary items in Level D, Form 1. Vocabulary questions at this level are primarily a test of word knowledge rather than a decoding skill test.

The comprehension section has 43 items consisting of small passages followed by a few questions. (This format allows us to see how the three groups perform on a comprehension task that does not involve the headings treatment.) The test consists of both literal (55%) and inferential types (45%) of questions (MacGinitie, 1980, p. 59-60, Teacher's Manual).

This test yields a comprehension and vocabulary score and then a total of the two scores. Adequate time is allowed for most students to complete both the subsections as this is meant to be a power test and not a speed test.

Nonstandardized Materials

Materials for the three treatments consisted of a prereading component and a content-area expository passage. The posttests included a delayed free recall of this passage and a main idea recall or formulation.

Prereading Component

Two versions of the prereading component were created. Version A contained the headings and subheadings from the selected main passage. In addition, instructions were

given on heading use. See Appendix A.01 for the exact contents of this component. Version B was a time filler for the two groups who were not to receive any heading strategy instruction. It consisted of a crossword puzzle, #5, adapted from Thorton, C., 1985, (#5 and #10 from the same source were used in the pilot study) that had the key words from the headings of the main expository passage embedded in an alphabetical list of answers to the crossword puzzle. This way both groups had a repeated chance to benefit from being exposed to the vocabulary used in the headings. However, the key words were not placed close to each other so that they could not be grouped in a meaningful manner, as if they were headings. See Appendix A.01 for the exact contents of the version A and B prereading components.

Main Expository Passage

All three groups read the same body of the passage. However, there were differences between the presence or absence of headings in the passages presented. The control group read version C - the passage with all text headings removed. The two experimental groups read version D with the chapter and section headings present. (See Appendix A.02.) The following section describes how the passage material was selected:

General Criteria for Selecting the Passage for the Study

- The selected passage had to be relevant to the current curriculum in schools. Instead of contrived passages that had often been used in previous heading studies, the intention in this study was to use real classroom materials. (Contrived passages allow one much more control over the number and the type of headings used in any passage plus they allow one to eliminate effects from other processing aids. However, results from contrived material fail to show how students are affected by headings when they actually read normal classroom textbooks with a variety of processing aids and fewer headings and subheadings.) By choosing a textbook that was currently being used by grade 5 students, this condition was satisfied.

- The reading material had to be used by a relatively large number of people. Therefore, a prescribed or authorized textbook for a province seemed appropriate.
- The passage had to consist of expository prose as this type of discourse was the focus of the study. Therefore, only expository prose passages were considered.
- There had to be at least two levels of headings. Most of the prescribed or authorized text material in three grade five content area subjects (Mathematics, Science and Social Studies) contained two or three levels of headings. The use of headings in text seems to be a common feature of fifth grade text material.
- The passage must not have been read by the subjects before.
- The passage was to represent reading material from a content-area subject. Social Studies was chosen because reading material in this subject often is of the information-classification type (Catterson, 1990, p. 557) which was used in the Goble and Coulombe studies (1986). The selection of material with a similar type of discourse was thought to be more useful for comparison purposes.

Selecting the Textbook to be Used in the Study - To insure the material was current and being used by a large number of Canadian children, five texts were chosen as possible selections from two provinces' prescribed and approved school lists (Circular 14, Ontario and B.C.'s Catalogue of Learning Resources: Primary to Graduation 1991-1992). The advantages of out-of-province authorized material were the range of texts that could be selected and the limited chance that any of the British Columbia pupils had used these texts. Therefore, all children in the selected districts would be able to be included in the study. The disadvantage to using Ontario authorized material is that this is not the real classroom material of British Columbia children. Using real, currently used, British Columbia materials enhances the ecological validity of the study (Baumann, 1981a). In consultation with the designated thesis chairperson, it was decided to narrow the choice of

subjects and select British Columbia text material in order to be applicable to the British Columbia school population.

The province of British Columbia currently has two authorized grade 5 social studies textbooks - Canada: Building Our Nation and Exploring Canada: Learning from the Past, Looking to the Future. These texts were examined carefully and a number of expository passages were selected. Both texts contained a fairly large amount of narrative prose and it was difficult to find suitable expository prose. The Canada: Building Our Nation had many first hand accounts, often written in narrative prose, and used only chapter headings. Therefore, this text was eliminated and the text, Exploring Canada: Learning from the Past, Looking to the Future was selected to be used in this research study.

Next, the Burnaby, Coquitlam, Courtenay, Delta and New Westminster school boards were phoned to ascertain what grade 5 social studies text was currently being used in their school districts. The district social studies consultants from the various school boards suggested that this researcher choose material that the classes were not using or work very closely with the classroom teacher to fit in with a suitable agenda. As one can not easily fit in with each classroom teacher because there no longer is any mandated or suggested order for teaching content-area topics, this researcher chose to use material from the text that was not being used by the subjects in their classrooms. Therefore, it was decided that only those classes that were using the text, Canada: Building Our Nation would be used in this study. This decision eliminated the Burnaby school district, and narrowed the classes available to the researcher in the Delta, Coquitlam and New Westminster school districts. Of the preselected districts, only the Courtenay school district was solely using the text, Canada: Building Our Nation as the main grade five social studies text when initially approached.

Selecting the Passage to be Used in the Research - The text, Exploring Canada:

Learning from the Past. Looking to the Future, contains large amounts of narrative prose interspersed with short sections of expository prose. From the available expository sections, three of the most appropriate were chosen and typed up. Next, some readability scores were produced on the typed selections using a grammar checker program for the Macintosh computer. These were compared with the readability levels of the passage used by the 11 and 12 year old students in the Hartley and Trueman (1985) study and the passages used in the Coulombe and Goble studies. Several passages were eliminated because they had very high readability levels for grade 5 students. The final choice was made in consultation with the thesis advisor. A passage from page 34 to 37, in a chapter called How Were Forests Used in the Past? was selected. This passage had several advantages. The topic of early forest use is fairly easy to understand and many British Columbia children probably have adequate background knowledge to relate to the material. Moreover, the selected passage had more similarities, especially in length with the Hartley and Trueman (1985) study and readability level to the relevant studies of Hartley and Trueman (1985), Coulombe (1986) and Goble (1986), than the other possible passages had. See Table 3.04 for a comparison of studies on three readability scales partly provided by Correct Grammar™ for the Macintosh®.

Preparing the Passage for Research Use - The selected text (Bowers & Swanson,

1985, p. 34-37) needed to be modified slightly for this experiment. A few sentences were removed because they made direct reference to information provided in a previous section of this chapter. (To see the original text and the sentences that were removed, refer to Appendix A.03.) Only one sentence had to be rewritten to include relevant information. The phrase, "at that time," on page 35 was replaced by two phrases "about 200 years ago, during the late 1700s" from the line above. The remaining text material formed a logical, self-contained passage. Two versions

Table 3.04**A Comparison of Three Studies on Readability**

Author of study in which passage was used	Name of passage	Number of words	Number of paragraphs	Number of headings	Ratio of words to headings	Flesch Reading Ease score	Grade level required	Flesch-Kincaid grade level	Gunning Fog index
Hobbins (current study)	How Were Forests Used in the Past?	1090	20	5	218	75.5 (fairly easy)	6	5.8	5.2
Hartley & Trueman (1985)	The Life of Louis Braille	1000 (approx.)	-	-	-	84 (easy)	(suitable for 11 and 12 year olds)	-	-
Stables (1985) Goble (1986) Coulombe (1986)	Termites	214	5	6	35.7	87.3 (easy)	5	2.9	3.0
Stables (1985) Goble (1986) Coulombe (1986)	Parrots	253	5	6	42.2	85.7 (easy)	5	3.6	3.9

of this remaining passage were constructed. Version C (to be used by the control group) contained the prepared passage but all the headings were removed. Version D (for the two experimental groups) contained the prepared passage with all headings present. Because of the changes between the original text, version C, and version D, the appropriate version was typed in a similar manner to the original version and inserted in place of the original text next to the pictures. In addition, the title for the chapter was added to the headings present version. It was in the form of a question because the text authors wished "to set the tone of inquiry" (The teacher's manual, Bowers & Swanson, 1985, p. 34). The research selection contained a number of special features to help students understand the text. These features were pictures with statement and question captions, key vocabulary in

boldface print, and inserted questions. Headings were also used but were not considered a special feature by the authors. All these processing features of the original text were retained in the prepared version D and only the headings were removed for version C. (See Appendix A.02.) Therefore, the prepared passages very closely represented the real classroom social studies material.

Exploring the Relevance of Treatment as a Real Activity in the Classroom - In this study, the subjects were required to read a four page passage selected from an authorized social studies textbook and recall as much information as possible after a one day delay. In addition, the heading strategy instruction group had to preview the headings, use the headings to link with background knowledge, predict what the passage was about and use the headings to categorize or group information. It is important to see if these are reasonable requests in a real classroom situation.

A number of sources were reviewed to see how typical the research situation was. First, the Teacher's guide to the textbook, Exploring Canada: Learning from the Past, Looking to the Future, was consulted. It suggests that at least one or more classroom periods should be devoted to the section on pages 31-37. In one part of the chapter introduction, the teacher is asked to guide their students to read all the headings in order to familiarize them with the structure and format of the chapter. Later on, the students are asked to read pages 31-37 before using information contained in the passage to do one of a number of activities. Therefore, reading the selected passage on pages 34-37 (in future, to be referred to as the forest passage) and recalling the information is a real classroom activity. A scan of the rest of the teacher's guide shows that one of the most basic activities required in social studies text is reading a certain number of pages (usually 3-8) and then being prepared to use the information that has been read in a range of tasks. The 1989 Social Studies Assessment for the British Columbia Ministry of Education found that 77% of the grade 4 teachers and 79% of the grade 7 teachers

of Social Studies used the textbook as one of their five most prevalent teaching strategies (Cassidy & Bognar, 1991, p. 75). In addition, in Skills Through the Grades in Appendix A of the British Columbia Social Studies Curriculum Guide indicates that children are introduced to acquiring information through reading materials at the appropriate level (G2 on page 53) as early as grade one. Moreover, students begin to classify pictures, facts and events under main headings or in categories by grade 2 (F6 on page 51). By grade 4, the students start to learn how to select the main idea and supporting facts (F2 on page 51). If these skills are in place, students should be able to read the passage in order to recall information and if headings are present, to use them classify facts. However, the skill of using headings to select main ideas and differentiate between main and subordinate ideas is a social studies skill that is not introduced until grade 6 (G4 on page 53). It is one of the purposes of this study to explore whether younger students (grade 5), who are given heading strategy instruction, can use it to improve comprehension and recall of expository material.

The Posttests

Two types of written posttests were given one day after the treatments were administered. The first test was a written free recall of the forest passage read the previous day. The students were requested to write everything they could remember about the passage they had read. The focus on this test was on the quantity of main ideas (or superordinate ideas), supporting ideas (or subordinate ideas) and specific details (or sub-subordinate ideas) recalled. The second test involved a delayed main idea recall/formulation task based on the same forest passage. Each child received a prepared structure. (See Appendix B.01.) On this structure, the subjects recalled or formulated the main idea of the passage and listed four of the most important supporting main ideas. These main ideas were expressed partly in the headings and partly by what was learned in

the passage as it relates to the main idea. This test measured the quality or accuracy of the subjects' responses.

The Delayed Written Free Recall Posttest - In this researcher's experience, free recall is not a common task in school, probably because it is very labour intensive and difficult to evaluate. Instead, multiple choice, matching or selected questions are often used when teachers wish to find how much students have understood and remembered a passage. The focus in this study was to explore heading effects on comprehension as examined through the recall process in a typical classroom. It was important to use a reading activity that students might be asked to use in this classroom setting but it was not deemed essential that our testing procedures be the same.

A large segment of heading studies have explored the effects of headings on the ability of the subjects to remember information that has been read. Three common ways to explore remembering are recognition tests, cued recall questions and uncued recall. In recognition activities, all the information is provided and the student must recognize the correct connections. In cued recall, part of the information is given or available and the student needs to remember the rest of the information. In free recall, no cues are given. Instead, the student is asked to tell orally or state in writing, everything that he remembers about the passage. Manzo (1975) says, "Unaided recall is the ability to recall much of what one has read without benefit of questions to aid remembering" (p. 288).

There were a number of reasons why delayed free recall was chosen as a way to assess heading effects. Firstly, free recall measures are commonly used or recommended in the field of heading research (e.g. Clark, 1982; Coulombe, 1986; Gibbs, 1985; Goble, 1986; Holley et al., 1981; King, 1985; Stables, 1985). Jonassen, Hartley and Trueman (1985) concluded at the end of one of their experiments that "the necessity of free-recall measures is also obvious" (p. 11).

Secondly, the literature points to free recall as a better method to get at the amount a student can recall and to see how this information is organized in memory. Clark (1982) claims that researchers, in the area of prose comprehension, have turned to free recall as it is found to be more informative than literal questions which measure "how well a student remembers the text when given a prompt, not how well it is understood or comprehended ..." (p. 435). Furthermore, Clark thinks that when literal questioning techniques are used, "nothing is learned about the students' abilities to remember text in an organized manner or to remember important (superordinate) information versus detail (subordinate) information" (p. 435). In regard to recognition tests, Radcliff and McKoon (1989) cite the studies of Tulving and Thomson (1973) and Watkins and Tulving (1975) as showing that "under a variety of conditions, there is significant recall of words that were not recognized" (p. 74). Therefore information that students might know, might not be recognized. Conversely, Anderson and Pearson (1984) said, "a recognition test item minimizes the need for retrieving information from memory since the information is provided in the item itself. [and] ... access is not a problem on recognition items Access is a critical process in free recall" (p. 283). So, with free recall, the student must access information from the passage without benefit of cues, and organize the information in some form for presentation. A free recall protocol enables the researcher to gain quite a large amount of information about the subjects' reading processes. Thirdly, the results of a heading research suggest that headings are more likely to have a significant effect on free recall than on recognition questions or cued recall. Therefore, a free recall measure was chosen to explore heading and heading strategy instruction effects.

In addition, a delayed rather than immediate free recall measure was used. Heading research to date seems to show headings to be more effective in delayed recall situations instead of immediate recall situations. (See the review of the

literature on Heading Effects on Recall.) In immediate recall, the student may have a tendency to recall information in patterns affected by the order that the information was read. For example, what was read last may be easier to remember using one's short term memory than what was read in the middle. By delaying the free recall, one is able to observe what is drawn out of long term memory storage. When students are asked to remember information after a time lapse, headings might provide categories under which information can be grouped. In the book edited by Tulving and Donaldson (1972), Postman discussed the need for humans to organize material in chunks or categories in order to remember more efficiently. If chunks or superchunks are recalled instead of specific pieces of information, the chunks or categories may further stimulate the person to remember some of the information contained within the chunk. Therefore, it is possible that headings aid in the chunking process and lead to improvement in recall of information.

It is also relevant to have information about delayed recall. There is little advantage to quantities of information being learned for immediate recall and then forgotten. Many times information is read that would be useful to recall on other occasions. Hence it is important to explore ways to retain information in memory so that it can be accessed at some later date and used for any necessary purpose.

Therefore, on this test, a delayed measure of free recall was used.

Main Idea Recall/Formulation - In the free recall posttest, general quantity and levels of organization of recall were explored. Yet, it has been hypothesized that headings might have more of an effect on recall of the superordinate concepts in the passage than on the recall of details. This is especially likely as headings often contain the subject part of the main idea and are themselves superordinate ideas. However, a free recall makes no specific demands for students to express the main themes of the passage. Indeed, as Loman and Mayer (1983) point out, some students have a tendency to use a rote reading strategy. They say:

When a reader is confronted with an unfamiliar passage, the reader may use at least two types of processing strategies. A *rote reading strategy* is used when the reader views the passage as a list of separate facts or events to be memorized; in this case, the reader's attentional strategy may be to focus on the first and the last few ideas in the passage (primacy and recency information), and the reader's organizational strategy may be to add each fact to memory as a separate unit. A reader who uses a rote reading strategy may show a serial position effect for idea units in recall and may be unable to make inferences or apply the presented information in creative problem solving. A *meaningful reading strategy* is used when the reader has a notion of the structure of the passage; in this case, the reader's attentional strategy may be focused on the key conceptual information in the passage, and the reader's organizational strategy is to build an organized, coherent representation. (p. 403)

So, the main idea recall/ formulation posttest was created to focus the attention of the student specifically on the key ideas in the passage and then assess their results on this type of knowledge about the passage.

Scoring

Free Recall Posttest - Several dependent variables were measured on the free recall posttest. These variables were: quantity of main ideas or superordinate ideas, quantity of supporting ideas or subordinate ideas, quantity of specific details or sub-subordinate ideas, and the total number of ideas recalled.

A number of free recall scoring systems were considered. The often cited Meyer (1975) procedure (see Baine, 1986, pages 143 to 147, for a list of purposes and a simple description) was thought to be too elaborate for the purposes of this study as it detected between eight to fifteen levels in the content structure of the passages. Simpler and somewhat similar free recall scoring procedures were those devised by Clark (1982), Niles (1955) and Niles and Catterson (1972/78). The Niles procedure was chosen because this researcher had access to a series of passages that Niles and Catterson had prepared as scoring protocols for their

reading tests. These were used to familiarize the researcher in the Niles scoring procedure.

Using the Niles procedure as a starting point, the researcher developed a protocol for the forest passage. First, the researcher divided up a number of the Niles and Catterson passages without looking at their protocols and then compared the results with the originals. Secondly, the four page research passage was broken into sections (usually pausal units) and placed in one of three locations depending whether the information contained a main idea, a supporting idea or a specific detail in the passage. (In order to keep the text intact, some ideas were broken at unusual spots.) Thirdly, another person repeated the process and produced their version of the divisions for the passage.

These versions were compared. Any differences were discussed and modified after a consensus was arrived at. The new, jointly approved version of the scoring protocol (see Appendix B.02) was arranged in columns for easy marking purposes.

Scoring the Main Idea Recall/Formulation Posttest - A system somewhat similar to Baumann's (1981a) scoring system for written recall gist statements was used. Baumann had given each complete (identical or paraphrased gist statement) main idea a full mark and each fragment of the gist statement a partial credit. In this study, four marks were given for a complete and accurate main idea statement and one mark was given for each fragment of a gist statement as predetermined on a scoring guide. No marks were given if the student combined parts of main ideas with subordinate or sub-subordinate ideas (specific details). The total score possible on this posttest was 20.

General Features of the Marking or Scoring of the Posttests - One key feature of the scoring procedures was blind scoring. While scoring the posttests, the researcher had no access to the complete student codes that told to which treatment group the

student had been assigned. The posttest papers contained only the assigned research numbers of the students. The thesis chairman held the full code list in her possession while the scoring and rescoring took place. Then, all the information was entered into computer and data analysis was carried out.

A second key feature of the scoring procedure was an intra-rater reliability check. After all the papers were marked, 10% were selected randomly by the thesis advisor or her assistant to be rechecked. The two sets of scores were compared and an intra-rater correlation coefficient was obtained.

PROCEDURE

The procedure consisted of three phases: the organizational phase, the pilot study phase and the main study phase.

The Organizational Phase

Before the study could take place, various contacts had to be made to obtain permission to carry out this research. First, a number of school districts were contacted by phone to find out what social studies text was being used in grade 5 classes that year and to learn what district wide reading achievement test was being used. Next, a reading passage was selected from one of the two recommended British Columbia social studies texts and permission from the publisher to use this passage with the treatment groups was requested. The original publishers, Douglas & MacIntyre, had sold the rights to the textbook, Exploring Canada: Learning from the Past, Looking to the Future, that contained the forest passage, to Nelson of Canada. Therefore, a second letter was written to the new publisher for permission to use the forest passage. (See Appendix C.01 for a copy of both letters.) Thirdly, school districts for the study were selected (see sampling in this chapter), and letters were written to the superintendents of three school districts: Coquitlam, Courtenay,

and Delta. Fourthly, thesis approval from the thesis committee was to be sought at a thesis proposal hearing. Fifthly, the Ethics committee at U.B.C. was asked to approve an application to conduct educational research using human subjects. Next, the researcher made arrangements with each school board to select appropriate classrooms for the study. Contact was made with the schools and teachers that were to be involved in the study. Lastly, permission was sought from parents to carry out an experiment involving their children.

Pilot Study Phase

Two phases of a pilot study were planned. The first phase of the pilot study was exploratory and used students from a grade five class in a Catholic school in the lower mainland. After each session, the children's comments were sought and noted. This part of the pilot study had a number of purposes. It provided a chance to field test heading strategy instructions, to learn about their understandability, effectiveness, time requirements, and the students' attitude about carrying out the instructions. In addition, the prepassage alternate treatments, that consisted of a cross-word puzzle with words from the headings in the forest passage embedded, were tested. The questions of level of difficulty of crossword puzzle, length of time needed to complete puzzles and interest level were explored (Two different crossword puzzles were tried. These puzzles, designated #5 [easier] and #10 [harder], were adapted from Thorton, 1985. Each puzzle was enlarged to contain all the key words that were used in the headings). The researcher also asked the various groups if they thought that the puzzle was more fun than the heading strategy instructions. Next, the forest passage was field tested for suitable time allowance and passage difficulty. Lastly, the posttests and the scoring protocols were tried out so the researcher could find answers to the amount of time allowance needed on posttests, whether the students had the ability to understand how to do the posttests, and the usefulness of the scoring protocols in providing consistency and accuracy. When the pilot

study was completed, the researcher sought feedback from the students and their teachers and noted their responses.

Results of Pilot Study #1

In early March, 1992, the first pilot study was carried out. The researcher spent one complete school day, followed by a 45 minute session the next day, in a Grade 5 class from a Catholic school in the Lower Mainland, trying out treatment variations and administering the posttests. The following is a brief listing of the activities that were carried out in the explorative pilot study:

1. The students were assigned to three reading ability groups by the teacher.
2. Students in each ability group were assigned to different treatment groups.
3. Within each treatment group, some students read the treatment materials silently in mixed group setting (replicating main study conditions) and times were recorded for each treatment group. These students circled any words they did not understand. Other students in each treatment group worked orally, on an individual basis with the researcher, in order to see if the students could read and understand all instructions and activities.
4. Prereading components:

Headings instruction - Generally, this component went very well. Only a few words caused students any problems and some of these were remedied in the material that was prepared for pilot study #2 (Appendix A.01 - Version A). A few concepts were also changed in order to make the heading instructions more clear and effective.

Puzzle activity - The students had very little problem solving puzzle #5 (Appendix A.01 - Version B - expanded puzzle #5) and its time requirements were fairly similar to the heading instruction strategies. Puzzle #10 (Appendix A.01- Version B-expanded puzzle #10) was harder to do and took far too long to finish.

Therefore, puzzle # 5 has been chosen by the researcher for the main experiment. It was thought that a few answers could be inserted in puzzle #5 to make the heading instructions and the puzzle activity more equal in time, if necessary. Variations were to be explored in the second pilot study.

5. Main passage components were not changed. The students thought the reading was quite easy.
6. Posttest Components: The directions on the posttests seemed to be fairly easy to follow. Only a few words needed to be changed. (See Appendix B.01, B.03, and B.04 for the differences in pilot study #1 and #2 and the format for the main study.)
7. Evaluation: The students filled out an activity form evaluation and the response was very positive. Most students found the activities easy or just about right in difficulty and just about right or too short in length.
8. Scoring and tabulating the results: The results of the free recall and the main idea recall/formulation test were scored and tabulated but not analyzed. These results were compiled on a graph (see Appendix B.05) and taken back to the pilot study #1 classroom as the teacher requested feedback for her students.
9. Evaluating the scoring of the posttests: Several things became very obvious when the posttests were scored. First, the free recall test was very difficult to mark because ideas were remembered in no particular order and information was linked with vague referents (e.g., *they*, or *the people*) so it was hard to figure out the subjects of actions and to decide when the student had left one topic and moved on to another. Moreover, when the scoring protocol listed the same items at several hierarchical levels, it was hard to decide at what level to give the subjects a mark because of vagueness of ideas. Secondly, very little was remembered and what was remembered was often generalized, inferred or linked in inaccurate ways. Thirdly, many children confused information from previous class discussions on conservation of forests today with information from the passage on forest use in the

past. Lastly, no students were able to respond with verbatim recall. It would appear that young students (ages 10-11) who are reading several pages of classroom expository prose do not process and recall text in a verbatim manner at all. The researcher thought the scoring protocols that had been developed for short passages of only several paragraphs were not adequate for the longer four page passage that the researcher had attempted to use when simulating classroom conditions. It was decided by the thesis advisor and the researcher that a completely new scoring system might have to be designed and tested before the main study could take place.

10. The search for a better scoring system: An extensive scan of the research in memory and recall was carried out to find a better scoring system. The result of this search is provided in the next section.
11. A new scoring protocol was developed and tried out by rescoring the posttests of the pilot study #1 subjects using this new scoring system. The results of the rescoring appear in Appendix B.06. The new scoring protocol (see Appendix B.07), which was created using ideas from a wide number of researchers, is designed to overcome problems that appeared in the pilot study and to accommodate the way children tend to process and recall text.

Developing the New Scoring System

Exploring How People Recall - One of the most obvious problems with the scoring system used in pilot study #1 was that the children produced no evidence of verbatim recall in their responses. Therefore, the first area this writer researched was how people recall information. Although most scoring systems reward verbatim recall, the literature shows that people do not recall in a literal or verbatim fashion (Baine, 1986; Baker & Stein, 1981; Bartlett, 1932; Graesser, 1981; Voss, Tyler & Bisanz, 1982). Very early on, Bartlett (1932) decided memories were not,

as supposed in his day, a large number of fixed and lifeless traces residing in specific locations in the brain. Instead, he hypothesized that people use schemata developed in the past to construct meaning about new situations or information.

Bartlett (1932) said,

The first notion to get rid of is that memory is primarily or literally reduplicative, or reproductive. In a world of constantly changing environment, literal recall is extraordinarily unimportant. ... In the many thousands of cases of remembering which I collected, a considerable number of which I have recorded here, literal recall was very rare. With few exceptions, ... re-excitement of individual traces did not look to be in the least what was happening. (p. 204)

He went on to suggest that some common features of remembering are condensation, elaboration and invention. Years later, Bartlett's ideas have become accepted in the research community. Graesser (1981) states, "During comprehension individuals normally focus on the meaning of the message rather than the exact wording and the syntax (the surface structure). As a consequence, individuals normally remember the semantic and pragmatic aspects of passages rather than the surface structure code..." (p. 6). Later, Voss, Tyler and Bisanz (1982) conclude:

When a text is read and an individual is asked to recall its contents, recall is typically not verbatim. Instead, the individual recalls some sections of the passage while not recalling other parts, and the individual often "recalls" statements that were not in the passage. Moreover, if a recognition test containing appropriate distractor items is given, the individual often has difficulty in determining which items were or were not in the text. These results constitute the basic empirical findings in the study of prose comprehension and memory. Their explanation has been the primary goal of psychological models of text processing. (p. 349)

Verbatim recall is especially unlikely when the length of the passage to be recalled is long, as it usually is in real-life situations. Baine (1986) states that, "a

verbatim recitation for a previously read passage ... [is] an impossible task with a lengthy or complex passage" (p. 17). Trabasso (1981) suggests a wide variety of different ways to represent meaning besides using verbatim recall because he finds problems with researchers emphasis on free (verbatim) recall when "the material read clearly exceeds limitations of surface retention" (p. 113).

Instead, more recent research has shown that readers tend to construct meaning from passages that they read rather than receive knowledge, intact, from text (Resnick, 1984; Rowe & Rayford, 1987; Struck, 1983; Voss, Tyler & Bisanz, 1982). Resnick (1984) concludes:

People *construct* rather than receive knowledge. Knowing something, whether a body of interrelated concepts or a performance skill, is a result of mental activity by an individual. This activity uses external information, and is responsive to what an individual may be told or shown. But the person does not simply "store" this information as received. Instead the person transforms it, links it to knowledge already held, and uses it to build a coherent interpretation of the world and its events. (p. 431)

Van Dijk and Kintsch (1983), in their new model of strategic discourse processing, also make the assumption that discourse processing "is a strategic process in which a mental representation is constructed of the discourse in memory, using both external and internal types of information, with the goal of interpreting (understanding) the discourse" (p.6). Van Dijk (specializing in textlinguistic) and Kintsch (noted for his work in memory) say that "Whereas our earlier model [1978] could be characterized as predominantly *structural*, we now propose a more dynamic, process-oriented, on-line model, an approach we want to call *strategical*" (p. 4).

However, Bartlett did not think that recall was equally reconstructive. Graesser (1981) says, "When Bartlett (1932) examined memory for stories after long and short retention intervals, he has made a few informal observations.

Memory for text initially tends to be 'reproductive' in the sense of being close to what was explicitly stated. However, memory is more 'constructive' as the retention interval increases ..." (p. 95). It becomes obvious that the recall of prose is not a simple matter of reproducing text. Graesser (1981) hypothesizes that recall of passages is critically affected by abstraction and summarization procedures and he identifies three stages that can effect recall: processes "occurring at acquisition, to some extent by processes occurring during memory retrieval and to some extent by abstraction and summarization operators" (p. 209). In other words, what we understand is not always what we store and what we remember from storage is not always then reproduced. If, as many researchers have hypothesized, people construct meaning from text, store some of this information in long term memory and then reconstruct the information when one is asked to recall information, researchers' emphasis on rewarding verbatim recall is unrealistic.

There are a number of ways that people do construct a representation of the text they have read. Firstly, a reader may condense or generalize a text. Graesser (1981) states that "... there is some evidence that recall of text material involves abstraction and summarization processes ..." (p.79). Baine (1986) in discussing the Kintsch and van Dijk (1987) model of text processing says:

Recall may not result in an exact *reproduction* of the original stimulus. For example, an individual performing a previously demonstrated set of steps, may resequence, eliminate or add to the steps demonstrated, while imitating the *essential features* of the modelled performance. This type of edited recall in some cases is desirable and, as is discussed later in the text, is prerequisite to the *generalization* and adaption of recalled strategies to novel application. Also, rather than provide a verbatim recitation of a previously read passage of prose - an impossible task with a lengthy or complex passage - readers may describe the general sequence of events, the major points or the gist of the topic expressed in the text. (p. 17)

Deletion is another common feature of prose recall (Graesser, 1981). Graesser (1981) hypothesizes that "recall of a passage is critically affected by abstraction and summarization procedures. These presumably unconscious procedures delete some nodes that were explicitly stated and insert other nodes that are inferences (rather than explicit passage statements)" (p. 210). Other features of recall, such as inferences (Crothers, 1979; van Dijk & Kintsch, 1983), elaborations (Wagner, 1986), substitutions and intrusions, come from the reader's world knowledge. Voss, Tyler and Bisanz (1982) say, "Lots of information isn't in the text. It is assumed knowledge. The meaning we give to discourse is based upon our knowledge of the world" (p. 369). Brown, Smiley, Day, Townsend, and Lawton (1977), in their study with grade 2 to grade 7 students, found that recall of ambiguous narrative passages was improved if a framework was given. In this respect, there were no developmental patterns. The children behaved like adults in their recall and recognition studies and Brown et al. argue that "for children as well as adults schemata provide the interpretive framework for comprehending discourse" (p. 1454). They say, "Texts are never fully explicit, and the reader must rely on preexisting knowledge to disambiguate situations, to fill in gaps, to incorporate the unfamiliar into the familiar, and to provide a plausible interpretation for the ambiguous or vague. Thus, a reader's personal history, knowledge, and belief systems will influence the interpretation that is given to a passage" (p. 1454). Unfortunately, people, when they read new material and have incorporated it into their long term memory, have trouble distinguishing their own inferences from the text's message. Baker and Stein (1981) state, "One of the most frequently tested hypotheses emerging from Bartlett's work (1932) is that people construct an integrated semantic representation as they read or listen to prose and that as a result of this integration, it is sometimes difficult to distinguish the actual text content from inferred information" (p. 25). Baker and Stein cite an experiment by Paris

and Carter (1973) that concludes "that children, like adults, construct the semantic relationships among ideas and integrate them in the representation stored in memory; this creates difficulty discriminating inferred from explicit information" (p. 26). In the pilot study for this research project, many students recorded information from their classroom lessons on forest practices today instead of recalling information from the text on forests in the past. In this case, previous information intruded upon the most recent information in a negative manner. Substitutions also occur in recall protocols. The substitution may be related but can be more general (e.g., boat for canoe) or more specific (e.g., capes for clothes). Students also substitute pronouns for nouns as if one can read their minds. Van Dijk and Kintsch (1983) discuss Karmiloff-Smith's (1981) observations with narrative prose that children of various ages and skills may use pronouns to represent the hero of the story and later refer to other characters with a pronoun and a description (p. 32). Brown, Smiley, Day, Townsend and Lawton (1977) sum up Bartlett's ideas on recall protocols in the following way: There was a high degree of inaccuracy in recall protocols (omissions, condensations and embellishments), these inaccuracies increased over time, and subjects seemed to be unaware that this was occurring and had trouble discriminating material that they had added or changed from the original material that they had read. It would seem that people have a system designed to recall in a more general rather than specific way. Indeed, Neisser (1989) thinks that memory for generic characteristics is more typical than memory for specific occasions (p. 73). Lastly, a number of researchers (Graesser, 1981; van Dijk & Kintsch, 1983) think recallers restructure text. Graesser (1981) lists five types of structural changes. They are appending, inserting, pruning, deleting plus restacking, and reordering (p. 250). In summary, Wagner (1986) says that for constructing text representations, people need the following strategies:

- the semantic-syntactic processes for construction of propositions,
- inferential and elaborative processes,
- reductive processes,
- reconstructive processes, and
- metacognitive processes (p. 893).

Although researchers must be cautious in concluding that the results of narrative prose research apply to expository prose, no research was found that indicated that people recall in a verbatim fashion. Therefore, a new scoring protocol would have to be sensitive to useful recall strategies while reducing marks awarded to less useful strategies.

Exploring Potential Methods for Preparing Scoring Protocols - Traditionally, free recall tests have asked the subjects to remember as much of the contents of a passage as possible. Then, the protocols of the subjects are scored for the amount of original text information that is remembered. Therefore, most methods or models turn to the text and attempt to break the selection into smaller units in order to obtain a reference for measuring comprehension and recall. As a result, researchers have used information derived from the study of text structure. Voss, Tyler and Bisanz (1982), in their review of prose comprehension and memory, group the methods of studying text structure under three categories: intuitively derived text structure, empirically derived text structure, and text structure derived from logic and linguistic theory (p. 351-353). This framework provides a useful way to look at the available models for use in deciding how to divide up text.

Idea units (intuitively derived text structure) - Voss, Tyler and Bisanz (1982)

say, "The need to divide a text into a number of units arose, at least in part, from the necessity of scoring recall protocols One technique developed was to divide the passage into a set of 'idea units,' in other words, units of text that embody a single complete idea. The units were typically small,

consisting of one or a few words. The investigator then determined which and how many of these units were recalled" (p. 352). Levitt (1956) warns experimenters that there can be problems with this method if one is comparing passages or if several experimenters are using the same passage but designing their own protocols. Some examples of systems using idea units are:

- Niles (1955) developed the Niles procedure that used idea units arranged in two columns representing two levels of information: main ideas and details,
- Niles/Catterson (1972/78) - Catterson adapted the Niles procedure to include three levels of information: main, subordinate, and sub-subordinate, and
- Just and Carpenter (1980) used idea units called sectors and synonyms and paraphrases were given full credit if they were close to the gist of the sector.

Empirically derived text structure

- Johnson (1970) developed a method that used empirically derived pausal units and weighted the text (narrative material) according to the structural importance of the linguistic subunits.
- Clark (1982), in a method similar to Johnson (1970), used pausal units to break up text, a score of one to three for level of importance, and developed a way to record the order of the ideas that were remembered.
- Rubins (1978) defined units in terms of grammatical criteria or how the word functioned. He used this method with narrative prose.

Voss, Tyler and Bisanz (1982) say, " Whereas empirically defined units have proved to be useful tools, the shortcomings of the method is that

it lacks a conceptual rationale to suggest what makes units differentially important and why such differences influence performance" (p. 353).

Kintsch and Vipond (1979) say that scoring protocols need some theoretical foundation. "Scoring for words won't do; and scoring for meaning - if it is not to be arbitrary - presupposes some model for the representation of meaning. A number of such models are now available, and we can expect a wider use of recall and summarization techniques" (p. 338).

Text structure derived from logic and linguistic theory - Voss, Tyler and

Bisanz (1982) say "these approaches have shared the assumption that investigators could characterize the underlying structure of a text in terms of basic units and the relations among the units" (p. 353).

- Dawes (1966) devised a method for measuring memory (set relations) and distortion (overgeneralization and pseudo-discrimination) of meaningful written material based on logical relations.
- Meyer (1975) identified the structure of ideas in a passage using a series of propositions, arranged in hierarchical tree diagrams based on the classification of predicates.
- Frederiksen's model (1977) combined a semantic and logical structure. Frederiksen's model also included inferences.
- Kintsch (1974), Kintsch and van Dijk (1978); Kintsch and Vipond (1979); van Dijk and Kintsch (1983) broke text into propositions and atomic propositions and these were arranged in a hierarchical structure using processing cycles. (The model of Kintsch and his associates is considered to be one of the best analyses of text structure and text processing (Beyer, 1986; Voss, Tyler & Bisanz, 1982).

Problems with Available Methods for Preparing Scoring Protocols

1. Some of the methods are very complicated to prepare. Baker and Stein (1981) list the following models: Crothers (1972); Frederiksen (1972); Kintsch, (1974); Meyer, (1975), and say they are often not used because of their complexity.
2. Many systems reward only literal recall or close proximities. Voss, Tyler and Bisanz (1982) say, "We note that a serious problem facing investigators using unit recall is how to handle intrusions, and even more importantly, how to score generalized statements" (p. 374).
3. Many systems are designed to be used with shorter passages, usually only one or several paragraphs in length.
4. Some of the systems have been designed to score narrative prose.
5. Most systems are better suited to analyze recall of older subjects. Younger subjects (grade 4 and 5) have a tendency to recall text in a less coherent and more incomplete fashion (Wagner, 1986, p. 896). The results of the pilot study scoring protocols in this thesis showed that the children did not remember very much of the passage and what they did remember was sometimes confusing or only partially accurate.

Therefore, the passage needed to be broken into finer units so that what few fragments the children did remember could be rewarded. Some might argue that if a child has not remembered a significant chunk of a sentence, he should not receive credit. However, based on the literature reviewed, it was decided that the scoring protocol should allow for partial or fragmentary information from the passage to be partially rewarded because some information recalled at this age is better than no information recalled. As children mature, they remember more information and are more successful in relating ideas.

New Protocol Sources - Although no method or procedure was used, as is, ideas from a number of methods were used in creating a new scoring protocol. This system uses a hierarchical tree system for diagramming ideas based on the work of Meyer

(1975) but the arrangement is concentric rather than linear. This system also has many fewer levels of information than Meyer's system. Frederiksen (1977) tried to create a system that would take inferences into account and this system rewards on-topic inferences. Kintsch and van Dijk (1978) developed a system of text processing and production that discussed some of the categories that the new scoring system rewards. Graesser (1981) in his work on the construction of prose representation system, such as the five types of structural changes, used a system of nodes that have been adapted for use here. Lastly, Mandl and Ballstaedt (1986) diagrammed the idea of information being stored in a network or a knowledge structure and showed how new information is incorporated with old information on a topic (p. 866). Neisser (1989) also refers to networks when he is discussing Endel Tulving's work. Neisser (1989) says, "Most cognitive psychologists today, including Tulving himself (1985), think of semantic memory as an information-processing system in the head. Many specific models of that system have been proposed, most of them based on hypothetical networks of labelled associations" (p. 68-69). This thesis uses a scoring protocol that is a series of networks to which new information can be added or embedded.

The New Scoring Protocol Explained

Dividing up the Text - The new protocol starts with the old scoring system based on Niles' idea units. The Niles and Catterson (1972; 1978) procedure was chosen a second time because it is very easy to use and modify, and it contained a manageable three levels of information. It was thought that the difficulties mentioned by Levitt (1956) and discussed above, under *Idea units*, would not be a problem in a study where only one passage was used and where only one experimenter divided up the passage and marked all the protocols. (However, for large scale or joint research, one of the more complicated systems with a theoretical base would be more

appropriate.) This time the passage was broken up into much finer divisions more closely resembling the size of units in Kintsch and van Dijk (1978) (see argument #5 above). Care was taken to not have the same information fragments at several levels even if the text repeated the ideas. The subjects in each section were usually located at the main idea level and were rewarded only once.

Arrangement of protocol - The design of series of rings around the bull's-eye allows the researcher or teacher to see clearly what levels of information are remembered and to follow the readers mind as it struggles to recall information. The center ring held all main idea fragments including the headings. The second ring contained subordinate idea fragments and the outer ring was reserved for specific details. Each idea fragment or unit acted as a node that was linked to other related idea fragments by lines. The result was a network arrangement of units that seemed to be more useful for displaying the message of the text and for capturing the students' thoughts or remembrances than a linear arrangement. The marker then used a coloured line to show the order and direction of the student's thoughts. The arrangement was especially useful for showing misconnected information. On the scoring protocols, the units of information were well spaced to allow for inferences, substitutions, and generalizations etc. to be added in at appropriate points. A different coloured pencil was used to identify different processes that were used by the students. The categories were: generalization, inference, substitution (more general or more specific), misconnected information, and information acquired only from the pictures.

Awarding marks - This marking system differs the most from other scoring systems, not so much in their attempts to divide the text up for scoring, but in rewarding marks mainly for verbatim recall. In other words, most

systems reward students for showing only literal recall ability that is not necessarily the most useful way to recall a passage. The system used in this research rewards, either partially or fully, on-topic paraphrasing, summarizations and on-topic inferences (especially when implicit understanding is made explicit), it partially rewards (1/4, 1/2 or 3/4 marks) substitutions (such as being more specific or more general than the text) and gives marks for remembrances from pictures as they were part of the natural text presented. This system shows what information was deleted and can be made to show in what order ideas are remembered. The system rewards remembering but penalizes (deducts partial marks) misconnected information. Any information that is supplied by the child, that was not explicitly expressed in the text, is written on the protocol with its awarded mark. This information is also kept on a general record sheet under the appropriate headings (inference, picture clue etc.). That way if a similar response is given by another student, the same mark will be awarded. Because the judgments of the marker are so important in this kind of a marking scheme, a set of rules or guidelines for awarding marks was devised. The researcher maintained a record of the application of the rules as the marking progressed.

Advantages of the New Scoring System

1. The system rewards generalizations or summarizations that are on-topic.

Therefore, children should have a chance to score more points for their remembrances. (This is based on the idea that we construct meaning. When there is a great deal to be recalled, remembering verbatim is a very difficult and time-consuming process. It makes sense to generalize in order to grasp the essentials of the situation.)

2. Inferences that are on topic are rewarded. (Once again inferences are elaborations on the information that one is recalling. Once information is integrated in the mind with prior knowledge, it is very hard for the reader to separate his new understanding as a result of reading the passage from the author's actual points.) Here we reward only inferences that fit within the confines of the author's topic and do not count inferences that are outside of the author's area of focus.
3. Ideas that are remembered but are incorrectly linked together (termed disconnects here) are partially penalized because it is important that ideas are not only remembered but are correctly linked to each other. This way you can reward the students for every piece of an idea that is correctly remembered and yet subtract marks when pieces of ideas are not correctly connected.
4. Because the text has been broken down into finer idea fragments than the old scoring system, students can be rewarded for partial remembrances and hence the new system is able to differentiate student responses more finely. (See differences between old and new scoring protocols - Appendix B.06.)
5. The new scoring protocol greatly improves consistency. The original scale was often very hard to mark because children did not use a verbatim-like recall. There was a need to standardize marking. This scoring system attempts to find out at what level each piece of information fits and allows the researcher to make new categories if necessary. Once a new category has been established, it is recorded on a master sheet and all further responses of a similar nature would receive the same mark.
6. The recall units are diagrammed more as a network than as a linear recall protocol because this is closer to the way the brain is thought to operate. Moreover, with this arrangement, it is easier to grasp and follow the students' line of thinking. It is also easier to make decisions on inferences and generalizations using a network system where one can chart the student's progress through recall using a line.

7. Although the different levels of information are no longer placed in three easy-to-mark vertical columns, the arrangement of all information to fit within three rings of the bull's eye design on the diagram makes totalling the rings equally as easy.

Disadvantages of the New Scoring System

1. Decisions have to be made on the weighting and penalties of generalizations, inferences, disconnects and restructures of information that are somewhat subjective or intuitive, whereas verbatim recall is judged on whether it is either present or absent.
2. It is also necessary to keep detailed records of all decisions made in #1 so that the marker remains consistent throughout the marking of all the protocols.

Pilot Study #2

One school board was to be formally approached to provide the pilot study classroom plus two main study classrooms of grade 5 social studies students. All three classes were to be representative or randomly sampled after research conditions had been met. None of the students in the pilot studies were to be used in the main study. It was the function of this pilot study to be the final test run for the research. The class was to receive the full main study procedures (stated below), including the coding process and the standardized pretest. All material was to be marked but not statistically analyzed. Then any necessary final adjustments would be made.

Main Study Phase

The following is a plan of the procedure that was to be applied:

Preparing for the Research , Administering the Pretest and Preparing for the Treatments

1. As each of the eight class lists are made available to the researcher, a research class number in Roman numerals is assigned each class. The class number is followed

by individual numbers that are assigned alphabetically and correspond to first names on the class lists. A name tag is then produced for every child in every class that consists of the child's first name and any necessary first letters in the last name to identify each student from his classmates, his or her class designation, followed by an individual research number.

For example: Sandra S. #VII-229

On the first day in the classroom, the prepared name tags are distributed and taped to the subjects' desk prior to the research activity. After each session, the tags are collected and retaped for each research day. This system allows the children to identify themselves no matter where they sit and provides a research number for the children to copy on to all research material. The research number is verified by the researcher before the work of the student is collected each session.

2. Give all the students in the eight classes the standardized reading test, Gates-MacGinitie Reading Test, Canadian Edition, Level D, Form 1. Instructions are to be followed exactly from the teacher's instruction manual. Omit any students that the teacher thinks would be unable to manage the test and would be very frustrated. Allow any student to take the reading test if the teacher thinks being part of the group activity is more important to the student than finding the tasks manageable.
3. Rank order the students using the raw score from the comprehension subtest of the standardized reading test.
4. Eliminate learning disabled readers and New Canadians who are non-English speaking from the study. Exact guidelines will be established after the pilot study and pretest have been given.
5. The remaining students will be divided into three stratified groups (one-third in each group or at the closest break points) based on rank order scores higher, medium and lower reading comprehension ability groups).

6. Using random assignment procedures, the stratified students will be assigned to three treatment groups.
7. Next, treatment envelopes will be prepared. A treatment code will be added to the original research number on the envelope. The code consists of the following categories and appears in the following order:
 - a) school class # - assigned a roman numeral by selection order
 - b) a personal research number based on alphabetical order
 - c) a reading comprehension ability stratification -
 - higher as X
 - middle as Y
 - lower as Z
 - eliminated as W
 - d) Treatment group -
 - T₁ - control group as C
 - T₂ - headings only treatment as H
 - T₃ - headings and strategies as S

Here is an example of the coding procedure and its interpretation that will appear on the treatment envelopes: # II- 019-Y- C represents a student from class II, who is given the student number of 019, is from the middle reading comprehension ability group, and who is randomly assigned to the control treatment. A master list for each class contained the full research code and the partial names of the students.

Preparing and Administering Treatments

1. The full assigned code will be put on each treatment envelope (see the example above). Each envelope will then be filled with the appropriate treatment material based on the envelope specifying C, H or S.
2. The three treatments are to be given in the same classroom at the same time. To distribute the treatment envelopes, the researcher matches the research number on

the treatment package with the research number on the taped name tags on the desks of the students. Because all directions are written, the researcher will be free to circulate and assist any child who does not understand the directions. There is no time limit. Envelopes will be collected as the students finish. If any children finish early, they will be asked to read the library book that they were to have on their desks or complete some assigned class work.

3. When all treatments have been administered, treatment packages and the master lists will be given to the thesis chairperson for safekeeping until after the posttests are scored to prevent researcher bias.

Administering and Scoring Posttests

1. Posttest booklets were developed in preparation for administering the posttests. Students will be given a posttest booklet containing Part A (Posttest 1) on page 1, a lined second piece of paper, and Part B (Posttest 2) on page 3. Each booklet will be identified only with the assigned class and student research number (for example: #II- 019); not the full code (for example: # II-019-Y-C). The researcher will check carefully to see that the research number that the student places on the booklet matches the student number that is taped on his or her desk.
2. The posttests will be identical for all students and are to be administered one day after treatment. Instructions will be presented in written form and page one instructions will also be read orally. In Part A of the posttest booklet, the students will be asked to write down everything they remember about the passage. In Part B, each child will be asked to recall or formulate the topic for the whole passage and list four of the most important ideas from this passage on the appropriate lines that will be provided (see Appendix B.04). There is no time limit.
3. Next, all papers will be marked using the new scoring system. Because the posttest booklets will be identified only with class and student number (for

example: #III-035) and all master lists and treatment packages will have been turned into the thesis chairperson, the researcher will not be able to identify either the treatment group or the ability group when the papers are scored.

4. All the marked protocols will be turned over to a third party. Next, 10% of the posttests will be randomly chosen for rescoring, under the supervision of the thesis chairperson. The researcher will rescore 10% of the original posttests using fresh scoring sheets. When a second copy of the marks is returned to the thesis advisor or the third party, the original tests will be taken back and compared to the rescored protocols. The intra-rater reliability correlation coefficient will be computed.
5. When all tests are scored and 10% rescored, the treatment envelopes will be released to the researcher and the posttest protocols will be matched with the full codes on the envelopes.
6. All data will be entered into the computer and the statistical analysis will begin using SYSTAT 5.2.1 for the Macintosh computer.

DATA ANALYSIS

Answers to the research questions and hypotheses were sought using inferential statistics. The main statistical procedure chosen for this study was a 3 x 3 factorial analysis of variance. This procedure was used to investigate any significant differences among the mean scores of the subjects on three levels of the independent variable **Treatments**, shown as **A** in the diagram (see Table 3.05), and three levels of the variable **Reading Comprehension Ability**, shown as **B**. In addition, the interaction between A and B (**AB**) was explored to see if the two factors interacted significantly with one another. The ANOVA was used six times on four dependent measures of free recall (quantity of superordinate, subordinate, sub-subordinate ideas and total of all three) shown as **a,b,c**,

and **d**, one dependent measure on accuracy of main idea recall/formulation as shown by **e**, and a total score for both posttests shown as **f**). This is also diagrammed in Table 3.05.

The various assumptions that underlie the analysis of variance (normality, homogeneity of variance and independence) and their possible violations were considered. Firstly, Glass and Hopkins (1984) claim, "Nonnormality has negligible consequences on type-I and type-II error probabilities unless populations are highly skewed, *n*'s are small, *and* directional ("one-tailed") tests are employed" (p. 351). The sample size of 20 subjects per cell was considered to be quite adequate and this research did not use directional tests. Also, some of the selection for sample population was done randomly or representatively so the chance of extreme skewing is unlikely. In addition, the results of the two standardized reading pretest measures could be used to indicate whether the sample is normal or skewed. Therefore, nonnormality should not be a problem. Secondly, this research has equal cell sizes of 20 subjects. Glass and Hopkins (1984) say when the *n*'s are equal, concern for homogeneity of variance is less of a problem. Thirdly, the assumption of independence is met because each subject has been randomly assigned to treatment groups from each strata of ability level. Keppel and Saufley, Jr. (1980) state that, "The assumption of independence is generally satisfied through the random assignment of subjects to the treatment conditions" (p. 97). Care was taken with the design of this study to insure that independence was not violated.

Another statistical procedure that was considered for this research was an analysis of covariance. This procedure would be used in place of the ANOVA to control for differences other than those that might exist because of the treatment variable if the research groups are too dissimilar before treatment. General reading ability and reading comprehension ability were expected to have a large influence on the subjects' recall of the expository passage regardless of treatments, so the comprehension subscores and total reading scores from the pretest (the standardized Gates-McGinitie Reading Test, Canadian edition) could be used as a covariate. Although reading comprehension ability differences

Table 3.05

The Factorial Design with Emphasis on Data Analysis

		B (Reading Comprehension Ability)			dependent variables
		higher (H)	middle (M)	lower (L)	
A (Treatments)	T ₁	n = 20	n = 20	n = 20	60 \bar{X}_{T_1}
	T ₂	n = 20	n = 20	n = 20	60 \bar{X}_{T_2} a,b,c,d,e,f
	T ₃	n = 20	n = 20	n = 20	60 \bar{X}_{T_3}
		60	60	60	N = 180
AB		\bar{X}_H	\bar{X}_M	\bar{X}_L	

N = number of subjects in study

n = number of subjects in cell

A and B - independent and control variables

AB - interaction of variables

T₁ = Treatment 1 - no headings, no heading strategy instructions

T₂ = Treatment 2 - headings but no heading strategy instructions

T₃ = Treatment 3 - headings and heading strategy instructions

a = quantity of superordinate ideas in delayed free recall.

b = quantity of subordinate ideas in delayed free recall.

c = quantity of sub-subordinate ideas in delayed free recall.

d = quantity of ideas recalled from the delayed free recall (a, b, c)

e = accuracy of main idea recall/formulation after a one day delay

f = total from a, b, c, and e

had been considerably controlled for in the three level reading comprehension ability stratified design, the statistical technique of analysis of covariance could be used to further control for initial differences between groups in general reading ability and reading comprehension ability. Elashoff (1969) states that when ability groups are being compared, "The further apart the two groups are in mean ability the more imprecise is the estimate of the difference in the adjusted treatment means" (p. 378). Once again, a number of factors needed to be satisfied for the analysis of covariance. Elashoff (1969) suggests that:

the assumptions that assignment to treatments has been at random, that the covariate is independent of the treatments, and that there is no treatment-slope interaction are crucial to the underlying rationale for the use of covariance analysis. The assumptions of linearity, normality, and homogeneity of variances are necessary for statistical simplicity and the validity of standard statistical tests; transformations of the data may be useful for making the data satisfy these assumptions and alternative covariance procedures which do not depend on these assumptions have been developed for certain cases. Generally, violation of the assumption of linearity, homogeneity or regressions, normality, or homogeneity of variances will be less serious if individuals have been assigned to treatments at random and the x variable has a normal distribution. (p. 395-396)

The level of significance was set at $\alpha = .10$. In educational research, the most commonly used level of significance is an alpha level set at .05. Because this research was exploratory and had a potentially weak treatment effect, a higher alpha level was selected. Borg and Gall (1989) suggest that "in exploratory studies the .10 level may be used" (p. 351). [However, Bonferroni (Kirk, 1982; Systat, 1992b) cautions researchers about the effect of a large alpha level when using repeated tests. He suggests dividing the alpha level by the number of repeated tests. Therefore, in this research one should be cautious about any probability results that lie between .02 and .10.] Expectations of a weak treatment effect (because of the small number of headings to the amount of text in the selected forest passage) led to a need for increased statistical power. A high level of alpha and an adequate sample cell size were used to gain statistical power. Controlling the factor of reading

comprehension ability in a stratifying design also was used to help isolate true differences due to treatment. All data was processed using the SYSTAT 5.2.1 - A statistical Package for the Macintosh computer.

LIMITATIONS

The following is a discussion of the limitations that should be noted when interpreting the results of this study:

- It is very hard to control for type and difficulty of the reading material. To control for these variables, B.C. authorized grade 5 social studies material that was currently being used in many classes was selected. This gives the study greater ecological validity. However, it makes it much more difficult to explore the effect of headings. In many studies that have been reviewed, contrived passages were used. Contrived passages allow one much more control over the number and the type of headings used in any passage plus any other processing aids can be eliminated from the text. However, results on contrived material fail to show how students are affected by headings when they actually read normal classroom textbooks with a variety of processing aids and fewer headings and subheadings. Real textbook material uses a number of processing aids to help the reader comprehend. In the case of the material selected in this study, headings, pictures, inserted questions and bolded key words were used. In four pages of text, only four headings were used. As there is a limit to the number of pages that grade 5 children can read and recall comfortably, this study is left with very few headings to create any effect. Therefore there is likely to be a very weak treatment effect. As a result, an alpha of .10 was used to gain statistical power.
- Because there is no recommended order for teaching social studies topics in the selected school districts, no material could be selected that represented material that

none of the eight classes had read. Instead, it was necessary to sample only those students that had not been taught from the textbook from which the passage was chosen. This limited the number of classes that could be used in the study and made the sample less random.

- Sampling was strengthened by having all the treatments given in each class at the same time. This arrangement avoided the John Henry because no treatment seemed more special than any other treatment and it allowed the final unit of measurement to be the individual student rather than the class. However, because all the treatments were given at the same time, no oral instructions could be given to the heading strategy instruction group and the quality of the instruction was thereby affected. Only heading strategies presentable in the written instruction format could be used.
- One of the weaknesses of testing the results of an instructional program, is that one does not know if the students actually used the heading strategies that were taught. This experiment guides students in such a way that the student was sure to have focused on the headings in the heading strategy instruction group. On the other hand, a number of heading strategies can not be easily and effectively explained in one set of instructions. A period of instruction is necessary if the students have not already grasped these points intuitively. In order to see a more full picture, looking at the results of both long term instructional programs in heading use plus the results of heading studies that insure the students focus on the headings is necessary. This study only did the latter and tried to compliment the studies of Coulombe (1986) and Goble (1986) who explored the former.
- This study used a written free recall as a measurement tool of some dependent variables. The free recall was an attempt to learn how an individual comprehends and recalls material that he reads. It is both better and weaker than other comprehension tools. At this point there is no way to totally understand how another person comprehends. Free recall relies on memory. In addition, although

it does require a person to group or organize recalled thoughts in some fashion for writing, it does not insure that the subject will attempt to express the main ideas of the passage that he/she is recalling. Therefore, it is not ideal for our purposes when the literature leads one to believe that main idea recall is improved more by headings than memory for details. Free recall is better than some comprehension measures but it may not be able to show the true extent of the main idea understanding that occurs as a result of headings being present. To overcome this problem, a fourth dependent measurement, a main idea recall/formulation test, was added. All measures though, are crude attempts at trying to really understand how headings affect both the readers' comprehension and recall of expository prose.

- Because of the need to use classroom subjects, this study was limited to the effects of headings on one passage only. Repeated experiments on different materials over different periods of time would be more effective in exploring the question.

SUMMARY OF THE CHAPTER

In this chapter, the plan for the research was fully developed. A design and targeted population were selected. A standardized pretest measure was chosen, and plans for rank-ordering students and dividing subjects into approximately three even groups, based on higher, middle and lower scores on the pretest, were discussed. The three treatments and the posttest materials were prepared and tested in a pilot study. As a result, some adjustments were made to the materials. A new scoring protocol was designed because the original protocol was problematic. The rationale for this new scoring system was also discussed. The final details of the main study were given. A brief description of the data analysis considerations and procedures were outlined. The chapter ended with a discussion of the limitations of study. In chapter 4, details of the actual study and its findings will be presented.

CHAPTER FOUR

The Results

INTRODUCTION

In chapter 3, a series of methodological choices were made that were designed to explore the research questions posed in chapter 1 and reviewed in chapter 2. A procedure for conducting this research was also presented. In chapter 4, the focus is on what actually happened when the research was carried out in the field and what the results of the research were.

This chapter begins with the identification of any changes that had to be made in the research plans during the process of conducting the research. Secondly, conditions that prevailed during the research are briefly noted. Thirdly, the focus will shift to considerations that are important for the analysis of the data and then the data will be analyzed. The chapter closes with a summary of the research findings.

The Actual Study Versus the Planned Study

A number of changes were made in the research project. These are noted and the possible effects discussed.

1. Obtaining the required number of classes:

The plan called for three classes to be selected from each of the three school districts. One of the school districts was to provide a pilot study class plus two main study classes. Unfortunately, in spite of efforts made at the district level, this school district was only able to provide one class for the study. Because of time constraints and other considerations, it was not feasible to approach another school district to obtain more subjects. As a result of these unforeseen events, the total

available classes dropped from nine to seven and a number of modifications had to be made to the proposed study. These will be discussed in item #3.

2. Locating classes that met the criteria:

It was the researcher's intention to carry out the task of finding classes that met the criteria (those classes that were not using the text, Exploring Canada: Learning from the Past, Looking to the Future, in their social studies program and had not had the Gates-MacGinitie Reading Test, Level D) once the school board representatives had generally approved the research proposal and had given the researcher permission to approach the schools. After obtaining a list of classes that met the research criteria, it was hoped that the researcher and the school board officials would discuss the actual class selection based on random sampling or if necessary, the selection of schools that were most representative. To facilitate this process, a list of randomly chosen schools, placed in the order to be approached in each district, was prepared and sent to each school board office. This plan was not feasible with the various school boards who usually prefer to make initial arrangements themselves with the schools (principals and teachers) before the researcher approaches the school (although one school district did eventually permit the researcher to phone schools to obtain this information). In attempting to make this study ecologically valid (by using real classroom material that required knowledge of which social studies textbook each class was using), the researcher created inconvenience for the school board officials and the schools that they represent. This problem is something that should be avoided in the future, if possible. In the end, the researcher was assigned classes in the three districts in which one class was first on the randomly chosen list, one class was second on the randomly chosen list with some reservations about the first class qualifying, one class was a volunteer classroom, and the rest of the classes were thought to be representative of their districts.

3. Obtaining a satisfactory sample size:

Losing two classes created a serious potential loss of research subjects. A number of changes were made to maximize the number of subjects who could be used in the study:

- a) It was decided that the second pilot study would be eliminated. Fortunately, the first pilot study had provided a great deal of information and the loss of the second pilot study did not create any noticeable problems. As a result, the class that would have been scheduled to be a pilot study class, was available for the main research study.
- b) The cut-off point for the elimination of students who had reading or English language difficulties was lowered from the Gates-MacGinitie grade equivalent score of 4.0 to Grade 3.2. This does present some concerns about the ability of some of the children to read and understand the reading passage. However, it more truly represents typical classroom conditions where most of the students attempt to use the regular classroom materials. The results of the lower reading comprehension ability group will now show heading effects on students who are not fully able to decode the reading passage. The choice of grade 3.2 was chosen because it was one of the ways that children in the past were selected for special remedial or learning assistance help. It was thought that if a child was performing at two full grade levels below the class average, they probably would not be able to carry out classroom tasks successfully and should receive special reading or English language assistance. Therefore, because the average class reading score was expected to fall at the grade 5.2 level in October and November of grade five, a grade 3.2 equivalent score was chosen to be the cut-off score. Also, the tasks that were expected during the research were deemed to be unmanageable for students scoring below this point. This

change provided a considerable number of extra subjects for the experiment who were needed to obtain sufficient cell sizes.

- c) An uneven cell design was accepted in order to use every student that qualified. It was not possible to fill every cell with 20 students using the seven classes that were available to the researcher, after student attrition because of absenteeism, emotional and medical reasons and elimination due to reading difficulties. Instead, every available, qualifying student was used so the final cell counts (see Table 4.02) could be as full as possible. There are statistical problems when uneven cell sizes are used but the SYSTAT statistical package used by the researcher automatically adjusted the computations of the ANOVAs to compensate (SYSTAT: Statistics, Version 5.2 Edition, 1992, p. 275). Because some cells contained fewer subjects than 15, the results of heading effects on the specific reading comprehension ability groups must be viewed with caution (Borg & Gall, 1989, p. 233). Fortunately, the main statistical results compare heading effects of the three treatment groups and each of these are comprised of 41 to 43 subjects.

After making all the above changes, the available, qualifying student subjects dropped from the required 180 to 131.

4. Classification of subjects into ability groups:

The plan called for extra students who had been classified as higher, middle or lower reading ability comprehension ability students to fill gaps created by student attrition. As there were no extra subjects, the groups were separated at the best natural breaking point in the list of rank-ordered raw scores on the Gates-MacGinitie Reading Comprehension subtest and uneven groups were created by necessity. If the groups had been divided up exactly evenly, students with identical reading scores would have been put in different reading ability groups and this

made little sense. There were two obvious dividing points when the rank-ordered scores were surveyed. Uneven cell size was compensated for on SYSTAT.

5. Classification of subjects into treatment groups:

Once the reading comprehension ability groups were selected, the ability groups were to be randomly assigned to treatment groups until the three cells at each ability level were filled. This was replaced with a systematic counterbalanced assignment to treatment groups using the rank-ordered list. The student with the highest comprehension subscore on the Gates-MacGinitie Reading Test was assigned to treatment group 1 (designated group 1 randomly). The next highest score was assigned to treatment group 2 and the third highest score to treatment group 3. At this point the order was reversed. The fourth highest score was also assigned to treatment group 3, the fifth to treatment group 2 and the sixth to treatment group 1. The 1-2-3-3-2-1 pattern was followed until all the students were assigned to treatment groups. This design provided very similar reading comprehension abilities in each treatment group, as measured on the standardized reading test, and helped to ensure that the groups were relatively equal on this most important factor before beginning the treatments. It was hoped that this similarity would compensate for the lack of random assignment and would result in statistically equivalent groups.

General Research Conditions

Setting Up the Study

The three participating school boards were contacted at the end of August or early September and provided with a copy of the research proposal, the Ethics committee approved consent form, and an information sheet for principals and teachers outlining the research involvement in the schools. Once the names of the selected schools were made available from the school board offices, the principals were contacted and a meeting was set

up with the teachers. During this meeting, the consent letter was approved or modified to suit the schools (one school added a covering letter that showed their support for the research), convenient dates and times were selected for the research, conditions of the research were discussed, and class lists (with or without last names) were obtained.

Carrying out the Research

The classroom phase of the research was begun on October 8 and ended on November 13. The research was carried out in the individual classrooms or in the library. Desks were moved apart to insure individual responses. The children seemed genuinely willing to cooperate and all the teachers were very supportive, flexible and helpful. The classroom environment was judged to be suitable for conducting the research.

During the classroom research phase, a number of students had to be withdrawn or excluded from the study for the following reasons:

1. Seven children did not return consent forms and ten children returned consent forms marked no. These students were removed from the study.
2. For emotional reasons, two children were excused from the study. On Day 1 in the classroom, the Gates-MacGinitie Reading Test, Canadian Version, Level D, Form 1 was given. All teachers decided to have every member of their class (except special needs students) attempt the test in order to feel like they were part of the group. This proved too stressful for two subjects who did not complete the standardized reading test.
3. After the reading test was administered and the tests marked, 29 students were eliminated because their comprehension subtest scores were below the Grade 3.2 level. (Britton & Lumpkin, 1982, point out that the Gates-MacGinitie test does not provide passages at a readability level below grade 4 and therefore these results must be viewed with caution.)

4. Ten children had to be eliminated because they were absent on one of the three research days.
5. One child was eliminated for medical reasons because he wrote the posttest without some critical medication (Ritalin) that he needed to perform normally.

There were 190 potential subjects enrolled in the 7 classes. After student attrition (59 students), the final number of subjects in this research was reduced to 131 students.

All the teachers preferred to have most of the eliminated students pretend to continue so they would feel part of the group. Therefore, these students were assigned a code W that indicated to only the researcher that their papers were to be excluded from the study results. They were given the Headings Only treatment material and their crossword puzzle also contained additional answers to assist them with the task. Any students that were absent on the initial testing date were also eliminated and given a W code. The code W was chosen as it represented withdrawn but it was designed also to be an unobtrusive part of the three ability codes that were X, Y and Z. Students who did not bring back the consent forms or who did not have their parents' permission were also eliminated and their work was coded with NC or N respectively and was turned in only to the teacher.

Representativeness of the Sample

Because it is useful to view the results of the subjects in this research with those of previous heading studies, it is important to compare the representativeness of this sample with the samples used in former studies. In Table 4.01, the means and standard deviations of the T-scores from the Gates-MacGinitie Reading Test, Canadian Edition, Level D (1979-80) of the present sample (from the Coquitlam and Delta public school districts in the Lower Mainland and from Courtenay School district on Vancouver Island) are compared with two other research studies in both parochial (Goble - Vancouver, Coquitlam and Burnaby) and public school systems (Stables - Richmond, Maple Ridge, and Surrey) and the 1982 West Vancouver fifth grade population that used the same reading test on the same

grade level in the lower mainland area of British Columbia. The table shows that the sample used in this current study was very similar to those used in two previous studies and the whole grade 5 school population of one school district in the lower mainland of British Columbia. Therefore, even though the classes from three school districts in the present study were not all randomly selected, they seem to be very representative of grade 5 students in six other schools districts in southwestern British Columbia.

Table 4.01

Comparison of Means and Standard Deviations of the T-scores of Grade 5 Groups from Nine School Districts in Southwestern British Columbia on the Gates-MacGinitie Reading Test, Comprehension Subtest

Group	\bar{X}	S.D.	N
Current study	52.11	8.12	131
Goble (1986)	52.35	9.23	153
Stables (1985)	53.22	9.83	50
West Vancouver (1982)	53.38	7.90	313

Note: Much of the information for this table came from Goble, 1986, p. 59-60.

RESULTS OF THE RESEARCH

The Standardized Pretest Measures

The purpose of the pretest was to find some reading tasks that attempted to measure the differences in the reading comprehension ability in the treatment groups before the treatments were given. The full Gates-MacGinitie Reading Test, Canadian Version, Level D, Form 1 was administered and two scores were considered in judging differences before

treatment. These scores were the comprehension subtest and the full test results (vocabulary and comprehension subtests). In Table 4.02, the means and standard deviations of the comprehension subtest raw scores are displayed for each treatment group. It can be observed that there were almost no differences between the grand means of the treatment groups on the raw scores on the comprehension subtest of the Gates-MacGinitie Reading Test. Furthermore, there was little difference among the grand means of the three treatment groups on the total raw scores (vocabulary and comprehension subtests) on the Gates-MacGinitie Reading Test. This was confirmed visually with box plot graphs and by conducting statistical analysis of variance tests. The box plots (or box and whiskers) appeared to be almost identical in range and the results of both the analysis of variance tests showed no significant differences in means of the three treatment groups. As was expected, there are significant differences in the grand means of the three reading comprehension ability groups. Therefore, because of the similarity of the three treatment groups, all the hypotheses in this research were explored using analysis of variance techniques instead of analysis of covariance.

Data Analysis Considerations

Scoring Reliability

All scoring for both the pretests and the posttests was done by the researcher. The posttest protocols were marked using the researcher-designed scoring system that was explained in Chapter 3. Before the posttests were marked, an assistant to the chairperson performed a computer procedure to randomly select 10% (14 subjects) of the protocols to be remarked. The selected protocols were photocopied by the assistant and the copied versions were put in a sealed envelope along with the randomly selected list and sent to the thesis chairperson. The researcher had no access to any part of this procedure. When the protocols were being marked, the researcher only had knowledge of the student research number (e.g., VII-207). The list with the treatment and ability group codes and

Table 4.02

The Final Factorial Design with Cell Size (n), Means and (S.D.) on Pretest:
Gates-MacGinitie Reading Comprehension Subtest

		B			
		(Reading Comprehension Ability)			
		higher (H)	middle (M)	lower (L)	dependent variables
A (Treatments)	T ₁	n = 14 33.86 (3.06)	n = 13 26 (1.73)	n = 15 19.13 (2.1)	42 \bar{X}_{T_1} 26.17 (6.61)
	T ₂	n = 15 34.07 (3.35)	n = 12 26.33 (2.06)	n = 16 19.38 (2.13)	43 \bar{X}_{T_2} a,b,c,d,e,f 26.44 (6.80)
	T ₃	n = 14 34.43 (3.46)	n = 16 26.25 (2.08)	n = 16 19 (2.10)	46 \bar{X}_{T_3} 26.22 (6.77)
		43	41	47	N = 131
AB		\bar{X}_H	\bar{X}_M	\bar{X}_L	
		34.12 (3.22)	26.20 (1.93)	19.17 (2.07)	

N = number of subjects in study n = number of subjects in cell

A and **B** - independent variables **AB** - interaction of variables

T_1 = Treatment 1 - no headings, no heading strategy instructions

T_2 = Treatment 2 - headings but no heading strategy instructions

T_3 = Treatment 3 - headings and heading strategy instructions

a = quantity of superordinate ideas in delayed free recall.

b = quantity of subordinate ideas in delayed free recall.

c = quantity of sub-subordinate ideas in delayed free recall.

d = quantity of ideas recalled from the delayed free recall (a,b,c)

e = accuracy of main ideas recalled or formulated after a one day delay.

f = total score for free recall test and the main idea recall/formulation test.

the actual research materials were stored with the thesis chairperson.

After the protocols were marked and recorded, the assistant collected the marked materials and gave the researcher the protocols that were to be remarked. Once again, the researcher scored blind. When the results of the remarked (10%) protocols were entered into the computer, a Pearson correlation matrix was computed using the SYSTAT (1992b) statistical package on the Macintosh Computer. The intra-rater reliability results appear in Table 4.03.

Table 4.03
Intra-rater Reliability Correlation Coefficients for the Posttests

a, b, c - Free Recall Posttest		
a - Superordinate Ideas	0.9851	
b - Subordinate ideas	0.9953	
c - Sub-subordinate ideas	0.9970	
d - Total Free Recall	0.9989	
e - Main Idea Recall/Formulation Test	0.9824	
f - Total Posttests		0.9985

The results of the intra-rater reliability check were assumed to be acceptable. No attempt was made to carry out an interrater reliability check because of the highly interpretive nature of the scoring procedure. It would necessitate a considerable time commitment from someone to learn the scoring procedure and score 10% of the protocols.

Outliers

When a series of scattergrams were carried out, there seemed to be evidence of an outlier. SYSTAT (1992b) notes, "The F-test is robust to certain violations of assumptions,

but factorial ANOVA is not robust against outliers" (p. 269). Leinhardt and Leinhardt (1980) concur and both groups recommend doing box plots on data before using the results from the analysis of variance runs. Box plots for each treatment group were carried out on both pretest and posttest measures. On the standardized reading test, no outliers appeared in the treatment groups on the comprehension subtest or the total reading test. However, in the nonstandardized measures, the box plots revealed one outlier in treatment group 3. When box plots were carried out for the three treatment groups on six dependent measures, one subject appeared as an outlier in five of the six dependent measures. Her recall was so good that her scores were often twice as high as the next highest student. A variety of possible causes were considered. (No possible causes suggested by Borg and Gall [1989, p. 368] seemed feasible.) The researcher concluded that the most likely cause was unusually superior recall by the outlier as the pilot study also contained an outlier who was able to recall twice as much information as the next highest student in the class. Although both these students were good readers, they were not exceptional readers. Indeed, they were not even the best readers in their classes. Therefore it would appear that the outliers are only exceptional when it comes to remembering information.

Borg and Gall (1989) state, "The decision to eliminate one or more outliers from a research study is problematic. Even one or two outliers can distort the results yielded by conventional statistics, unless the sample is large. You can not eliminate outliers just for this reason, though. Outliers should only be eliminated for good cause, ..." (p. 368). Leinhardt and Leinhardt (1980) say, "The problem with choosing the mean and related statistics such as standard deviation is, for the most part, their lack of resistance to the impact that one or a few deviant data values can have" (p. 97). Yet, they too think that utmost caution should be used in removing data from a study. Shavelson (1981) recommends if outliers are found, the data should be analyzed with and without the outliers. Therefore, analysis of variance procedures were conducted for both the outlier present group (N=131) and outlier absent group (N=130). As this outlier appears to have

violated the homogeneity of variance on several dependent measures (total score on the free recall test and the total of both posttests), only the tables for the outlier removed group will be shown after the first ANOVA test is presented. However, the p-values for the outlier present group will also be mentioned. Fortunately, although the results between outlier present and absent vary, the outlier did not affect the outcome on any ANOVA test and, therefore, one can have confidence in the significant findings.

Results of the Nonstandardized Posttest Measures

The results of the data will be analyzed in terms of the following null hypotheses:

Ho₁: There will be no significant differences among the mean scores on the delayed written posttests for the two experimental groups (treatment group **2** - headings **without** heading strategy instructions and treatment group **3** - headings **with** heading strategy instructions) and the **control** group (treatment group **1** - no headings and no heading strategy instructions) on the following dependent variables:

- a** - quantity of superordinate or main ideas in free recall
- b** - quantity of subordinate ideas or supporting ideas in free recall
- c** - quantity of sub-subordinate ideas or details in free recall
- d** - total score on free recall test (**a**, **b**, and **c**)
- e** - accuracy of main idea recall/formulation
- f** - total score for free recall and main idea recall/formulation tests

Free Recall: Superordinate Ideas

There were significant differences among the mean scores on the three treatment levels with respect to the quantity of superordinate or main ideas recalled on the Free Recall Test. (See Tables 4.04 and 4.05.) A further look at the Scheffé test reveals that treatment

Table 4.04

Analysis of Variance by Treatment Groups with Outlier Present (n=131) on Quantity of Superordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P
1 control	2.82	2.16	18.13	p<.001
2 without	3.92	2.74		
3 with	6.33	3.91		

**Scheffé Post Hoc Test - Superordinate Ideas
(Outlier Present)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.205	-	-
3	<.001	<.001	-

Table 4.05

Analysis of Variance by Treatment Groups with Outlier Removed (n=130) on Quantity of Superordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P
1 Control	2.82	2.16	17.08	p<.001
2 without	3.92	2.74		
3 with	6.04	3.43		

**Scheffé Post Hoc Test - Superordinate Ideas
(Outlier Removed)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.164	-	-
3	<.001	.001	-

group 3 significantly outperformed both treatment group 1 and treatment group 2 (p<.001).

Treatment group 2 did not significantly outperform either group 3 or group 1. These

results apply to the three treatment groups with and without the outlier removed. Thus, the null hypothesis was rejected. This means that the group who received a social studies passage with headings and heading strategy instructions (treatment group 3) remembered significantly more information than those students who received a passage with headings only (treatment group 2) and those that received a passage with the headings removed and no heading strategy instruction (treatment group 1 - control group).

Free Recall: Subordinate Ideas

There were no significant differences among the mean scores on the three treatment levels with respect to the quantity of recall of supporting or subordinate ideas in either the sample with the outlier present ($p=.117$) or the outlier removed ($p=.165$) (see Table 4.06). Therefore, the null hypothesis was accepted. This means that the treatment groups did not differ significantly when recalling subordinate ideas in a free recall situation.

Table 4.06

**Analysis of Variance by Treatment Groups with Outlier Removed (n=130)
on Quantity of Subordinate Ideas Recalled on the Free Recall Posttest**

Group	\bar{X}	S.D.	F-Ratio	P	
1 control	3.49	3.71	1.83	0.165	(n.s.)
2 without	4.90	4.40			
3 with	4.77	3.92			

Free Recall: Sub-subordinate Ideas

The results show that there were no significant differences among the mean scores on the three treatment levels with respect to the quantity of sub-subordinate ideas or specific details recalled (see Table 4.07). Thus, the null hypothesis is accepted. Headings and heading strategy instructions did not significantly improve the students' recall of sub-

subordinate ideas or specific details on the free recall test. These results were consistent for both the conditions of the outlier present ($p=.107$) and the outlier removed ($p=.279$) although there was a trend towards the outlier having an effect on the quantity of subordinate ideas recalled.

Table 4.07

**Analysis of Variance by Treatment Groups with Outlier Removed (n=130)
on Quantity of Sub-Subordinate Ideas Recalled on the Free Recall Posttest**

Group	\bar{X}	S.D.	F-Ratio	P	
1 control	3.53	3.11	1.29	0.279	(n.s.)
2 without	4.08	3.39			
3 with	4.63	3.58			

Free Recall: Total

There was a significant difference among the mean scores on the three treatment levels with respect to the total number of ideas recalled in the free recall test (see Table 4.08). These differences were consistent with the outlier present ($p=.004$) and removed ($p=.005$). Thus, the null hypothesis has been rejected. The Scheffé test indicates that treatment group 3 significantly outperformed treatment group 1 but not treatment group 2. Treatment group 2 did not outperform treatment group 1. This indicates that the students who received heading strategy instructions (treatment group 3) remembered more ideas on the free recall test than the group that received no headings and no heading strategy instructions (treatment group 1).

Table 4.08

**Analysis of Variance by Treatment Groups with Outlier Removed (n=130)
on Total Ideas Recalled on the Free Recall Posttest**

Group	\bar{X}	S.D.	F-Ratio	P
1 control	9.85	7.74	5.49	.005
2 without	12.89	9.41		
3 with	15.44	9.02		

**Scheffé Post Hoc Test - Free Recall Test Total
(Outlier Removed)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.221	-	-
3	.005	.306	-

Main Idea Recall/Formulation: Accuracy

There were significant differences among the mean scores on the three treatment levels with respect to the number of ideas remembered in the delayed written main idea recall/formulation test (see Table 4.09). This effect applied when both the outlier was present ($p < .001$) and when the outlier was removed ($p < .001$). Further analysis using the Scheffé test revealed that treatment group 3 significantly outperformed both treatment group 2 and 1 ($p < .001$). Thus, the null hypothesis was rejected. This data seems to indicate that having heading strategy instructions significantly improves one's ability to remember or formulate main ideas for passages that have been read.

Table 4.09

**Analysis of Variance by Treatment Groups with Outlier Removed (n=130)
on Accuracy of Recall on the Main Idea Recall/Formulation Test**

Group	\bar{X}	S.D.	F-Ratio	P
1 control	2.21	2.23	28.32	<.001
2 without	2.81	2.64		
3 with	6.82	4.97		

**Scheffé Post Hoc Test - Main Idea Recall/Formulation
(Outlier Removed)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.638	-	-
3	<.001	<.001	-

Free Recall and Main Idea Recall/Formulation: Total

There were significant differences among the mean scores on the three treatment levels with respect to the total number of ideas remembered on the two posttests. Treatment group 3 significantly outperformed treatment 2 and 1 (see Table 4.10). This effect was significant with and without the outlier removed ($p < .001$). Thus, the null hypothesis has been rejected. There was no significant difference between treatment group 2 and 1. This shows that heading strategy instruction improved the total recall of the students on the reading passage but that headings without heading strategy instruction did not.

Table 4.10

**Analysis of Variance by Treatment Groups with Outlier Removed (n=130)
on Total Quantity Recalled on Both Posttests**

Group	\bar{X}	S.D.	F-Ratio	P
1 control	12.06	8.72	13.41	<.001
2 without	15.70	11.31		
3 with	22.27	11.93		
Scheffé Post Hoc Test - Total on Both Posttests (Outlier Removed)				
Matrix of pairwise comparison probabilities				
	1	2	3	
1	-	-	-	
2	.210	-	-	
3	<.001	.005	-	

H₀₂: There will be no significant differences among the mean scores on the delayed written posttests of each specific reading comprehension level (higher, middle, or lower) for the two experimental groups (treatment group **2** - headings **without** heading strategy instructions and treatment group **3** - headings **with** heading strategy instructions) and the **control** group (treatment group **1** - no headings and no heading strategy instructions) on the following dependent variables:

- a** - quantity of superordinate or main ideas in free recall
- b** - quantity of subordinate ideas or supporting ideas in free recall
- c** - quantity of sub-subordinate ideas or details in free recall
- d** - total score on free recall test (**a**, **b**, and **c**)
- e** - accuracy of main idea recall/formulation
- f** - total score for free recall and main idea recall/formulation tests

Analysis of Variance - Higher Reading Comprehension Ability and Treatments

Free Recall: Superordinate Ideas - There was a significant difference among the mean scores between the treatment group 3 and treatment group 1 in the higher reading comprehension ability group with respect to the quantity of main ideas remembered in a free recall test (see Table 4.11). When the outlier was present, the result was $p=.004$ and when the outlier was removed, the result was $p=.007$. These results show that the higher reading comprehension ability group that received the heading strategies (treatment group 3) outperformed the higher reading comprehension ability group that had a passage without headings and who received no heading strategy instruction (treatment group 1) but did not significantly outperform the treatment group 2 that received headings but did not receive heading strategy instructions. Therefore, the null hypothesis was rejected.

Table 4.11

Analysis of Variance - Higher Reading Comprehension Ability Group with Outlier Removed (n=42) and Treatments on Quantity of Superordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P
1 control	3.70	1.92	5.59	.007
2 without	5.73	2.72		
3 with	7.27	3.56		

**Scheffé Post Hoc Test - Superordinate Ideas
(Higher Reading Comprehension Ability Group - Outlier Removed)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.159	-	-
3	.008	.358	-

Free Recall: Subordinate Ideas - There were no significant differences among the mean scores for the higher reading comprehension ability group on the three treatment levels with respect to the quantity of subordinate ideas in a free recall whether the outlier was present ($p=.526$) or absent ($p=.411$). (See Table 4.12.) Thus, the null hypothesis (H_{02} : **b**) was accepted. No higher reading comprehension ability group outperformed any other high ability group on the three treatments on the dependent variable of quantity of subordinate ideas recalled on the Free Recall Test.

Table 4.12

Analysis of Variance - Higher Reading Comprehension Ability Group with Outlier Removed ($n=42$) and Treatments on Quantity of Subordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P	
1 control	5.32	4.54	.91	.411	(n.s.)
2 without	7.43	4.73			
3 with	5.73	4.08			

Free Recall: Sub-subordinate Ideas - There were no significant differences among the mean scores for the higher reading comprehension ability group on the three treatment levels with respect to the quantity of sub-subordinate ideas in the Free Recall Test. (Outlier present - $p=.657$; Outlier removed - $p=.852$). (See Table 4.13.) Thus, the null hypothesis (H_{02} : **c**) was retained. The higher reading comprehension ability groups in each treatment group were not significantly different in their recall of sub-subordinate ideas on the Free Recall Test.

Table 4.13

Analysis of Variance - Higher Reading Comprehension Ability Group with Outlier Removed (n=42) and Treatments on Quantity of Sub-Subordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P	
1 control	5.25	3.94	.16	.852	(n.s.)
2 without	5.88	4.02			
3 with	5.17	2.93			

Free Recall: Total - There were no significant differences among the mean scores for the higher reading comprehension ability group on the three treatment levels with respect to the total number of ideas remembered in the delayed written free recall test. (Outlier present - $p=.243$; Outlier removed - $p=.314$). (See Table 4.14.) Thus, the null hypothesis ($H_{02}: d$) was retained. The higher reading comprehension ability groups in each treatment group were not significantly different in their total recall of ideas on the Free Recall Test.

Table 4.14

Analysis of Variance - Higher Reading Comprehension Ability Group with Outlier Removed (n=42) and Treatments on Total Number of Ideas on the Free Recall Test

Group	\bar{X}	S.D.	F-Ratio	P	
1 control	14.27	8.97	1.20	.314	(n.s.)
2 without	19.05	9.68			
3 with	18.17	7.34			

Main Idea Recall/Formulation: Accuracy - There were significant differences among the mean scores for the higher reading comprehension ability group on the three treatment levels with respect to the number of ideas remembered in the delayed

written main idea recall/formulation test. This was significant ($p<.001$) when the outlier was present and when the outlier was removed (see Table 4.15). Thus, the null hypothesis ($H_0: e$) was rejected. The higher reading comprehension ability group in treatment group 3 that received headings with heading strategy instructions significantly outperformed the higher reading comprehension ability groups in both treatment group 2 and 1 ($p<.001$) on their accuracy of main idea recall/formulation (on the Main Idea Recall/Formulation Test).

Table 4.15

Analysis of Variance - Higher Reading Comprehension Ability Group with Outlier Removed (n=42) and Treatments on the Accuracy of Main Idea Recall/Formulation on Posttest 2

Group	\bar{X}	S.D.	F-Ratio	P
1 control	2.46	2.09	24.19	<.001
2 without	4.17	2.95		
3 with	9.85	3.47		

**Scheffé Post Hoc Test - Main Idea Recall/Formulation
(Higher Reading Comprehension Ability Group - Outlier Removed)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.293	-	-
3	<.001	<.001	-

Free Recall and Main Idea Recall/Formulation: Total - There was a significant

difference among the mean scores for the higher reading comprehension ability group on the treatment levels with respect to the total number of ideas remembered on the two posttests. This was significant ($p=.023$) when the outlier was present and when the outlier was removed ($p=.023$) (see Table 4.16). The higher reading comprehension ability group that received headings with heading strategy

instructions (treatment group 3) significantly outperformed the group that received no headings and no heading strategy instructions (treatment group 1) but did not outperform the group that received headings without heading strategy instructions (treatment group 2) as shown by the Scheffé Test.

Table 4.16

Analysis of Variance - Higher Reading Comprehension Ability Group with Outlier Removed (n=42) and Treatments on Total Quantity Recalled on Both Posttests

Group	\bar{X}	S.D.	F-Ratio	P
1 control	16.73	10.59	4.14	.023
2 without	23.22	11.18		
3 with	28.02	8.58		

**Scheffé Post Hoc Test - Total of Both Posttests
(Higher Reading Comprehension Ability Group - Outlier Removed)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.247	-	-
3	.024	.472	-

Analysis of Variance - Middle Reading Comprehension Ability and Treatments

This section shows how the middle reading comprehension ability group was affected by the three different treatments as shown by the results of the ANOVAs on the six dependent variables. (As the outlier was not in this reading ability group, there can be no effect by the outlier.) However, these results are affected by the Bonferroni criteria (Kirk, 1982, Systat, 1992b) and should be used only with caution. In each case, the data will be analyzed according to the original alpha level first. If the results are higher than .02 when rounding off has taken place, a second analysis of the results will be stated using the Bonferroni critical values.

Free Recall: Superordinate Ideas - The results show that there were significant differences among the mean scores ($p=.003$) for the middle reading comprehension ability group on the three treatment levels with respect to the quantity of main ideas on the Free Recall Test (see Table 4.17). The Scheffé test shows that the results were significant at the .10 level. The middle comprehension ability group that received headings with heading strategy instructions (treatment 3) outperformed both the groups that received no heading strategy instructions (treatment groups 1 and 2). The null hypothesis was rejected.

If adjustments are made for a Bonferroni critical value of .02, treatment group 3 still outperforms treatment group 1 ($p=.004$), but does not outperform treatment group 2 ($p<.06$). The null hypothesis is still rejected.

Table 4.17

Analysis of Variance - Middle Reading Comprehension Ability Group (n=41) and Treatments on Quantity of Superordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P
1 control	2.77	2.25	7.00	.003
2 without	3.85	2.79		
3 with	6.44	3.01		

**Scheffé Post Hoc Test - Superordinate Ideas
(Middle Reading Comprehension Ability Group)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.614	-	-
3	.004	.058	-

Free Recall: Subordinate Ideas - There were no significant differences among the mean scores ($p=.433$) for the middle reading comprehension ability group on the three

treatment levels with respect to the quantity of subordinate ideas remembered on the Free Recall Test (see Table 4.18). The null hypothesis was accepted.

Table 4.18

Analysis of Variance - Middle Reading Comprehension Ability Group (n=41) and Treatments on Quantity of Subordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P	
1 control	3.94	3.63	.86	.433	(n.s.)
2 without	4.92	4.36			
3 with	5.70	2.91			

Free Recall: Sub-subordinate Ideas - Although there is a tendency to significance ($p=.109$), there were no significant differences among the mean scores for the middle reading comprehension ability group on the three treatment levels with respect to the quantity of sub-subordinate ideas remembered on the Free Recall Test (see Table 4.19). The null hypothesis was accepted.

Table 4.19

Analysis of Variance - Middle Reading Comprehension Ability Group (n=41) and Treatments on Quantity of Sub-Subordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P	
1 control	3.42	2.48	2.35	.109	(n.s.)
2 without	3.69	2.55			
3 with	5.72	3.92			

Free Recall: Total - There was a significant difference among the mean scores for the middle reading comprehension ability group on the treatment levels with respect to

the total quantity of ideas remembered on the Free Recall Test (see Table 4.20). The Scheffé test shows that treatment group 3 outperformed treatment group 1 ($p=.037$) and therefore, the null hypothesis was rejected. The treatment group 3 did not outperform treatment group 2, however. This data shows that when heading strategy instructions were given and headings were present, treatment group 3 recalled significantly more than students who received no headings and no heading strategy instructions but not more than the group that received headings but no heading strategy instructions.

If an adjustment is made for the Bonferroni critical value, then the null hypothesis is accepted. Treatment group 3 did not significantly outperform treatment group 1.

Table 4.20

Analysis of Variance - Middle Reading Comprehension Ability Group (n=41) and Treatments on Total Number of Ideas on the Free Recall Test

Group	\bar{X}	S.D.	F-Ratio	P
1 control	10.14	7.48	3.60	.037
2 without	12.46	8.93		
3 with	17.86	7.66		

**Scheffé Post Hoc Test - Free Recall Test Total
(Middle Reading Comprehension Ability Group)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.770	-	-
3	.046	.222	-

Main Idea Recall/Formulation: Accuracy - There were significant differences among the mean scores for the middle reading comprehension ability group on the three treatment levels with respect to the accuracy of ideas remembered on the Main Idea

Recall/Formulation Test (see Table 4.21). The Scheffé test shows that treatment group 3 outperformed treatment group 1 ($p=.007$) and treatment group 2 ($p=.050$) and therefore, the null hypothesis was rejected. This data shows that when heading strategy instructions were given along with headings (treatment group 3), the students recalled significantly more main ideas than students who received no headings and no heading strategy instructions (treatment group 1) and the group (treatment group 2) that received headings without heading strategy instructions.

After a Bonferroni adjustment has been made to the critical probability level, treatment group 3 does not significantly outperform treatment group 2, but does outperform treatment group 1 ($p<.007$). Therefore, the null hypothesis is still rejected.

Table 4.21

Analysis of Variance - Middle Reading Comprehension Ability Group (n=41) and Treatments on the Accuracy of Main Idea Recall and Formulation on Posttest 2

Group	\bar{X}	S.D.	F-Ratio	P
1 control	2.35	2.31	6.32	.004
2 without	3.42	2.23		
3 with	7.19	5.49		

Scheffé Post Hoc Test - Accuracy of Main Idea Recall/Formulation (Middle Reading Comprehension Ability Group)

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.789	-	-
3	.007	.050	-

Free Recall and Main Idea Recall/Formulation: Total - There were significant

differences among the mean scores ($p=.003$) for the middle reading comprehension

ability group on the three treatment levels with respect to the total quantity of ideas remembered on the Free Recall Test and the Main Idea Recall/Formulation Test (see Table 4.22). The Scheffé test shows that treatment group 3 outperformed treatment group 1 ($p=.005$) and treatment group 2 ($p=.056$). Therefore, the null hypothesis was rejected. This data shows that when heading strategy instructions were given and headings were present, treatment group 3 recalled significantly more ideas on both posttests than students who received no headings and no heading strategy instructions (treatment group 1) and those that had headings present with no heading strategy instructions (treatment group 2).

When the Bonferroni procedure is used, treatment group 3 continues to significantly outperform treatment group 1, but not treatment group 2. Therefore, the null hypothesis is still rejected.

Table 4.22

Analysis of Variance - Middle Reading Comprehension Ability Group (n=41) and Treatments on Total Quantity Recalled on Both Posttests

Group	\bar{X}	S.D.	F-Ratio	P
1 control	12.48	7.78	6.67	.003
2 without	15.88	10.97		
3 with	25.05	9.93		

**Scheffé Post Hoc Test - Total Recall on Both Posttests
(Middle Reading Comprehension Ability Group)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.682	-	-
3	.005	.056	-

Analysis of Variance - Lower Reading Comprehension Ability and Treatments

In this section, the focus is on how the lower reading comprehension ability group was affected by the three different treatments as shown by the results of the ANOVAs on the six dependent variables. As the outlier was not in this reading ability group, there is no effect by the outlier. However, like the middle reading comprehension ability level, the results of the lower reading comprehension ability level are affected by the Bonferroni criteria (Kirk, 1982; Systat, 1992b).

Free Recall: Superordinate Ideas - The results show that there were significant differences among the mean scores ($p=.008$) for the lower reading comprehension ability group on the three treatment levels with respect to the quantity of superordinate or main ideas remembered in the Free Recall Test (see Table 4.23). The Scheffé test shows that the results were significant at the .10 level. The lower comprehension ability group that received headings with heading strategy instructions (treatment group 3) outperformed both the groups that received no

Table 4.23

Analysis of Variance - Lower Reading Comprehension Ability Group (n=47) and Treatments on Quantity of Superordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P
1 control	2.05	2.11	5.35	.008
2 without	2.27	1.45		
3 with	4.66	3.44		

**Scheffé Post Hoc Test - Superordinate Ideas
(Lower Reading Comprehension Ability Group)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.971	-	-
3	.020	.033	-

heading strategy instructions (treatment group 2 at $p=.033$, and treatment group 1 at $p=.020$). The null hypothesis was rejected.

When adjustments are made for the Bonferroni critical probability level, treatment group 3 outperforms treatment group 1, but not treatment group 2. The null hypothesis is still rejected.

Free Recall: Subordinate Ideas - There were no significant differences among the mean scores ($p=.308$) for the lower reading comprehension ability group on the three treatment levels with respect to the quantity of subordinate ideas remembered on the Free Recall Test (see Table 4.24). The null hypothesis was accepted.

Table 4.24

Analysis of Variance - Lower Reading Comprehension Ability Group (n=47) and Treatments on Quantity of Subordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P	
1 control	1.40	1.29	1.21	.308	(n.s.)
2 without	2.50	2.60			
3 with	3.06	4.29			

Free Recall: Sub-subordinate Ideas - There were no significant differences among the mean scores ($p=.538$) for the lower reading comprehension ability group on the three treatment levels with respect to the quantity of sub-subordinate ideas remembered on the Free Recall Test (see Table 4.25). The null hypothesis was accepted.

Table 4.25

Analysis of Variance - Lower Reading Comprehension Ability Group (n=47) and Treatments on Quantity of Sub-Subordinate Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P	
1 control	2.02	1.77	.63	.538	(n.s.)
2 without	2.67	2.63			
3 with	3.09	3.37			

Free Recall: Total - Although there was a tendency to significance ($p=.113$), there were no actual significant differences among the mean scores at ($p<.10$ level) for the lower reading comprehension ability group on the three treatment levels with respect to the total quantity of ideas remembered on the Free Recall Test (see Table 4.26). Therefore, the null hypothesis can not be rejected. The treatment group 3 did not outperform treatment group 2 or 1. This data shows that when heading strategy instructions were given and headings were present, treatment group 3 did not recall significantly more than students who received no headings and no heading strategy instructions (treatment group 1), and the group that received headings without heading strategy instructions (treatment group 2).

Table 4.26

Analysis of Variance - Lower Reading Comprehension Ability Group (n=47) and Treatments on Total Quantity of Ideas Recalled on the Free Recall Posttest

Group	\bar{X}	S.D.	F-Ratio	P	
1 control	5.47	3.58	2.30	.113	(n.s.)
2 without	7.44	5.69			
3 with	10.81	10.07			

Main Idea Recall/Formulation: Accuracy - There was a significant difference among the mean scores ($p=.018$) for the lower reading comprehension ability group on the treatment levels with respect to the accuracy of ideas remembered on the Main Idea Recall/Formulation Test (see Table 4.27). The Scheffé test shows that treatment group 3 outperformed treatment group 2 ($p=.023$) and therefore, the null hypothesis was rejected. The treatment group 3 did not outperform treatment group 1, however ($p=.128$). This was the only time that treatment group 3 outperformed treatment group 2 but not treatment group 1. This data shows that when heading strategy instructions were given and headings were present, treatment group 3 recalled significantly more main ideas than students who received headings without heading strategy instructions. Treatment group 3 did not significantly recall more main ideas than the group that received no headings and no heading strategy instructions (treatment group 1).

Table 4.27

**Analysis of Variance - Lower Reading Comprehension Ability Group
($n=47$) and Treatments on
Accuracy of Main Idea Recall or Formulation**

Group	\bar{X}	S.D.	F-Ratio	P
1 control	1.87	2.39	4.42	.018
2 without	1.09	1.58		
3 with	4.00	4.02		

**Scheffé Post Hoc Test - Main Idea Recall/Formulation
(Lower Reading Comprehension Ability Group)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.755	-	-
3	.128	.023	-

Free Recall and Main Idea Recall/Formulation: Total - There was a significant difference among the mean scores ($p=.046$) for the lower reading comprehension ability group on the treatment levels with respect to the total quantity of ideas remembered on the Free Recall Test and the Main Idea Recall/Formulation Test (see Table 4.28). Therefore, the null hypothesis was rejected. The Scheffé test shows that treatment group 3 outperformed treatment group 1 ($p=.070$) but not treatment group 2 ($p=.140$). This data shows that when heading strategy instructions were given and headings were present, treatment group 3 recalled significantly more ideas on both posttests than students who received no headings and no heading strategy instructions (treatment group 1) but not those students that had headings without heading strategy instructions (treatment group 2).

If a Bonferroni adjustment is made, treatment group 3 no longer significantly outperforms treatment group 1, and the null hypothesis is accepted.

Table 4.28

Analysis of Variance - Lower Reading Comprehension Ability Group (n=47) and Treatments on Total Quantity of Ideas Recalled on Both Posttests

Group	\bar{X}	S.D.	F-Ratio	P
1 control	7.33	4.53	3.32	.046
2 without	8.53	6.50		
3 with	14.81	12.78		

**Scheffé Post Hoc Test - Total of Both Posttests
(Lower Reading Comprehension Ability Group)**

Matrix of pairwise comparison probabilities

	1	2	3
1	-	-	-
2	.930	-	-
3	.070	.140	-

H₀₃: There will be no significant interaction between reading comprehension ability level (higher, middle and lower) and treatment (treatment group 1- no headings and no heading strategy instruction; treatment group 2 - headings without heading strategy instruction; treatment group 3 - headings with heading strategy instruction) on the delayed written posttests on the following dependent variables:

- a - quantity of superordinate or main ideas in free recall
- b - quantity of subordinate ideas or supporting ideas in free recall
- c - quantity of sub-subordinate ideas or details in free recall
- d - total score on free recall test (a, b, and c)
- e - accuracy of main idea recall/formulation
- f - total score for free recall and main idea recall/formulation tests

There were no significant interactions between reading comprehension ability level (higher, middle and lower) and treatment (treatment group 1 - no headings and no heading strategy instruction; treatment group 2 - headings without heading strategy instruction; treatment group 3 - headings with heading strategy instruction) on the delayed written posttests on the following dependent variables:

- a - quantity of superordinate or main ideas in free recall
- b - quantity of subordinate ideas or supporting ideas in free recall
- c - quantity of sub-subordinate ideas or details in free recall
- d - total score on free recall test (a, b, and c)
- f - total score for free recall and main idea recall/formulation tests

There was a borderline interaction on the main idea recall/formulation test (dependent variable: e) between the low and middle reading ability groups and treatments 1 and 2. It was decided that this interaction was not of any practical significance ($F=2.44$, $p=.050$).

SUMMARY OF RESEARCH RESULTS

A series of ANOVAs were carried out using the SYSTAT statistical package 5.2.1 for the Macintosh computer. The level of significance for this experiment was set at the alpha level of .10. The results of the ANOVAs, that looked at the effects for the three treatments on the six dependent variables, showed a number of main effects for treatment group 3. These results were still significant after the Bonferroni procedure (Kirk, 1982; Systat, 1992b) was applied. The group that received heading strategy instruction plus headings significantly outperformed treatment groups 1 and 2 in recall of main ideas on the Free Recall and the Main Idea Recall/Formulation Tests and on the total recall from both posttests. It also enabled treatment group 3 to significantly outperform treatment group 1 in total recall on the Free Recall Test. Treatment group 2 never significantly outperformed treatment group 1 on any dependent measures. This means that headings with heading strategy instruction received by treatment group 3 had a considerable effect on the results of two posttests while having headings without heading strategy instructions, as treatment group 2 received, did not significantly improve recall performance over the control group (treatment group 1) that read a social studies passage without the benefit of headings or heading strategy instruction.

When further analysis was carried out on the treatment effect in each reading comprehension ability group on the six dependent variables, a similar pattern appears. Treatment group 3 significantly improved recall on main ideas in the Free Recall Test and the Main Idea Recall/Formulation Test, plus had some effect on total recall in both posttests. Although the three ability groups benefitted from the treatment with both headings and heading strategy instruction, the middle treatment group found this treatment especially effective (7 significant Scheffé tests). However, caution must be used with the results when the specific reading comprehension ability levels are compared with treatments on the six dependent measures because the cell size is small (numbers ranging from 12 to

16 - see Table 4.02) and some of these measures were affected by the Bonferroni procedure. Although the pattern is similar to that of the main effects, it is weaker for the specific comprehension ability levels. After the Bonferroni procedure is applied, the higher reading comprehension ability group found headings more helpful (4 significant Scheffé tests) than the middle ability group (3 significant Scheffé tests). The middle reading comprehension ability group found the heading strategy instructions more helpful than the lower ability level (2 significant Scheffé tests).

Generally, the subjects in this sample found that headings with heading strategy instructions definitely aided their ability to recall or formulate main ideas and to some extent helped the students with overall recall. It did not help the students recall subordinate (supporting ideas) or sub-subordinate ideas (details) on the free recall posttest. There were no significant effects for the headings only group over the control group.

In chapter 5, the research results will be discussed. Suggestions will be made for future research and implementation, and some general conclusions will be proposed.

CHAPTER FIVE

Summary and Conclusions

SUMMARY OF THE RESEARCH

This study was designed to investigate whether the presence of headings in regular classroom content area reading material naturally facilitated the quantity and type of recall of expository prose by fifth grade students, and whether the exposure to and use of heading strategy instructions further improved the recall of the students.

Students from seven classrooms in three school districts were chosen to be representative of classes in each district or were randomly selected. An Experimental Pretest-Posttest Control Group Design was used to explore the research problem. In the first phase of the experiment, all the students were given a Gates-MacGinitie Reading Test, Canadian Edition, Level D, Form 1. The students were rank-ordered on the basis of the comprehension subtest of this test and divided into approximately even groups based on higher, middle and lower reading comprehension ability performances. The students were then placed in treatment groups using a systematic, counterbalanced assignment procedure that ensured that each treatment group contained a similar number of higher, middle and lower reading comprehension ability subjects.

All treatment groups read a four page passage from a currently authorized grade 5 social studies textbook in British Columbia. The three treatment groups consisted of:

- 1) a control group that read a passage with all headings removed,
- 2) a treatment group that read the passage with the original text headings present, and
- 3) a treatment group that received heading strategy instructions, and then read the passage with headings present.

The control and headings only groups were given an alternative prereading activity (a puzzle with key words from the headings of the passage embedded) that took approximately the same time as the heading strategy instructions. All instructions were written so that the three treatments could be conducted at the same time in each classroom.

The posttests consisted of two measures: a free recall test, and a main idea recall/formulation test. All students in the experiment completed the same posttest measures. These were scored according to a newly designed scoring protocol. The researcher had no access to information about the ability or treatment group of each subject while marking the protocols. Ten percent of the tests were rescored in a blind remarking situation. The level of significance for this experiment was set at the alpha level of .10 and the results were analyzed using analysis of variance on Systat (1992b), a statistical program for Macintosh personal computers.

DISCUSSION OF RESEARCH RESULTS

Results of the Pretest

After the different reading comprehension ability groups were assigned in a systematic and counterbalanced fashion, the three treatment groups were compared to see if there were any differences in the groups before treatment. An analysis of variance on the Gates-MacGinitie comprehension subtest scores was used to determine whether there were any significant differences in treatment groups. A box plot was also produced and the results were almost identical for the three groups, with no outliers present. This close similarity in groups was also reflected in the means and standard deviation scores shown in Table 4.02. Therefore, the three treatment groups were assumed to be similar before treatments were begun.

Summary of Posttest Results

Numerous tests were performed using an analysis of variance technique and further Scheffé tests were included to isolate specific effects of different factors on the analysis of variance tests (see chapter 4). Because of the complexity of this factorial design, the results have been grouped under the following headings:

Effect for Presence of Headings on Recall

There were no significant recall effects on any statistical test for the presence of headings. These results reconfirm the results found by Hartley and Trueman (1985), Landry (1966), and Stables (1985) for students at a similar grade level. To date, there are no experiments found by this researcher that show significant effects for the presence of headings with grade 5 students on recall of expository prose.

However, there is some indication that headings in text had some small, but not statistically significant, effect on recall. When a series of Scheffé tests were carried out, the heading strategy instruction plus headings (treatment 3) significantly outperformed the control group (treatment 1) that had no headings and no instruction on 13 Scheffé tests, whereas treatment group 3 significantly outperformed the headings only group (treatment 2) on only 5 Scheffé tests if the Bonferroni adjustments are made to the critical probability level or 9 Scheffé tests if the original alpha level of .10 is used (see Table 5.01).

These results suggest that textbook authors should continue to produce text materials that contain headings. However, other intervention will be necessary if grade 5 students are to make significant use of headings to aid recall.

Effects of Heading Strategy Instruction

Superordinate Level of Recall - There were definite significant differences among the three treatment groups on two measures at the superordinate level. The main ideas on the free recall test and the main idea recall/formulation test were significantly

Table 5.01 - Summary of Scheffé Statistical Results

Scheffé Test Comparisons of Treatment Groups (numbers)

by Reading Ability Levels

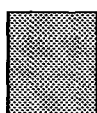
(N=130 - outlier removed)

Note: Treatment Group 1 - no headings and no heading strategy instructions

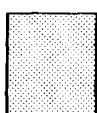
Treatment Group 2 - headings and no heading strategy instructions

Treatment Group 3 - headings and heading strategy instructions

dependent variable	main		sub		sub-sub		free recall total		main recall/ formulation		total posttests	
comparisons	3/1	3/2	3/1	3/2	3/1	3/2	3/1	3/2	3/1	3/2	3/1	3/2
reading group												
three levels combined	<.001	<.001	.28	<.99	<.28	<.70	.005	<.31	<.001	<.001	<.001	.005
upper ability level	<.008	<.36	.97	<.61	<.999	<.88	<.52	<.97	<.001	<.001	.02	.47
middle ability level	<.004	<.06	.43	.85	.16	.25	<.05	.22	.007	<.05	.005	<.06
lower ability level	.02	.03	<.32	.87	.54	<.91	<.12	<.41	<.13	.02	.07	<.14



significant effects
meeting Bonferroni's critical value



significant effects
not meeting Bonferroni's critical value
(use with caution)

improved with the addition of heading strategy instructions. The Scheffé tests showed that this effect was consistent when treatment group 3 was compared with both treatment groups 2 and 1 (see Table 5.01). This would suggest that the grade 5 students in this sample benefitted from heading strategy instruction because it improved their ability to recall at the superordinate or main idea level. These results are particularly important as it has been shown that young people are less skilled at categorizing information at the superordinate level (Gardner, 1991; Lakoff, 1987) and do not find that information at the superordinate level is most memorable (Baumann, 1981b). Moreover, elementary pupils have trouble getting the gist of a passage and identifying or constructing main ideas (Baumann, 1981a).

Subordinate and Sub-subordinate Level of Recall - Heading strategy instructions had no significant effect on the ability of treatment group 3 to recall subordinate (supporting ideas) and sub-subordinate (details) information on the combined reading groups or on any specific reading ability group. These results are not surprising because headings represent the superordinate levels of text and therefore their effect is more likely to be shown at the superordinate level. These results also indicate the need for research designs to include level effects rather than measuring general recall.

Total Recall (Total Free Recall and Total of Both Posttests) - Generally, heading strategy instructions helped treatment group 3 to significantly outperform the headings only group (treatment 2) and the no headings or instruction group (treatment 1) on the total of both recall tests. In the total quantity of ideas recalled on the free recall posttest, the heading strategy group outperformed group 1 but not group 2.

These results suggest that it was generally helpful for treatment group 3 to receive heading strategy instructions in order to improve the total number of ideas recalled. One possible hypothesis is that students were able to use headings to

organize or chunk information (Postman, 1972) and hence increase their total amount of recall. Another explanation is that the students might have found that the focus on headings helped them to understand the passage more when reading and therefore improved their overall recall. Meaningful material is recalled more easily than meaningless or rote information unless the incentives are high to remember the meaningless material (Jones, 1986). Jones (1986) says, "... memory requires thinking, and there are various levels of processing information for both short-term and long-term storage of information In general, the deeper the level of processing, the higher the level of immediate and delayed recall ..." (p. 7).

In summary, heading strategy instructions had a number of significant effects on superordinate recall and total recall. These results (subject to confirmation) suggest that giving students direct instruction in heading strategies use would be a fruitful course of action. These results seem to reconfirm the results of Goble (1986) who found that direct heading instruction significantly improved the recall of grade 5 pupils. They also concur with Baumann (1984) who found that direct instruction of main ideas significantly aided recall.

Effects of Reading Comprehension Ability Performances

The results of the ANOVAs show that the higher reading group outperformed the middle reading group which outperformed the lower reading groups on all measures ($p < .001$). These results are consistent with the research literature that shows reading comprehension ability has a significant effect on recall performance (e.g., Baumann, 1984; Coulombe, 1986; Hartley & Trueman, 1985).

Effects of Treatments on Specific Reading Comprehension Ability Groups

In previous research, there has been some suggestion that headings have more of an effect on students from specific reading ability groups, rather than a general effect.

However, in this research, each ability group tended to be affected by the treatments in a similar pattern (i.e., heading strategy instructions: especially improved recall at the superordinate level, had some significant effects on total quantity of recall, and had no significant effects on subordinate and sub-subordinate recall). Moreover, the heading strategy instruction treatments at each specific ability level were significantly more effective than the control groups (on 9 Scheffé tests, of which 7 met the Bonferroni criteria) more often than with the treatment 2 groups that had headings only (on 6 Scheffé tests, where only 2 met the Bonferroni criteria) (see Table 5.01).

Although the pattern was approximately the same, the middle reading ability group appeared (see Table 5.01) to find heading strategy instructions more useful (if the original alpha level is used) than the higher and lower reading groups (Number of significant Scheffé tests: The middle ability group had 7 [3 met the Bonferroni criteria], the upper ability group had 4 [all met the Bonferroni criteria], and the lower ability group had 4 [2 met the Bonferroni criteria]). Some heading research in the past has found headings to be more helpful for lower ability students (Hartley & Jonassen, 1985, generally, and Hartley et al., 1980 and Hartley, Morris & Trueman, 1981, when the headings were in the form of questions). Other research showed that an upper ability group that received instruction benefitted the most (Coulombe, 1986). It is possible that the difficulty of the reading material might be a factor in causing different reading comprehension ability groups to find headings and heading strategy instruction more or less effective. Spyridakis and Standel (1987) found signalling aids are most effective when the passage is neither too difficult or too easy. In this research, it seems reasonable that a passage with a difficulty of grade 5 to 6 on three readability scales (see Table 3.04) would be most suitable for the middle and upper reading groups and would be found to be rather difficult for some subjects in the lower reading ability group.

SUGGESTIONS FOR FUTURE RESEARCH

A number of tentative suggestions have been based on the assumption that the results of Goble (1986) and this thesis reflect true differences in performance. First and foremost, it is necessary to replicate or confirm the results of the two studies (that of sensitizing grade 5 students to headings and heading strategy instruction) using a variety of expository material. If this research is replicated, a number of changes might lead to an improved design. The changes are:

- *Clearly show the students what is involved in free recall and main idea recall/formulation and have them practice both types of responses prior to reading expository prose in the research situation.*

This way, the subjects will be more familiar with the requested research tasks.

- *Add a pretest memory component.*

In this research, care was taken to avoid confounding reading comprehension ability with treatment effects. No similar measure was taken before treatment to establish general ability to recall information. In future research, pretest measures of both recall ability and reading comprehension ability need to be obtained.

Some tentative suggestions for publishers, researchers and educators are given below:

Publishers

- *Continue to provide text material with headings.*

Because headings can serve a number of encoding (comprehension and recall) and retrieval functions (see chapter 1 and the review of the literature in chapter 2), their presence in text is important. Although headings will not be useful for everyone all the time, headings are of use to many readers some of the time.

- *Publishers of textbooks aimed at teaching teachers how to teach reading could consider including a separate section on the importance of headings, because of their multiple functions, and show teachers how to instruct students to use headings effectively.*

This should combine direct instruction of heading understanding and heading strategy instructions.

Researchers

- *Focus on improving scoring protocols for longer, more natural classroom textual material so that subjects are rewarded for summarizing, generalizing and inferring because these are sensible strategies for comprehending and coping with the recall of larger text passages.*

The new scoring protocol, only one possible prototype, used in this thesis seemed to work well for the researcher. It clearly differentiated performances and rewarded partial attempts instead of crediting only completely accurate responses. The protocol also included a mechanism for scoring summarizations, generalizations and inferences, when appropriate. In addition, because of its graphic nature, the scoring protocol provided information about how students processed and recalled text. Now, there is a need to formalize the scoring rules so they could be used by classroom teachers to obtain informal information about their students' comprehension and recall from their textbooks.

Serious researchers need to continue the efforts to develop feasible ways to partition text and analyze the responses of their research subjects.

- *Explore patterns of recall and look for ways to aid children in recalling information.*

The results of this study show that the children were not able to recall much information and what was recalled was often fragmented and sometimes meaningless. These findings are similar to that of Baumann (1984) who found that

the amount of recall by grade 6 students on a free recall test was poor for all three treatment groups, and Wagner (1986), who found that his young pupils (grades 4 and 5) tended to represent text meaning incoherently and incompletely. Baine (1986) recommends systematically teaching memory skills. A researcher could explore potentially useful strategies for remembering information.

Researchers and/or Teachers

- *Experiment to find the most efficient ways to teach heading understanding and heading strategy use.*

Pressley, Forrest-Pressley and Elliot-Faust (1988) suggest research on the potent components in a complex set of strategies. They say, "complex treatments are expensive in terms of time and effort. There is high incentive to streamline by eliminating aspects of instruction that do not enhance the intervention" (p. 114-115). In this study, a number of heading strategies were suggested. It may be that only some of these are truly effective. If some of the suggestions do not contribute to improved comprehension and recall, they could be eliminated.

- *Replicate the research of Coulombe (1986).*

It is important to replicate the Coulombe (1986) research which was similar in method and materials to the Goble (1986) research, but did not find significant results for instruction. It is not clear whether grade 4 students are just not cognitively ready for this instruction or if they did not have enough time to absorb the information in the eight lessons that were provided. This time the length of instruction should be increased to cover the later possibility.

CONCLUSIONS

It is not enough to just provide text material with headings and assume that children will benefit from them. This research shows that, at the grade 5 level, students do not automatically use headings to recall material at the superordinate level. The recall studies at the elementary level are consistent. If students are given material with headings and no instruction, these headings do not significantly improve their ability to recall information (Hartley & Trueman, 1985; King, 1985; Landry, 1966; Stables, 1985). If the students are instructed to use heading strategies (as is the case in this research) or are sensitized to headings (Goble, 1986) then students seem to be able to recall more information at the superordinate level (this research), plus their overall recall is improved (both studies).

The results of this research seem to indicate that grade 5 children in southwest British Columbia recall little of what they have read from a provincially authorized social studies textbook. Indeed, Stetson and Williams (1992) claim that there is overwhelming empirical evidence that large numbers of students can not understand their social studies textbooks. Any attempt to help students become aware of heading strategies that improve their ability to understand, integrate and recall textbook information, would be a very worthwhile endeavor. Educators seem to have assumed that headings in text are self-explanatory and the mere presence of headings in text should aid comprehension and recall. At the grade 5 level, with this sample, this certainly was not the case. At no point did the inclusion of headings alone effectively improve recall on any dependent measure over the control group that had the same passage and no headings present. When the students received heading strategy instructions, they improved both general recall and especially improved their ability to remember the main ideas in the passage. These seem to be important accomplishments for upper elementary school students. If this was all heading strategy instructions did, it would be useful for the students to learn to use headings effectively. However, there are a number of heading strategies that have broader

implications. A thorough understanding of categorization would be a useful aid to help children grasp the basic structures in text material. It would allow the students to see the author's structure and teach them to hook ideas to this basic framework. It could help students to select or eliminate textual material rapidly based on the usefulness of the material that is contained in the text, as suggested by the subject matter of the headings. Furthermore, when the students were writing their own material, the children could be shown how headings, that represent key ideas, can be used as a structure for writing clearly themselves.

There has been some realization lately that headings might be important to focus on if students are to comprehend the content area material. Some of the teacher guidebooks recommend that teachers direct children to preview headings and use these to predict what will be read. However, it is the contention of this researcher, that it is not enough to focus on headings on a lesson-by-lesson basis. The teacher is not going to be present every time the student reads informational material and students do not seem to apply such a procedure outside the classroom. It is essential that the students are taught heading strategies over a period of time until they are thoroughly comfortable with them and can select and use them effectively at any time they choose. It is the experience of this researcher, that with careful instruction over time, even with learning disabled children, strategies can be taught until they become a part of the strategic coping techniques of the students. Then the strategies become available for use anytime the child has a need. The key to effective transfer of strategies into life skills, once the heading strategies have been isolated, identified and modelled, is to practice using these strategies on reading material that is especially meaningful to the learner. Therefore, it is this researcher's view, that it would be worthwhile for the teacher to thoroughly teach heading strategies at the upper elementary level so the children have a useful set of tools for coping with expository text material during school.

The jobs of educators do not end at preparing children to carry out daily school tasks. One of the four main goals laid out in an ABC Special Television Show called Common Miracles: The New American Revolution in Learning (that aired on January 23, 1993) was learning how to obtain information. In a world flooded with written material, the skillful, strategic use of headings could be a much needed aid. Jones (1986) has defined cognitive instruction as "... any effort on the part of the teacher or the instructional materials to help students process information in meaningful ways and become independent learners" (p. 7). The teaching of heading understanding and the strategic use of headings would seem to qualify in both ways.

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APPENDIX A

- A.01 Prereading Component (versions A and B)
- A.02 Main Passage Component (versions C and D)
- A.03 Original Text

A.01 - Prereading Component (version A)

HOW TO USE HEADINGS TO READ BETTER

Today you are going to learn about some ways you can use titles or headings to read better. We call them **heading strategies** and they can help us to understand more of what we read in our social studies textbooks.

HEADING STRATEGIES

Strategy #1: Look at the title and ask yourself, "What do I already know about this topic?"

Here is an example for you to practice on. The example is the title from the passage or pages that you are going to read.

How Were Forests Used in the Past?

Please write down all that you know about how forests were used in the past.

Strategy #2: Read each of the headings in a passage and predict what you think the passage (or pages to be read) will be about.

Here are all the headings from the passage:

How Were Forests Used in the Past?

How the Indians Used the Forests

Clearing the Land

Logging in Eastern Canada

Logging in British Columbia

What do you predict this passage will be about if these are the headings from the passage?

List your predictions on the lines below.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

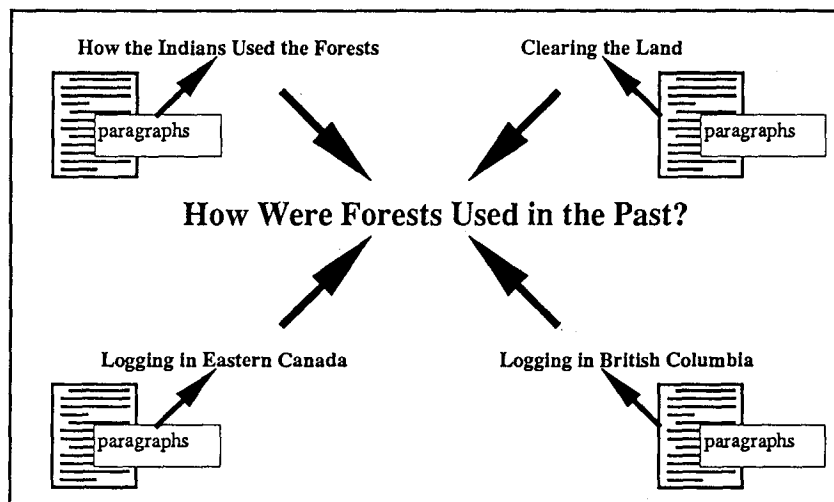
Strategy #3: Notice the different levels of headings.

Did you know that there are different levels of headings? Yes ____ No ____ The most important headings are usually the biggest or they are made to stand out with darker print.

Put a tick beside the heading that you think is the most important heading below:

- ☐ **How Were Forests Used in the Past?**
- ☐ **How the Indians Used the Forests**
- ☐ **Clearing the Land**
- ☐ **Logging in Eastern Canada**
- ☐ **Logging in British Columbia**

Did you pick the first one? If so, you are correct. The most important heading summarizes or tells the topic of all the information that follows. Each smaller heading tells us information about the bigger heading. Each group of paragraphs tells us information about its heading. Here is a diagram that may help to explain this idea.



We can learn information by reading the headings and noticing the different levels of headings. We can also remember much of the information in a passage by thinking about the headings first and then remembering any information that tells us about those headings.

Strategy #4: Setting a purpose for reading. Turn your headings into questions and then read to find the answers.

Setting a purpose for reading is an important strategy. You can use headings to set a purpose for reading by turning each heading into a question. In this passage, the first heading is already a question. It asks, "**How were the forests used in the past?**" When you read the passage, try to answer this question.

Let's turn the other headings into questions and then see if you can find the answers to the questions when you read.

"How the Indians Used the Forests" becomes

How did the Indians use the forests?

"Clearing the Land" could become

Who cleared the land?

Why did they clear the land?

How did they clear the land?

What land did they clear?

"Logging in Eastern Canada"

Turn this heading into some questions that you could ask.

Here are some of the questions that I thought up.

How was logging carried out in Eastern Canada?

Why was logging carried out in Eastern Canada?

When was logging carried out in Eastern Canada?

What were the logs used for?

The last heading is:

"Logging in British Columbia"

Make up some questions that you can think of related to this heading.

Now you are ready to read the passage. Turn to the next page and read the passage to see if you find any of the answers to the questions that you and I have asked earlier. If you have trouble reading any words, just do the best you can. Please read the four pages very carefully because you will be asked some questions tomorrow.

Now that you have read the whole passage carefully, we shall use one more heading strategy.

Strategy #5: Check your predictions and purpose for reading.

Now I would like you to check the predictions you made and the questions that you asked before you read. See if you have found out some answers to our questions? Here are the steps to follow:

1. Go back to strategy #2 on page 2 and look at the predictions that you made. Were your predictions right? Yes ____ No ____ It is alright to have different predictions than the textbook author.
2. Now look at the questions that we made up in strategy #4 on page 4 and 5. On those pages, circle those questions which you can now answer. It is not necessary to actually write out any of your answers.

Next time you read a textbook, you can use any of these heading strategies. Now are finished. You may read your library book or do your school work. Please do not talk to anyone. Thank you.

A.01 (continued) - Prereading Component (version B)
with Expanded Puzzle #5

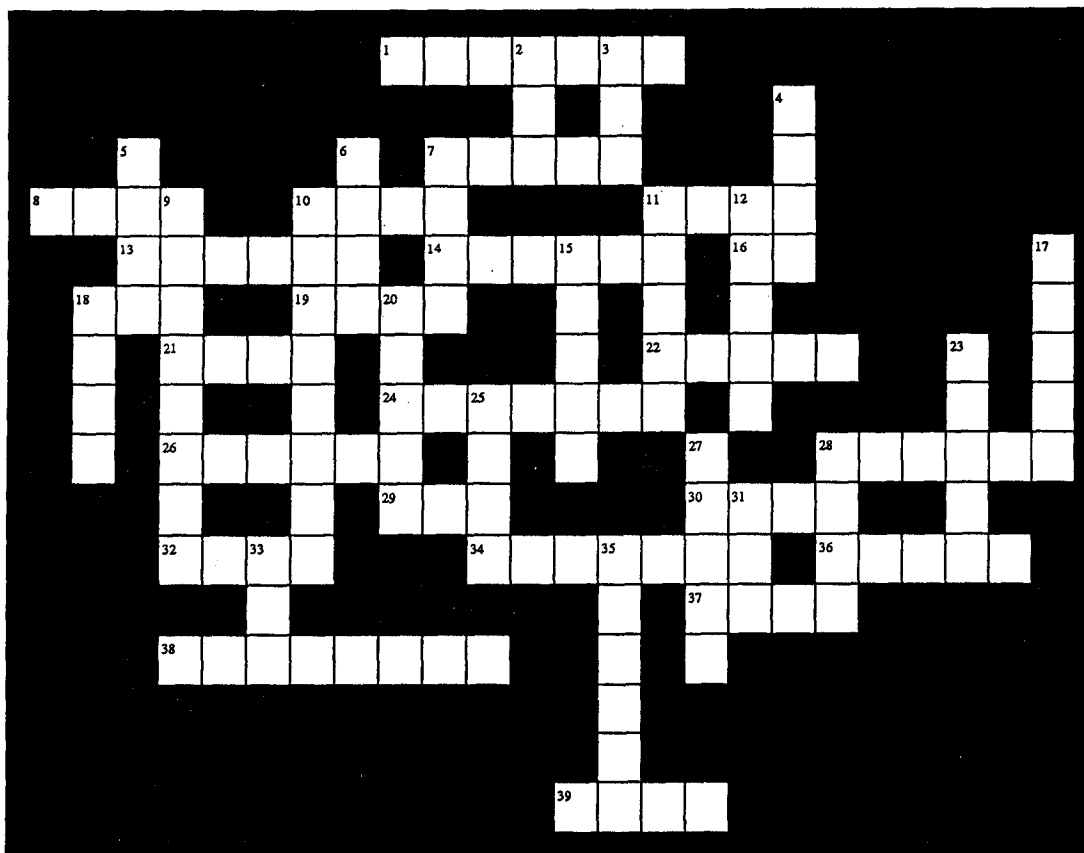
ACTIVITY A

Today you will be given a puzzle to do and some pages to read.

- #1. The crossword puzzle is found on page 2. Some of the answers have been done for you already. The list of words below may be used to answer the crossword puzzle. Not all words will fit in the puzzle. Read the list of answers over first and then do the puzzle on the next page. If you are not able to answer a question, just leave it out. When you have finished this puzzle, turn to page 3.

Puzzle Words

ad	Eastern	one
apple	feet	past
ate	fire	rain
British	forests	red
cent	funny	rent
Canada	globes	ride
clearing	gun	seat
color	home	shout
Columbia	Indians	slim
dark	kitchen	spider
December	land	tear
dime	logging	treat
dinner	medal	used
down	midnight	wagon
dress	nay	where
ear	nice	
Easter	noise	



ACROSS

1. Cutting down trees for wood products
7. Humorous
8. Thin
10. 10 cents
11. Not up
13. Supper
14. Religious spring holiday
16. Short for advertisement
18. Color that means "Stop!"
19. Penny
21. Kind
22. Yell
24. Cowboys and ____
26. Models of Earth
28. This spins webs.
29. What you hear with
30. Where you live
32. Rip
34. Cooking room
36. Red fruit
37. What you pay to live in an apartment
38. Open area with the trees cut down
39. Time before now

DOWN

2. Uses bullets
3. No
4. ____, sea and air
5. Passengers ____ on buses.
6. Flames
7. Plural of foot
9. 12 hours from noon
10. Last month of the year
11. Gown
12. Cart
15. "Trick or ____"
17. Red, blue, or orange
18. Water from the clouds
20. Sound
23. Award for being brave
25. Not light in color
27. In which place
28. Chair
31. Single thing
33. Past tense of eat
35. Country north of the United States

#2. The next activity is silent reading. Please read all four pages very carefully. Pay attention as you read because you will be asked some questions tomorrow. If you have trouble reading any words, just do the best you can.

#3. When you have finished reading the four pages, you may read your library book. Please do not talk to anyone. Thank you.

You may start reading the passage now.

A.01 (continued) - Prereading Component (version B)
with Expanded Puzzle #10

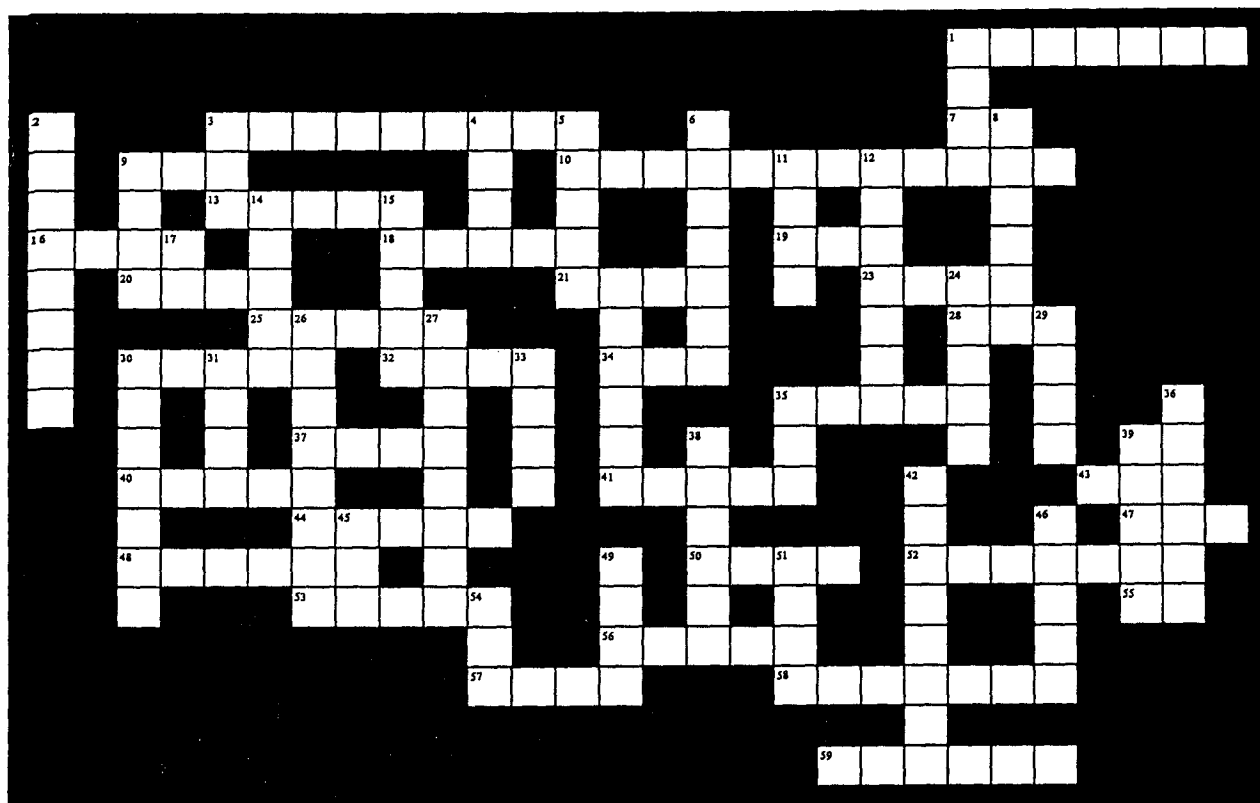
ACTIVITY A

Today you will be given a puzzle to do and some pages to read.

- #1. The crossword puzzle is found on page 2. Some of the answers have been done for you already. The list of words below may be used to answer the crossword puzzle. Not all words will fit in the puzzle. Read the list of answers over first and then do the puzzle on the next page. If you are not able to answer a question, just leave it out. When you have finished this puzzle, turn to page 3.

Puzzle Words

alarm	engines	mystery	sew
angry	free	nation	simple
Asia	forests	neighbor	start
beautiful	glass	nice	steer
beg	grin	noisy	their
boxes	Indian	nose	tiger
British	lambs	note	town
Canada	land	one	trash
Columbia	lazy	peace	turn
clearing	learn	past	used
create	let	pony	vacation
day	lilac	pretend	wool
die	logging	promise	work
drew	mask	rests	youngest
Eastern	meal	say	zoo
encyclopedia	middle	scent	



ACROSS

1. Cutting down trees for wood products
3. Attractive
7. New Mexico (abbreviation)
9. Perish
10. Reference book
13. You drink from this.
16. Not new
18. Possessive form of *they*
19. Animal park
20. Sheep fur
21. Kind
23. Lunch or dinner
25. Irate
28. Permit
30. Amity
32. City
34. 24 hours
35. To guide, as a car
37. Smile
39. "____ be or not to be. That is the question."
40. Garbage
41. Clamorous
43. Type of evergreen tree
44. Containers
47. Precious stone
48. Country
50. Makes a request
52. Produce
53. Relaxes
55. Right (abbreviation)
56. Aroma
57. Labor
58. Motors
59. Country north of the United States

DOWN

1. _____, sea and air
2. Major river in B.C.
3. Plead
4. Release
5. Gain knowledge
6. Enigma
8. Center
9. Sketched
11. Indolent
12. Vow
14. Light purple flower
15. Begin
17. Perform
22. Native American
24. Warning device
26. Person next door
27. Lowest in age
29. Rotate
30. Make believe
31. A continent in the east
33. You smell with this.
35. State orally
36. A lot of trees
38. Captain Hook is one.
39. Large striped cat
42. Rest from work
45. Single
46. Baby sheep
49. Halloween face
51. A toy for a windy day
54. Makes clothes

#2. The next activity is silent reading. Please read all four pages very carefully. Pay attention as you read because you will be asked some questions tomorrow. If you have trouble reading any words, just do the best you can.

#3. When you have finished reading the four pages, you may read your library book. Please do not talk to anyone. Thank you.

You may start reading the passage now.

A.02 - Main Passage Component (version C)



This photograph from the late 1800s shows an Indian woman weaving cedar bark. What might she be making?

These Indians hollow out a cedar log to make a dugout canoe around 1880. Why do you think they used cedar instead of some other kind of wood?

Five-hundred years ago, before Europeans settled in Canada, the native people were using the forests. The Indian tribes on the west coast hollowed out big cedar trees to make dugout canoes. In eastern Canada the Indians made canoes from bark. These birch-bark canoes were not as strong as dugout canoes, but they were much lighter to carry. If they got torn they could be easily patched up with another piece of bark.

The Indians also used the forests for making homes. On the west coast they built sturdy houses, some big enough for several families to live in. Some tribes in Eastern Canada moved around much more. They lived in wigwams made of poles and bark.

Other things were also made from wood. Indians shaped wood into bowls and spoons, paddles and harpoons, snowshoes and toboggans. On the west coast they carved totem poles and wove bark into ropes, baskets and clothing.

Indians used other living things in the forests besides the trees. They got food from the forests- nuts, berries, animals and fish. They made medicines from forest plants. In the east the Indians also collected sap from maple trees.

Even though the Indians used the forests for hundreds of years, they did not use up any of the resource. There were not very many Indians compared to the number of people living in Canada today. They used only what they needed, and the forest could easily replace that small amount. So when explorers from Europe arrived in Canada, the forests looked about the same as they always had.





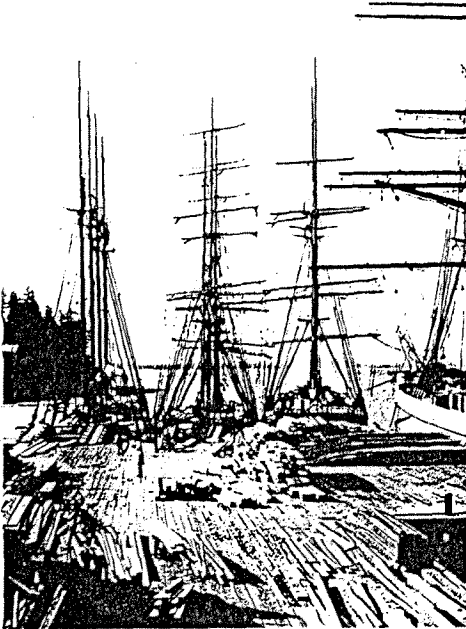
Settlers clear land for farming in Ontario in the early 1800s. How might they have used the wood they cut?

About 200 years ago, during the late 1700s, settlers in eastern Canada were clearing land for farms. To get rid of the trees, they burned down huge areas of forest. The settlers did not think the trees were valuable. Of course, they used some for building their houses and fences, and they burned wood for heat. But most trees were just a nuisance to settlers. The forests were in the way of the plows. So the settlers burned down the trees and started farms on the cleared land. This was the fastest way to settle a new land.

Canadians today spend a great deal of money protecting forests from fires. We look back at what the early settlers did, and today we think it was a terrible waste of good forest land. But we can understand why the early settlers had a different attitude towards the forest. They were in a new land that had more trees than they had ever seen. They could not imagine they would ever run out of trees. But they could imagine going hungry in the winter if they did not plant enough crops! And the forests were in the way.

- Why would clearing land be more difficult for early settlers than it is today?

Lumber is loaded onto ships to be sent to other countries around 1900. What might this lumber be used for?



There was a boom in Canada's forest industry in the early 1800s. Many people worked in **logging**, cutting down the trees. Canada started to sell a lot of **timber** to other countries. Timber from eastern Canada was shipped to Great Britain for making masts and spars.

Masts and spars were used on sailing ships. Before engines were invented, all ships used sails. The sails were held up by tall poles called masts. The poles that went across the top and bottom of the sails were called spars. Eastern Canada had tall, straight trees that were excellent for masts and spars. White pine trees were especially good.

Eventually, sailing ships were replaced by ships with steam engines, and there was no longer a need for Canadian masts and spars. By then, Canada had started selling wood for other uses. For instance, big tree trunks were cut with an axe on all four sides to make them square. These squared timbers were shipped to Great Britain to make buildings.

Without the modern machines used today, logging and **hauling** were a real test of skill and strength. The most dangerous part was floating the logs down the fast-flowing rivers in the spring. Many men died during these **log drives**.

In those days, customers wanted only the best wood - tall, straight timbers that were free of **knots** or cracks. As a result, early loggers took only the best pine trees, and wasted a great deal of other wood. When they made squared timbers, they sometimes discarded more than half the tree on the forest floor. The leftover wood was not worth selling.

- Can you think of any resources that we waste today?

Bit by bit, the best pine forests in eastern Canada disappeared. They were logged faster than they could grow back. Loggers were forced to switch to smaller pines and other kinds of trees. Yet few people thought of planting new trees to replace the ones that were cut. With so much forest in Canada, it was difficult to imagine running out of trees for logging.

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By 1870, loggers had started felling the huge trees of the west coast. Some wood was loaded onto sailing ships and sent to other countries. A lot of wood was needed in Canada, too. The government of Canada was building a railway across the country. Wood was needed for railway ties, stations and bridges, and for bunkhouses for the workers to sleep in.

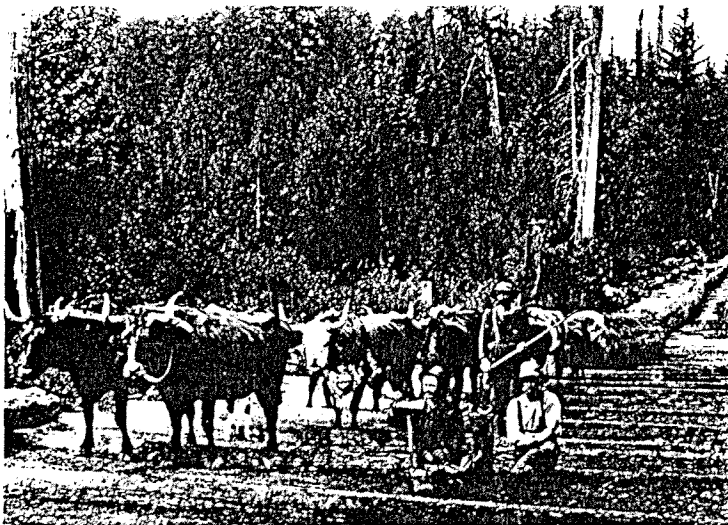
When the railway was finished, settlers from eastern Canada and from other countries moved to the prairies to start farming. They needed wood for fences and buildings. Wood was also needed to build new towns in British Columbia. Miners moved there to look for gold and other minerals.

Forest workers in those days worked long and hard. There were no machines, so all the cutting, hauling and sawing had to be done by hand or with animals. There were no logging trucks, so sometimes the logs were floated down rivers or along the coast to the sawmill. In some places, the logs were chained together and dragged from the forest by teams of oxen.

The person in charge of the bulls was the bull puncher. He was an important man. Usually he was a big fellow with a loud voice. His job was to keep the bulls working. If they moved too slowly, he gave them a prod with a sharp stick called a goad.

The first sawmills in British Columbia were built along the coast. Towns began to grow up around the mills. Some towns continued growing long after the sawmills shut down. They have become modern cities. Vancouver, the largest city in British Columbia, was once a logging town.

In the early days of logging, all work was done by hand. What do you think these loggers are doing?



Teams of oxen, such as this team photographed in the 1890s, were used to haul logs from the forest. Why do you think loggers used oxen instead of some other kind of animal?

A.02 (continued) - Main Passage Component (version D)

How Were Forests Used in the Past?



This photograph from the late 1800s shows an Indian woman weaving cedar bark. What might she be making?

These Indians hollow out a cedar log to make a dugout canoe around 1880. Why do you think they used cedar instead of some other kind of wood?

How the Indians Used the Forests

Five hundred years ago, before Europeans settled in Canada, the native people were using the forests. The Indian tribes on the west coast hollowed out big cedar trees to make dugout canoes. In eastern Canada the Indians made canoes from bark. These birch-bark canoes were not as strong as dugout canoes, but they were much lighter to carry. If they got torn they could be easily patched up with another piece of bark.

The Indians also used the forests for making homes. On the west coast they built sturdy houses, some big enough for several families to live in. Some tribes in Eastern Canada moved around much more. They lived in wigwams made of poles and bark.

Other things were also made from wood. Indians shaped wood into bowls and spoons, paddles and harpoons, snowshoes and toboggans. On the west coast they carved totem poles and wove bark into ropes, baskets and clothing.

Indians used other living things in the forests besides the trees. They got food from the forests- nuts, berries, animals and fish. They made medicines from forest plants. In the east the Indians also collected sap from maple trees.

Even though the Indians used the forests for hundreds of years, they did not use up any of the resource. There were not very many Indians compared to the number of people living in Canada today. They used only what they needed, and the forest could easily replace that small amount. So when explorers from Europe arrived in Canada, the forests looked about the same as they always had.





Clearing the Land

About 200 years ago, during the late 1700s, settlers in eastern Canada were clearing land for farms. To get rid of the trees, they burned down huge areas of forest. The settlers did not think the trees were valuable. Of course, they used some for building their houses and fences, and they burned wood for heat. But most trees were just a nuisance to settlers. The forests were in the way of the plows. So the settlers burned down the trees and started farms on the cleared land. This was the fastest way to settle a new land.

Canadians today spend a great deal of money protecting forests from fires. We look back at what the early settlers did, and today we think it was a terrible waste of good forest land. But we can understand why the early settlers had a different attitude towards the forest. They were in a new land that had more trees than they had ever seen. They could not imagine they would ever run out of trees. But they could imagine going hungry in the winter if they did not plant enough crops! And the forests were in the way.

- Why would clearing land be more difficult for early settlers than it is today?

Settlers clear land for farming in Ontario in the early 1800s. How might they have used the wood they cut?

Logging in Eastern Canada

There was a boom in Canada's forest industry in the early 1800s. Many people worked in **logging**, cutting down the trees. Canada started to sell a lot of **timber** to other countries. Timber from eastern Canada was shipped to Great Britain for making masts and spars.

Masts and spars were used on sailing ships. Before engines were invented, all ships used sails. The sails were held up by tall poles called masts. The poles that went across the top and bottom of the sails were called spars. Eastern Canada had tall, straight trees that were excellent for masts and spars. White pine trees were especially good.

Eventually, sailing ships were replaced by ships with steam engines, and there was no longer a need for Canadian masts and spars. By then, Canada had started selling wood for other uses. For instance, big tree trunks were cut with an axe on all four sides to make them square. These squared timbers were shipped to Great Britain to make buildings.

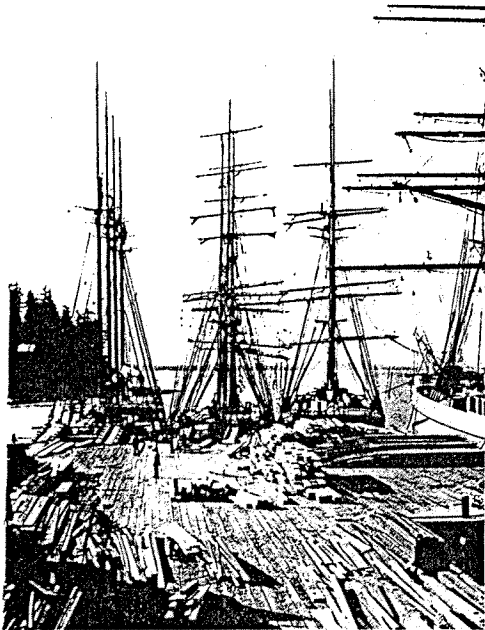
Without the modern machines used today, logging and **hauling** were a real test of skill and strength. The most dangerous part was floating the logs down the fast-flowing rivers in the spring. Many men died during these **log drives**.

In those days, customers wanted only the best wood - tall, straight timbers that were free of **knots** or cracks. As a result, early loggers took only the best pine trees, and wasted a great deal of other wood. When they made squared timbers, they sometimes discarded more than half the tree on the forest floor. The leftover wood was not worth selling.

- Can you think of any resources that we waste today?

Bit by bit, the best pine forests in eastern Canada disappeared. They were logged faster than they could grow back. Loggers were forced to switch to smaller pines and other kinds of trees. Yet few people thought of planting new trees to replace the ones that were cut. With so much forest in Canada, it was difficult to imagine running out of trees for logging.

Lumber is loaded onto ships to be sent to other countries around 1900. What might this lumber be used for?



From EXPLORING CANADA by Vivien Bowers. Copyright © 1985.

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Logging in British Columbia

By 1870, loggers had started felling the huge trees of the west coast. Some wood was loaded onto sailing ships and sent to other countries. A lot of wood was needed in Canada, too. The government of Canada was building a railway across the country. Wood was needed for railway ties, stations and bridges, and for bunkhouses for the workers to sleep in.

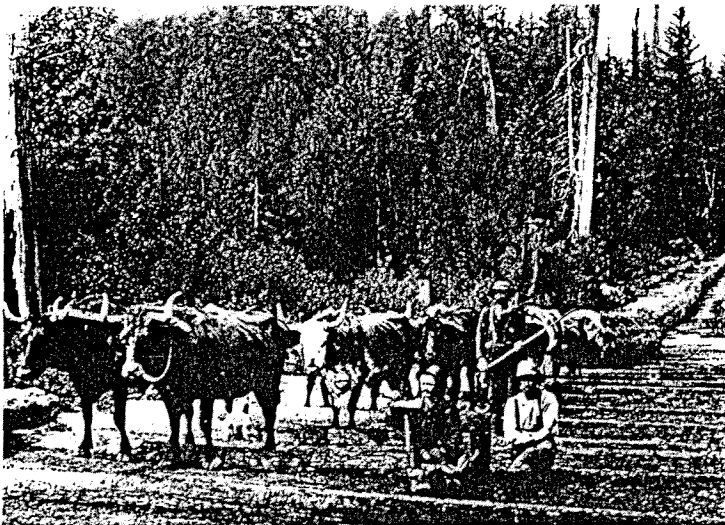
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In the early days of logging, all work was done by hand. What do you think these loggers are doing?



Teams of oxen, such as this team photographed in the 1890s, were used to haul logs from the forest. Why do you think loggers used oxen instead of some other kind of animal?

A.03 - Original Text

[] Indicates where the original text was removed.



This photograph from the late 1800s shows an Indian woman weaving cedar bark. What might she be making?

These Indians hollow out a cedar log to make a dugout canoe around 1880. Why do you think they used cedar instead of some other kind of wood?

How the Indians Used the Forests

Five hundred years ago, before Europeans settled in Canada, the native people were using the forests. The Indian tribes on the west coast hollowed out big cedar trees to make dugout canoes. In eastern Canada the Indians made canoes from bark. These birch-bark canoes were not as strong as dugout canoes, but they were much lighter to carry. If they got torn they could be easily patched up with another piece of bark.

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Clearing the Land

Settlers clear land for farming in Ontario in the early 1800s. How might they have used the wood they cut?

[Now let's go back to the time line. We'll move forward 300 years by skipping 300 rings from the centre of the trunk towards the outside edge. We'll come to a growth ring made] about 200 years ago, during the late 1700s,

A

[At that time] settlers in eastern Canada were clearing land for farms. To get rid of the trees, they burned down huge areas of forest. The settlers did not think the trees were valuable. Of course, they used some for building their houses and fences, and they burned wood for heat. But most trees were just a nuisance to settlers. The forests were in the way of the plows. So the settlers burned down the trees and started farms on the cleared land. This was the fastest way to settle a new land.

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- Why would clearing land be more difficult for early settlers than it is today?

Logging in Eastern Canada

[We'll jump forward another 20 rings on the time line. The growth ring we'll look at would have been made in 1805.]

There was a boom in Canada's forest industry in the early 1800s. Many people worked in **logging**, cutting down the trees. Canada started to sell a lot of **timber** to other countries. Timber from eastern Canada was shipped to Great Britain for making masts and spars.

Masts and spars were used on sailing ships. Before engines were invented, all ships used sails. The sails were held up by tall poles called masts. The poles that went across the top and bottom of the sails were called spars. Eastern Canada had tall, straight trees that were excellent for masts and spars. White pine trees were especially good.

Eventually, sailing ships were replaced by ships with steam engines, and there was no longer a need for Canadian masts and spars. By then, Canada had started selling wood for other uses. For instance, big tree trunks were cut with an axe on all four sides to make them square. These squared timbers were shipped to Great Britain to make buildings.

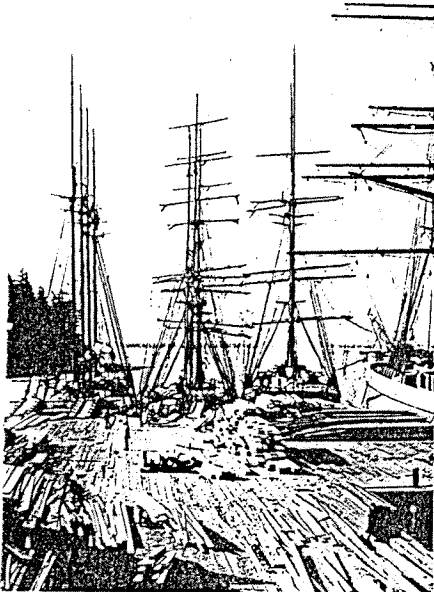
Without the modern machines used today, logging and **hauling** were a real test of skill and strength. The most dangerous part was floating the logs down the fast-flowing rivers in the spring. Many men died during these **log drives**.

In those days, customers wanted only the best wood—tall, straight timbers that were free of **knots** or cracks. As a result, early loggers took only the best pine trees, and wasted a great deal of other wood. When they made squared timbers, they sometimes discarded more than half the tree on the forest floor. The leftover wood was not worth selling.

- Can you think of any resources that we waste today?

Bit by bit, the best pine forests in eastern Canada disappeared. They were logged faster than they could grow back. Loggers were forced to switch to smaller pines and other kinds of trees. Yet few people thought of planting new trees to replace the ones that were cut. With so much forest in Canada, it was difficult to imagine running out of trees for logging.

Lumber is loaded onto ships to be sent to other countries around 1900. What might this lumber be used for?



Logging in British Columbia

[We'll move forward another 65 tree rings on the time line. Let's look at what was happening in British Columbia around 1870.]

By 1870, loggers had started felling the huge trees of the west coast. Some wood was loaded onto sailing ships and sent to other countries. A lot of wood was needed in Canada, too. The government of Canada was building a railway across the country. Wood was needed for railway ties, stations and bridges, and for bunk-houses for the workers to sleep in.

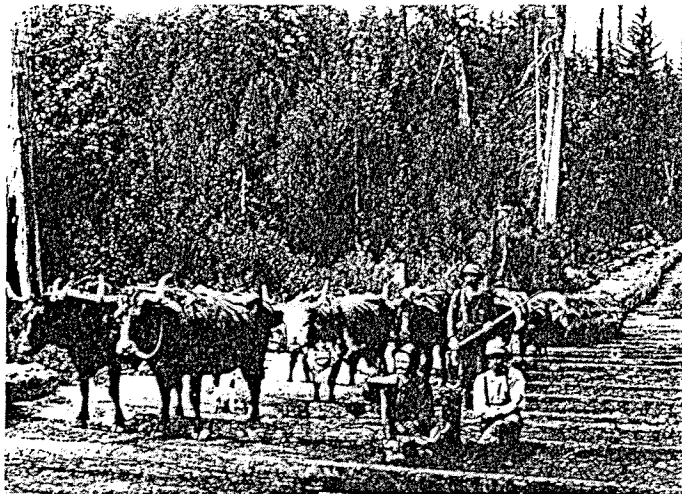
When the railway was finished, settlers from eastern Canada and from other countries moved to the prairies to start farming. They needed wood for fences and buildings. Wood was also needed to build new towns in British Columbia. Miners moved there to look for gold and other minerals.

Forest workers in those days worked long and hard. There were no machines, so all the cutting, hauling and sawing had to be done by hand or with animals. There were no logging trucks, so sometimes the logs were floated down rivers or along the coast to the sawmill. In some places, the logs were chained together and dragged from the forest by teams of oxen.

The person in charge of the bulls was the bull puncher. He was an important man. Usually he was a big fellow with a loud voice. His job was to keep the bulls working. If they moved too slowly, he gave them a prod with a sharp stick called a goad.

The first sawmills in British Columbia were built along the coast. Towns began to grow up around the mills. Some towns continued growing long after the sawmills shut down. They have become modern cities. Vancouver, the largest city in British Columbia, was once a logging town.

In the early days of logging, all work was done by hand. What do you think these loggers are doing?



Teams of oxen, such as this team photographed in the 1890s, were used to haul logs from the forest. Why do you think loggers used oxen instead of some other kind of animal?

APPENDIX B

- B.01 Posttest for Free Recall - Pilot Study #1
- B.02 Scoring Protocols - Pilot Study #1
- B.03 Posttest for Free Recall - Pilot Study #2
- B.04 Posttest for Free Recall - Main Study
- B.05 Results of Pilot Study #1
- B.06 Pilot Study Scoring Comparison
- B.07 New Scoring Protocol

B.01 - Posttest for Free Recall - Pilot Study #1

Research # _____

Time: start _____ finish _____

DIRECTIONS

1. Put your research number on the top of this page. When you are told to begin, record your starting time.
 2. Be sure you have school work or a library book ready to work on when you finish. You will not be allowed to leave your desk while other children are still working.
 3. There are three pages in this booklet. Be sure that you do both Part A and Part B.
 4. When you have finished, record the finishing time.
 5. Please do not talk. Thank you.
-

Part A

Do your best to write down **everything** that you can remember about the forest passage that you read yesterday. Do not worry about spelling. If you need more paper, put up your hand and I will give you some. Be sure to put your research number on any extra pages. After you have written everything you can remember, turn to page 3 and do Part B.

Continue on the next page.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in financial matters. The text suggests that organizations should implement robust systems to track every aspect of their operations, from procurement to sales, to ensure that all data is captured and stored securely.

2. The second part of the document addresses the challenges of data management in a rapidly changing environment. It highlights the need for flexible and scalable solutions that can adapt to new technologies and evolving business requirements. The author argues that organizations must invest in training and development to ensure that their staff are equipped with the skills necessary to manage complex data sets effectively.

3. The third part of the document focuses on the importance of data security and privacy. It discusses the various risks associated with data breaches and the potential consequences for an organization's reputation and financial stability. The text provides a comprehensive overview of best practices for data protection, including the use of encryption, access controls, and regular security audits.

4. The fourth part of the document explores the role of data in decision-making and strategic planning. It argues that data-driven insights are crucial for identifying trends, opportunities, and risks, and for making informed decisions that drive organizational success. The author suggests that organizations should leverage advanced analytics and visualization tools to make sense of large volumes of data and to communicate findings clearly to stakeholders.

5. The fifth part of the document discusses the importance of collaboration and communication in data management. It emphasizes that data is a shared resource and that effective data management requires a culture of transparency and open communication. The text suggests that organizations should establish clear roles and responsibilities for data management and encourage cross-departmental collaboration to ensure that data is used effectively and efficiently.

6. The sixth part of the document provides a summary of the key points discussed and offers some final thoughts on the future of data management. The author concludes that data is a powerful tool for organizations, but it must be managed responsibly and with a focus on security and privacy. The text encourages organizations to continue to invest in data management and to stay up-to-date with the latest trends and technologies in the field.

Part B

- a) What is the most important idea in the forest passage? Write one or two sentences.

- b) There were four major sections in the forest passage. List the main idea of each section. You may put these main ideas in any order.

1.

2.

3.

4.

You are finished now. Please start your school work.

B.02 - Scoring Protocols - Pilot Study #1

How Were Forests Used in the Past?

How the Indians Used the Forests

- _____ Five hundred years ago,
 _____ before Europeans settled in Canada,
 1) _____ the native people were using the forests.
 _____ The Indian tribes on the west coast
 _____ hollowed out big cedar trees
 _____ to make dugout canoes.
 _____ In eastern Canada the Indians
 _____ made canoes
 _____ from bark.
 _____ These birch-bark canoes
 _____ were not as strong as dugout canoes,
 _____ but they were much lighter to carry.
 _____ If they got torn they could be easily patched up
 _____ with another piece of bark.
-
- 2) _____ The Indians also used the forests for making homes.
 _____ On the west coast they built sturdy houses,
 _____ some big enough for several families to live in.
 _____ Some tribes in Eastern Canada moved around much more.
 _____ They lived in wigwams
 _____ made of poles
 _____ and bark.
-
- 3) _____ Other things were also made from wood.
 _____ Indians shaped wood into
 _____ bowls and
 _____ spoons,
 _____ paddles and
 _____ harpoons,
 _____ snowshoes and

- _____ toboggans.
 _____ On the west coast they carved
 _____ totem poles and
 _____ wove bark into
 _____ ropes,
 _____ baskets and
 _____ clothing.

- 4) _____ Indians used other living things in the forests besides the trees.
 _____ They got food from the forests-
 _____ nuts,
 _____ berries,
 _____ animals and
 _____ fish.
 _____ They made medicines
 _____ from forest plants.
 _____ In the east
 _____ the Indians also collected sap
 _____ from maple trees.
-
- _____ Even though the Indians used the forests for hundred of
 years,
 5) _____ they did not use up any of the resource.
 _____ There were not very many Indians
 _____ compared to the number of people living in
 Canada today.
 _____ They used only what they needed, and
 _____ the forest could easily replace that small amount.
 _____ So when explorers from Europe arrived in
 Canada,
 _____ the forests looked about the same as they always had.

Clearing the Land

- _____ About 200 years ago,
 _____ during the late 1700s,
 6) _____ settlers in eastern Canada were clearing the land
 _____ for farms.
 _____ To get rid of the trees,
 _____ they burned down huge areas of forest.
 _____ The settlers did not think the trees were valuable.
 _____ Of course, they used some for building their
 _____ houses and
 _____ fences, and
 _____ they burned wood
 _____ for heat.
 _____ But most trees were just a nuisance
 _____ to settlers.
 _____ The forests were in the way
 _____ of the plows.
 _____ So the settlers burned down the trees and
 _____ started farms
 _____ on the cleared land.
 _____ This was the fastest way to settle a new land.
-
- _____ Canadians today spend a great deal of money protecting
 forests
 _____ from fires.
 _____ We look back at what the early settlers did, and
 _____ today we think it was a terrible waste
 _____ of good forest land.
 _____ But we can understand why
 7) _____ the early settlers had a different attitude towards the forest.
 _____ They were in a new land
 _____ that had more trees than they had ever seen.

- _____ They could not imagine
 _____ they would ever run out of trees.
 _____ But they could imagine
 _____ going hungry in the winter
 _____ if they did not plant enough crops!
 _____ And the forests were in the way.

Logging in Eastern Canada

- 8) _____ There was a boom in Canada's forest industry
 _____ in the early 1800s.
 _____ Many people worked in logging,
 _____ cutting down trees.
 _____ Canada started to sell a lot of timber
 _____ to other countries.
 _____ Timber from eastern Canada was shipped
 _____ to Great Britain
 _____ for making masts and spars.
-
- 9) _____ Masts and spars were used
 _____ on sailing ships.
 _____ Before engines were invented,
 _____ all ships used sails.
 _____ The sails were held up by tall poles
 _____ called spars.
 _____ Eastern Canada had tall, straight trees
 _____ that were excellent for masts and spars.
 _____ White pine trees were especially good.
-
- _____ Eventually,
 _____ sailing ships were replaced by
 _____ ships with steam engines, and
 _____ there was no longer a need for Canadian masts
 and
 _____ spars.
- 10) _____ By then, Canada had started selling wood for other uses.

- _____ For instance, big tree trunks were cut with an axe
 _____ on all four sides
 _____ to make them square.
 _____ These squared timbers were shipped
 _____ to Great Britain
 _____ to make buildings.
-
- 11) _____ Without the modern machines used today,
 _____ logging and hauling were a real test
 _____ of skill and
 _____ strength.
 _____ The most dangerous part was floating the logs
 _____ down the fast-flowing rivers
 _____ in the spring.
 _____ Many men died
 _____ during these log drives.
-
- 12) _____ In those days,
 _____ customers wanted only the best wood -
 _____ tall,
 _____ straight timbers that were
 _____ free of knots
 _____ or cracks.
 _____ As a result, early loggers took
 _____ only the best pine trees, and
 _____ wasted
 _____ a great deal of other wood.
 _____ When they made squared timbers,
 _____ they sometimes discarded more than half the tree
 _____ on the forest floor.
 _____ The leftover wood was not worth selling.
-
- 13) _____ Can you think of any resources that we waste today? <-----

- _____ Bit by bit,
 14) _____ the best pine forests
 _____ in eastern Canada
 disappeared.
 _____ They were logged faster
 _____ than they could grow back.
 _____ Loggers were forced to switch
 _____ to smaller pines and
 _____ other kinds of trees.
 _____ Yet few people thought of planting new trees
 _____ to replace the ones that were cut.
 _____ With so much forest in Canada,
 _____ it was difficult to imagine running out of trees
 _____ for logging.

_____ Logging in British Columbia

- _____ By 1870,
 15) _____ loggers had started felling the huge trees
 _____ of the west coast.
 _____ Some wood was loaded
 _____ onto sailing ships and
 _____ sent to other countries.
 _____ A lot of wood was needed
 _____ in Canada, too.
 _____ The government of Canada was building
 _____ a railway
 _____ across the country.
 _____ Wood was needed for
 _____ railway ties,
 _____ stations and
 _____ bridges, and for
 _____ bunkhouses for the workers to sleep in.

- 16) _____ (Wood was needed for other purposes.)
 _____ When the railway was finished,
 _____ settlers
 _____ from eastern Canada and
 _____ from other countries
 _____ moved to the prairies
 _____ to start farming.
 _____ They needed wood for
 _____ fences and
 _____ buildings.
 _____ Wood was also needed to build new towns
 _____ in British Columbia.
 _____ Miners moved there
 _____ to look for gold and
 _____ other minerals.

- 17) _____ Forest workers in those days worked
 _____ long and
 _____ hard.
 _____ There were no machines,
 _____ so all the cutting,
 _____ hauling and
 _____ sawing had to be done
 _____ by hand or
 _____ with animals.
 _____ There were no logging trucks,
 _____ so sometimes the logs were floated
 _____ down rivers or
 _____ along the coast
 _____ to the sawmill.
 _____ In some places,
 _____ the logs were chained together and
 _____ dragged
 _____ from the forest

_____ by teams of oxen.

- 18) _____ The person in charge of the bulls was the bull puncher.
 _____ He was an important man.
 _____ Usually he was
 _____ a big fellow
 _____ with a loud voice.
 _____ His job was to keep the bulls working.
 _____ If they moved too slowly,
 _____ he gave them a prod
 _____ with a sharp stick
 _____ called a goad.

- _____ The first sawmills
 _____ in British Columbia were built
 _____ along the coast.
 19) _____ Towns began to grow up around the mills.
 _____ Some towns continued growing
 _____ long after the sawmills shut down.
 _____ They have become modern cities.
 _____ Vancouver,
 _____ the largest city in British Columbia,
 _____ was once a logging town.

B.03 - Posttest for Free Recall - Pilot Study #2

Research # _____

Time: start _____ finish _____

DIRECTIONS

1. Put your research number on the top of this page. When you are told to begin, record your starting time.
2. Be sure you have school work or a library book ready to work on when you finish. You will not be allowed to leave your desk while other children are still working.
3. There are three pages in this booklet. Be sure that you do both Part A and Part B.
4. When you have finished, record the finishing time, and then read your library book or start your school work quietly.
5. Please do not talk. Thank you.

Part A

Do your best to write down **everything** that you can remember about the forest passage that you read yesterday. Do not worry about spelling. If you need more paper, put up your hand and I will give you some. Be sure to put your research number on any extra pages. After you have written everything you can remember, turn to page 3 and do Part B.

Continue on the next page.

Part B

- a) What is the overall theme that the authors are trying to express in the forest passage?

- b) There were four major sections in the forest passage. List the topic or main idea of each section. You may put these topics or main ideas in any order.

1.

2.

3.

4.

You are finished now. Please read your library book or
start your school work. Do not leave your seat or talk.

B.04 - Posttest for Free Recall - Main Study

Research # _____

DIRECTIONS

1. Put your research number on the top of this page.
 2. Be sure you have school work ready to work on and a library book to read when you finish. You will not be allowed to leave your desk while other children are still working. Raise your hand and wait for the researcher to come to your desk if you have a problem.
 3. There are three pages in this booklet. Be sure that you do both Part A and Part B.
 4. When you have finished, turn your booklet upside down and read your library book or start your school work quietly.
 5. Please do not talk. Thank you.
-

Part A

Do your best to write down **everything** that you can remember about the forest passage that you read yesterday. Do not worry about spelling. If you need more paper, put up your hand and I will give you some. Be sure to put your research number on any extra pages. After you have written everything you can remember, turn to page 3 and do Part B.

Continue on the next page.

Part B

- a) You have just written as much as you can remember about the four page passage that you read yesterday. When you were reading, did you notice that the authors divided their information up into four sections? I would like you to tell me in a phrase or sentence what each section was all about. You may put these four main ideas in any order.

1. _____

2. _____

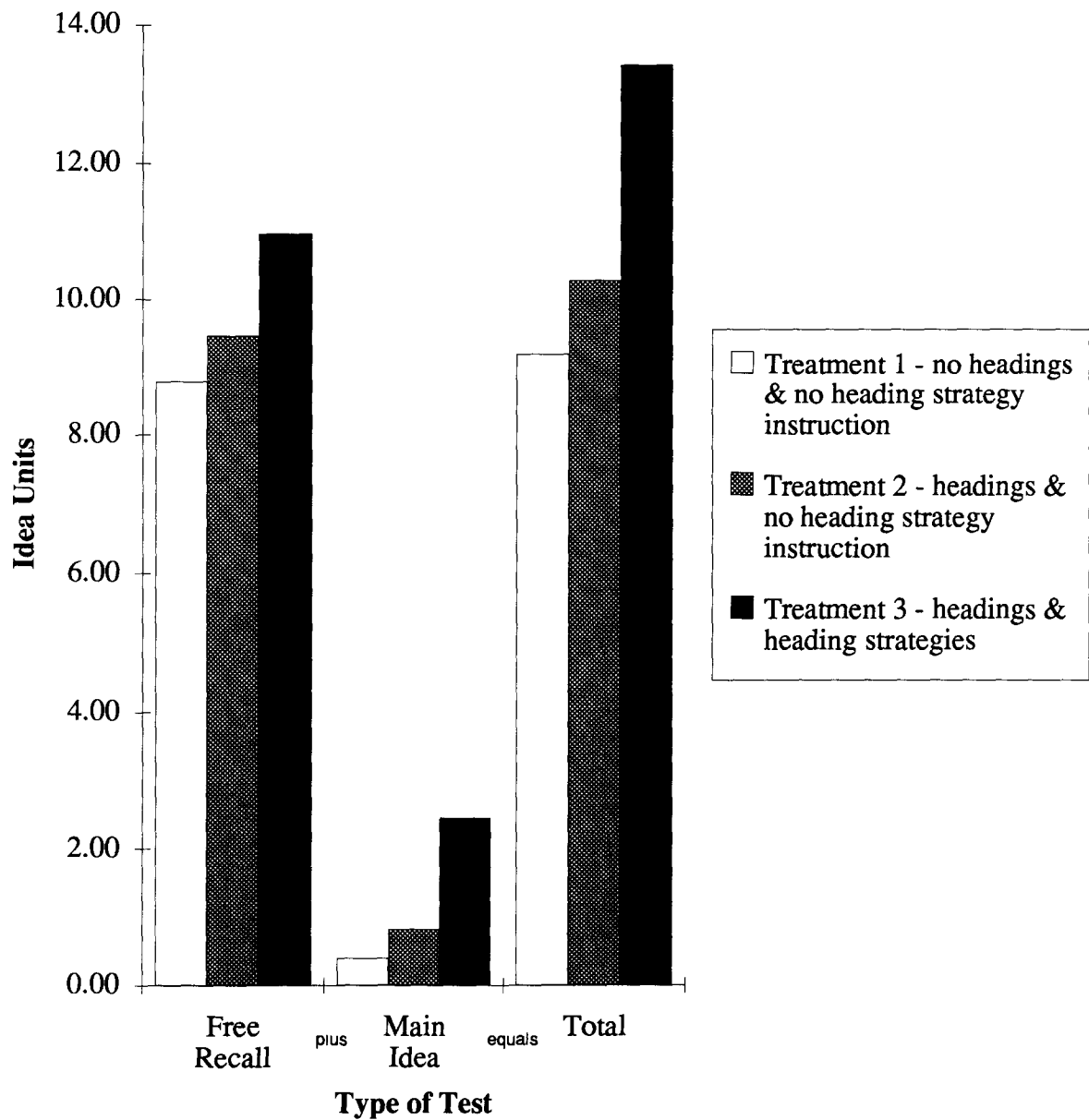
3. _____

4. _____

- b) Now you have written a main idea for each section. Your next task is to write one phrase or sentence that tells what the whole passage is all about. This sentence should summarize the main ideas of the four sections that you have listed above.

You are finished now. Please read your library book or start your school work. Do not leave your seat or talk.

HEADING EFFECTS ON FIFTH GRADE RECALL OF EXPOSITORY PROSE WITH AND WITHOUT STRATEGY AWARENESS



B.06 - Pilot Study Scoring Comparison

	PILOT STUDY SCORING COMPARISON							
Research	Old Scoring System				New Scoring System			
Number	Main	Sub	Sub-sub	Total	Main	Sub	Sub-sub	Total
1	3.75	8.5	7.5	19.75	8.5	5.25	7.5	21.25
2	0.5	3.25	1.75	5.5	3.25	5	3.5	11.75
3	0	1.5	3	4.5	0.25	3.25	5	8.5
4	1.75	6.5	4.75	13	2.25	8.5	2	12.75
5	1.75	8	4	13.75	5.5	6.75	2.5	14.75
6	4	1.25	1	6.25	9	0	1	10
7	1	12	10	23	4	9.75	10.5	24.25
8	1.5	2	2	5.5	6	2.5	2	10.5
9-Abs.	-	-	-	-	-	-	-	-
10	2	3.5	2	7.5	4.5	3.75	0.5	8.75
11	1.5	9.25	5.75	16.5	2.75	10.5	2.25	15.5
12	0	2.75	1.5	4.25	1.25	3	1.75	6
13-NC	-	-	-	-	-	-	-	-
14	0.5	7	8	15.5	2.25	8.75	7.25	18.25
15	1.5	3	1	5.5	3.5	1	0.5	5
16	1	7.5	4.5	13	7.25	5	4	16.25
17	0.75	8	4	12.75	5.5	7.5	4	17
18	2.25	5	4.25	11.5	3	6.5	3	12.5
19	1	0.5	1	2.5	3	1.25	0	4.25
20	0.25	3	1	4.25	2	2	1	5
21	1	4.25	1	6.25	2.5	5.25	1.5	9.25
22	1	3.5	0.5	5	3.75	5.25	1	10
23	0.25	6.5	1.5	8.25	5.75	3.5	2.5	11.75
24	0	0	0	0	0	0	0	0
25	1.5	8	5	14.5	5.25	11	4.5	20.75
26	2.5	25.5	16	44	9.5	23.5	11.25	44.25
Grand Totals	31.25	140.3	91	262.5	100.5	138.8	79	318.3

B.07 - New Scoring Protocol

Research # _____

How forests were used in the past

Passage Total

m

s

ss

total

nuts
berries
animals
fish

foods

medicines

from forest plants

in the east

maple trees

collected sap

(as a result)
when explorers from Europe
arrived in Canada, forests looked
the same as they always had

not many Indians

(why?)

only used what
they needed

they did not use up
the resource

forests could
easily replace
what was used

over
hundreds of
years

(wisely)

500 years ago

(time)

before
Europeans
settled in
Canada

used other living
things besides
trees

How the Indians Used the Forests

Native people or The Indians used the forests
in a number of ways

other things
were made of
wood

West Coast

bark

wove

carved

shaping wood

ropes

baskets

clothing

hats

woman

totem poles

bowls

spoons

paddles

harpoons

snowshoes

toboggans

made of poles
and bark

(don't move
around much)

some big enough for
several families to live in

strong
or
sturdy homes

West Coast

lived in
wigwams

some tribes moved
around much more

Eastern Canada

to make
homes

Eastern Canada

made bark canoes

Eastern Canada
Indians

(from trees)

birch
trees

(advantages/disadvantages)

could be easily
patched

lighter to carry

not as
strong/tear

stronger

heavier to
carry

(advantages/disadvantages)

big

hollowed
out

(from trees)

made dugout
canoes

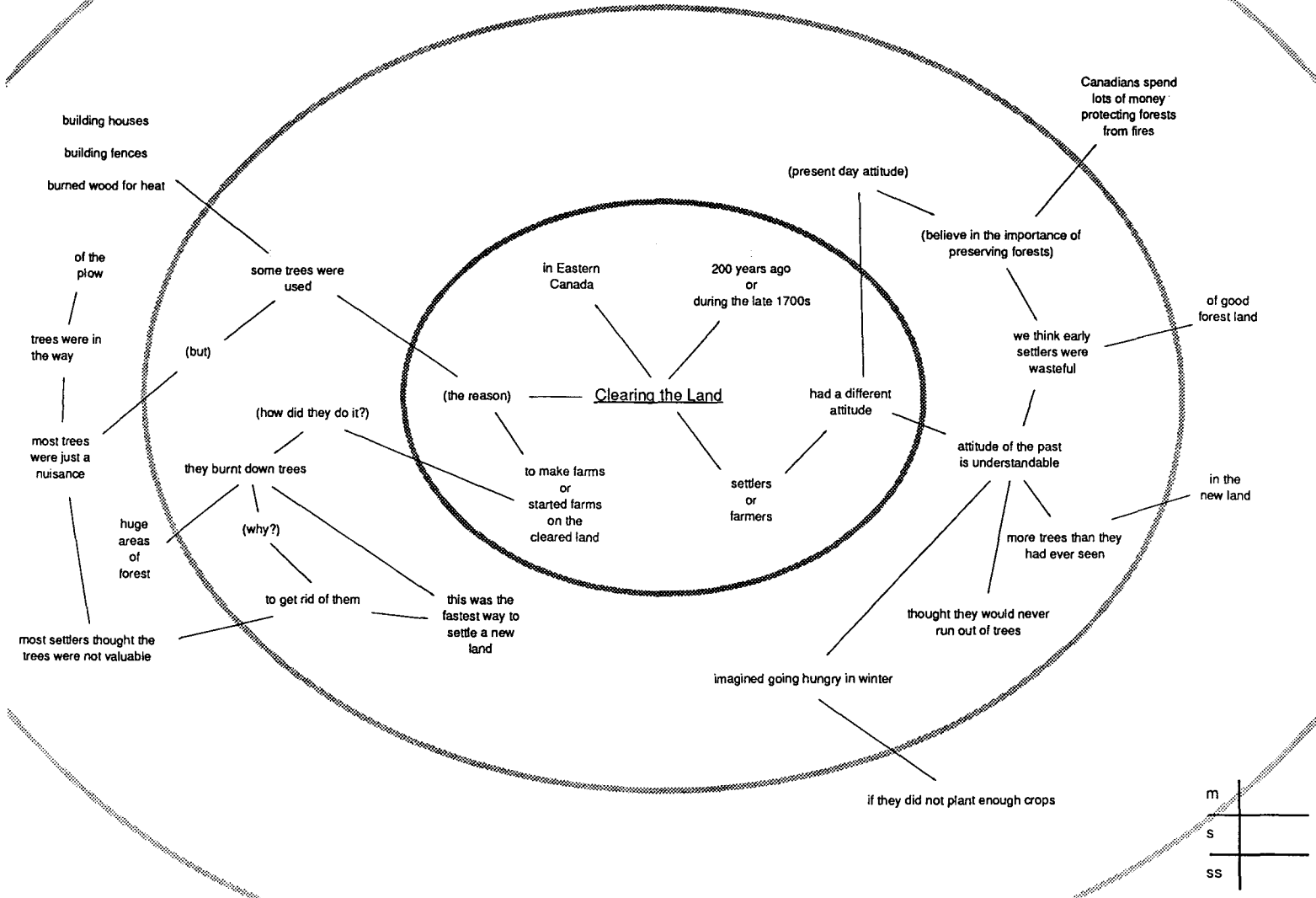
West Coast
Indians

to make
canoes

Research # _____

Settlers clear land for farming
in Ontario in the early 1800s

How might they have used the
wood they cut?



m
s
ss

APPENDIX C

C.01 Letters to Publishers and Responses

C.01 - Letters to Publishers and Responses

THE UNIVERSITY OF BRITISH COLUMBIA



Department of Language Education
2125 Main Mall
Vancouver, B.C. Canada V6T 1Z4
Tel: (604) 822-5788
Fax: (604) 822-3154

January 16, 1992

Nelson, Canada
1120 Birch Mount Road
Scarborough, Ontario
M1K 5G4

Dear Permissions Department Staff:

I understand that Nelson, Canada has bought the copyright for the Grade 5 Social Studies textbook, Exploring Canada: Learning from the Past, Looking to the Future, which Douglas & McIntyre (Educational) Ltd. published in 1985. I am writing you to ask for permission to duplicate and distribute a few pages from this text.

I am researching the topic of **Heading Strategy Instruction** for my thesis at the University of British Columbia. This textbook is ideal for my purposes because it uses headings and subheadings and is a prescribed textbook for British Columbia students. I would like permission to type out a 4 page passage (pages 34-37 or a similar four page passage) and duplicate it to be used in my research study with 180 students from three school districts. I will clearly label the passage as an excerpt, listing the book's title, authors, publisher and new copyright owner.

I would greatly appreciate it if you could give me written permission to use this or a similar 4 page section of your company's textbook in my research. If you have any further questions, I can be reached by collect call at (604) 524-1694. If you wish to confirm this research with the University, my thesis advisor is Dr. Florence Pieronek from the Department of Language Education and she can be reached at the following phone number: (604) 822-5338. Both Dr. Pieronek and I can be reached by mail or fax as listed above.

Thank you for your consideration.

Sincerely,

Carole Hobbins
Graduate Student
8778

Dr. Florence Pieronek
Thesis Advisor

Nelson Canada

75 Years "A Continuing
Contribution to Canadian
Education 1914 - 1989"

February 4, 1992

Ms. Carole Hobbins
Graduate Student
University of British Columbia
Dept. of Language Education
2125 Main Mall
Vancouver, BC V6T 1Z4



Dear Ms. Hobbins:

Thank you for your letter of January 16, 1992 requesting permission to use an excerpt from Exploring Canada: Learning from the Past, Looking to the Future by Vivian Bowers as part of your research study .

NELSON CANADA is pleased to grant you permission to do so. No fee is required.

However, we would appreciate the following acknowledgement to appear:

From EXPLORING CANADA by Vivan Bowers. Copyright © 1985.
Used by permission of NELSON CANADA, A Division of Thomson
Canada Limited.

Sincerely,

Sandra Mark
Permissions Editor

Nelson Canada
A Division of Thomson Canada Limited
1120 Birchmount Road, Scarborough, Ontario, M1K 5G4 (416) 752-9100 Fax: (416) 752-9646

THE UNIVERSITY OF BRITISH COLUMBIA



Department of Language Education
2125 Main Mall
Vancouver, B.C. Canada V6T 1Z4
Tel: (604) 822-5788
Fax: (604) 822-3154

December 13, 1991

Dear Ms. Saeko Usakawa:

I am writing you to ask for permission to duplicate and distribute a few pages from the Grade 5 Social Studies textbook, Exploring Canada: Learning from the Past, Looking to the Future, which Douglas & McIntyre (Educational) Ltd. published in 1985. I am researching the topic of *Heading Strategy Instruction* for my thesis at the University of British Columbia. Your Company's textbook is ideal for my purpose because it uses headings and subheadings and is a prescribed textbook for British Columbia students. I would like permission to type out a 4-page passage (pages 34-37) and duplicate it to be used in my research study with 180 students from two school districts. I will clearly label the passage as an excerpt, listing the book's title, authors and publisher.

I would greatly appreciate it if you could give me written permission to use this section of your company's textbook in my research. If you have any further questions, I can be reached at 524-1694. If you wish to confirm this research with the University, my thesis advisor is Dr. Florence Pieronek. She is in the Department of Language Education and she can be reached at the following phone number: (604) 822-5338.

Thank you for your consideration.

Sincerely,

Carol Hobbins
Graduate Student
8778

Dr. Florence Pieronek,
Thesis Advisor.
/gv