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TITLE OF THESIS/TITRE DE LA THÈSE A Comparison of High and Low
Grade Four Readers on Their Use of
the Logical Connective Because

UNIVERSITY/UNIVERSITÉ University of Alberta

DEGREE FOR WHICH THESIS WAS PRESENTED/
GRADE POUR LEQUEL CETTE THÈSE FUT PRÉSENTÉE M.F.D.

YEAR THIS DEGREE CONFERRED/ANNÉE D'OBTENTION DE CE GRADE 1979

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THE UNIVERSITY OF ALBERTA

A Comparison of High and Low Grade Four
Readers on Their Use of the Logical Connective Because

by

Charlotte S. Zinn



A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF EDUCATION

DEPARTMENT OF ELEMENTARY EDUCATION

EDMONTON, ALBERTA

FALL, 1979

THE UNIVERSITY OF ALBERTA
FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "A Comparison of High and Low Grade Four Readers on Their Use of the Logical Connective Because" submitted by Charlotte S. Zinn in partial fulfilment of the requirements for the degree of Master of Education.

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ABSTRACT

This study compared high and low reading achievement groups on their use of causal connectives. Answers to questions and unaided recalls were analyzed in order to determine the effect of the presence or absence of causal connectives on reading comprehension.

Thirty-two grade four students were selected from five urban elementary schools. Subjects were chosen for the study on the basis of the comprehension scores on the Gates-MacGinitie Reading Test, Primary C, Form 2 (1968), and the nonverbal scores of the Canadian Lorge-Thorndike Intelligence Test, Form 1 (1967). Subjects formed two equal groups, a low achievement group and a high achievement group.

Two test passages were constructed and each subject was presented with the two passages, one with the causal connectives present and the other with these connectives absent. Following silent reading of each passage, the student was requested to give an oral recall. Also, questions were asked to probe comprehension of causal relationships. Subjects' responses were tape-recorded and later transcribed. Recalls were divided into basic structures (Fagan, 1978), and then each basic structure was categorized using Furniss' (1978) adaptation of Drum and Lantaff's system. Responses were also examined for causal connectives which had been stated by each subject.

The statistical analysis of the data included t-tests for dependent and independent means.

Findings indicated that there were insignificant differences in comprehension within the achievement groups on passages with connectives present and connectives absent. There were some significant differences between achievement groups, rather than the number of comprehension questions answered correctly. On passages with causal connectives present, the low group produced more hesitations, repetitions and other holding devices than did the high group. On passages without causal connectives, the high group produced more text specific information than the low group, and the low group produced more text evoked information (faulty inferences, erroneous responses etc.) than the high group. In addition, more causal connectives were spontaneously produced on the recalls of subjects in the high group than the low group on passages with causal connectives present.

It was concluded that logical connectives do have an effect on the processes involved in comprehension. Implications for classroom teachers and clinicians were included, as well as suggestions for further research.

ACKNOWLEDGMENTS

I am indebted to the following people who assisted and supported me during the course of this study.

Dr. Grace Malicky, my supervisor, who was always patient and supportative. I am deeply grateful for her guidance.

Dr. Frances MacCannell and Dr. Carolyn Yewchuk, the members of my examining committee. Their interest and careful reading of the study was beneficial.

Sheri McLean and Barb Shokal for the typing of this thesis.

My parents who have always encouraged and supported my endeavors.

Glen and Jack for their encouragement and support.

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CHAPTER I

The Problem

Comprehension is the very heart of the reading act. There is no use in reading unless one understands the meanings. ...We must find out how better to use the content of reading in developing ability to think in depth. (Smith, 1977, p.38).

Comprehension is seen as the main goal of reading by many researchers and theorists (Smith, 1963; Goodman, 1972; Smith, 1975). It is recognized by those people involved in teaching students to read that comprehension is the ultimate goal (Goodman, 1972). However, what is necessary is the identification of the processes involved in comprehension.

Smith and Barrett (1974) have developed a taxonomy of skills necessary for comprehension. They have included the following categories of skills: literal recognition or recall, inference, evaluation, and appreciation. Jenkinson (1973) includes construction, interpretation, and evaluation of meaning as being crucial to the comprehension process. Some researchers (Davis, 1968; Holmes, 1970; and Singer, 1970) see comprehension as a hierarchy of sub-skills.

Although the skills necessary for comprehension have been explored, another factor important in comprehension is knowledge of language structures. Often students are presented with readers and other textbooks which require a knowledge of complex language structures. It is often assumed that if the text is issued for a specific grade level then a child at that level will be able to comprehend the language structures contained within the book. Crucial to comprehension is understanding of relationships among ideas. Several comprehension

materials appear to reflect the belief that inclusion of connectives helps to foster greater understanding of these relationships, e.g.

Croft Skillpacks and BFA Comprehension Skills kits. As a student reads it is expected that understanding of the relationships between the ideas is achieved through understanding of the logical connective. Thus, there is a need for an investigation to determine if the use of logical connectives has an effect on the processes involved in comprehension.

The Semantic Potential Theory of Language (Fagan, 1978) provides one way of describing the kinds of information that can be used by the readers to reconstruct meaning from written language. Fagan groups linguistic information into three categories: denotational, relational and text relational which includes logical connectives.

Several studies have been carried out to measure understanding of connectives (Robertson, 1968; Stoodt, 1972; Corrigan, 1975; Lawton, 1977). These studies involved subjects in elementary grades. Other studies have been completed using older subjects (Bernstein, 1971; Neilsen and Braun, 1978; Marshall and Glock, 1978). This study will attempt to determine differences between high and low readers at the elementary level in their use of logical connectives to aid comprehension. In addition, most studies completed to this time have considered the effect of connectives on the number of comprehension questions correctly answered. This study will endeavor to consider differences in the nature or quality of comprehension as well as the quantity of questions answered. As a final difference this study will focus on one specific connective used to signal causal relations, "because".

Purposes of the Study

The major purpose of this study is to compare high and low grade four readers on their use of logical connectives on passages with logical connectives present and those with logical connectives removed. The study will compare readers on both the number of questions answered correctly and on quality of comprehension. Students will be asked to recall as much from each story as they can and these unaided recalls will be divided into basic structures which will be categorized according to Furniss's (1978) categories (text specific, text entailed, text evoked, and text external). The number of units in each category will be compared for both high and low readers. As well, there will be a comparison between reading groups for the number of logical connectives used in oral recalls.

The logical text relation involved in this study is that of causality. Fagan (1979, p. 1) describes causal connectives as those which "express the relation of cause and effect or the relation between certain regularly correlated events". For example, these words imply causality "causes", "because", "as a result of", "thus", "therefore", "that", "as". This study deals with only one of these causal connectives, "because".

Definition of Terms

The following terms used in this study are defined as follows:

Basic Structures

These structures include both basic and alternate t-units. The basic t-unit is the simplest independent predication which may be used to convey information. Alternate syntactic structures have a basic t-unit make up and with the addition or substitution of words can become

a basic t-unit (Fagan, 1978).

High Reading Achievement Group

Those grade four students who achieved at or above the 70th percentile on the Gates-MacGinitie Reading Test.

Low Reading Achievement Group

Those grade four students who achieved at or below the 30th percentile on the Gates-MacGinitie Reading Test.

Causal Connective

Those connectives which signal either a physical or an explanatory causal relationship. In a physical relationship the first event is sufficient for the occurrence of the second. e.g. The car stopped because it ran out of gas. An example of an explanatory relationship is: John did not do his homework, because he is lazy (Pearson and Johnson, 1978).

Hypotheses

The following null hypotheses were formulated and investigated.

Hypothesis 1

There will be no significant difference in the performance of the high reading group on the passage with connectives and the passage with the connectives removed for:

- a) the number of basic structures produced in each recall category
 - i) text specific
 - ii) text entailed
 - iii) text evoked
 - iv) text external
- b) the number of logical connectives produced in the recall
- c) the number of questions answered correctly

Hypothesis 2

There will be no significant difference in the performance of the low reading group in the passage with connectives and the passage with the connectives removed for:

- a) the number of basic structures produced in each recall category
 - i) text specific
 - ii) text entailed
 - iii) text evoked
 - iv) text external
- b) the number of logical connectives produced in the recall
- c) the number of questions answered correctly

Hypothesis 3

There will be no significant difference between the low and high reading achievement groups on the passage with the logical connectives present for:

- a) the number of basic structures produced in each recall category
 - i) text specific
 - ii) text entailed
 - iii) text evoked
 - iv) text external
- b) the number of logical connectives produced in the recall
- c) the number of questions answered correctly

Hypothesis 4

There will be no significant difference between the low and high reading achievement groups on the passage with the logical connectives absent for:

- a) the number of basic structures produced in each recall category
 - i) text specific
 - ii) text entailed
 - iii) text evoked
 - iv) text external

- b) the number of logical connectives recalled
- c) the number of questions answered correctly

Significance of the Study

The Semantic Potential Theory of Language provides a theoretical base for describing language. According to this theory, language contains the potential for the construction of meaning. This study focuses on how readers make use of the informational cues included in the theory, and will provide information on how causal connectives are used in the comprehension process. As well the results will have implications for teachers and the way they teach comprehension of causal relations. It is hoped that this study will also provide direction for people involved in the sphere of production and selection of instructional materials.

Limitations of the Study

1. Oral recalls do not provide direct access to processes which occur during comprehension, and care must be taken in making inferences about comprehension from this data.
2. When students are giving oral recalls, it is possible that they may recall the relationship but do not explicitly state the connective.
3. The subjects used in this study may have been in an unfamiliar reading situation. They may have been unaccustomed to giving an unaided recall following the reading of a passage. Also, the use of a tape recorder and the presence of the researcher may have placed the subjects in an unfamiliar reading situation.

Plan of the Investigation

The investigation is reported according to the following plan. A review of literature relevant to this study will be presented in Chapter II. Chapter III will describe the experimental design. Analysis and discussion of the data will appear in Chapter IV. Chapter V will present a summary of the study, conclusions, implications for instruction, and suggestions for further research.

CHAPTER II

Background of the Study

Introduction

This chapter is designed to examine the theoretical framework upon which the study is based. The Semantic Potential Theory of Language (Fagan, 1978) is the theoretical basis which is considered. Following this, research on logical connectives will be reviewed in two sections, oral and written language. Finally, the chapter will consider the system used in this study for analyzing unaided recalls.

Theoretical Base of Study

In the past, language has been considered by linguists in terms of phonology, syntax, and semantics. These three components are often examined separately. However, as Fagan (1978) points out "When a person speaks, he automatically draws on information from all language components" (p. 1). His Semantic Potential Theory of Language (SPTL) is an attempt to provide information on the oral code within the communication framework.

The Semantic Potential Theory of Language provides a way of describing various kinds of information that can be used by the reader to reconstruct meaning from written language. It also provides a description of the linguistic information contained in language. The final form of language is called an utterance which can be either verbal or in the written form. Meaning is not in the printed words and syntax of the utterance but is reconstructed by the reader who

interprets cues contained in the printed words. The reader uses his background knowledge to reconstruct the meaning.

The communication message may be influenced by participants and role relationships as well as the nature of the communication task. The current state of the speaker's mind is divided into three areas: 1) knowledge, general and specific which refers to the speaker's background information brought to the communication situation, 2) affective disposition and intentions, the speaker's emotional state at the time of the utterance, and 3) available linguistic knowledge which is the type of information conveyed in the utterance. Within the area of linguistic information three divisions occur; the intended message, motor plans and production, and linguistic information. Intended message refers to the purpose of the message while motor plans and production refers to the mazes or pauses, repeats or corrections which occur in communication.

Linguistic information can be examined under three types of information: relational, denotational, and text. Relational information refers to several functional roles that words may have eg. subject, verb, direct - object, etc. Denotational information refers to the units within a syntactic form established through the lexical items. Text information refers to the relationships within and across propositions. Such relationships may include referential (pronouns, synonym, class inclusion, etc.) or logical (spatial, conditional, conjunction, etc.).

The SPTL has been used as the theoretical base for studies on oral (Fagan, 1978) and written language (Adams, 1979; Forster, 1978);

and has been found useful in defining variables which differentiate oral and written language samples. The theory was used in this study to define the aspect of written language to be systematically varied, and to organize recall protocols into units for analysis.

Causal Connectives and Oral Language

This study focuses on the effect of causal connectives on reading comprehension. The following section will review studies on the development of use of causal connectives in oral language.

The study of the growth of verbal reasoning and children's use of language was examined by Piaget ([1924] 1969). He stated that the connective "because" is used by children in the following ways:

- a) Prelogical relations are of two types: the first type has clauses which are randomly juxtaposed and joins two clauses which do not have an explicit relationship; the second type, a psychological relation, has two clauses joined by "because" in which one clause describes an action and one motivation.
- b) Causal relations use "because" to connect two events where one event is brought about by the other.
- c) Logical relations have two ideas or judgments connected so that the clauses describe the logical relation of implication (p. 195).

He concluded that causal explanation begins at about seven or eight years and logical justification develops at a later time.

Based on Piaget's work several studies have evolved. Roberta Corrigan (1975) investigated how children use and understand the connective "because". She set out to establish the sequence of the usage of the three types of "because", to determine if understanding of

"because" precedes its usage, and to control syntax so that differences were cognitive rather than syntactic. In her study, Piaget's broad statements about the use of "because" were narrowed so that the categories were mutually exclusive. Causal relations connecting physical phenomena were labeled physical; psychological relations connecting affective states with physical events were labeled affective; and logical relations connecting ideas or judgments, as in the difference between being alive and being dead, were labeled concrete logical. Her subject's ages ranged from 2.5 to 7.5 years. Three usage, three comprehension, and three reversal tasks were designed each of which consisted of three items from the three categories. Corrigan's results indicate that age was a significant factor in that there was a direct relationship between the scores and chronological age. It was found that items in the affective category were easier than other items because of egocentrism in the young children. Affective states were more related to experience than physical phenomena. The children aged six to seven passed concrete logical items more frequently indicating the onset of Piaget's concrete operations stage of development. Thus, Corrigan hypothesized that concrete operations may be a prerequisite for the usage and understanding of the connective "because". She also confirmed the hypothesis that the understanding of "because" precedes its usage.

These findings are also supported by J.T. Lawton's (1977) study. The purpose of this study was to measure the effect of using advance organizers on children's use and understanding of the causal and logical "because". The investigation looked at the following aspects:

- "1. Would diminution of syncretic understanding and reasoning be brought about by teaching high-order concepts and high-order rules for the use of concrete operations?
2. Would such learning result in an overlapping of learning between age groups and accelerate a transition between stages of development?
3. Would sequential transfer occur between like high-order concepts and high-order rules of logical operations?" (p. 42).

The subjects (120 children) were selected from two primary schools in north England. Two age groups were designated, six to seven years and ten to eleven years. Each group contained 60 children. The English Picture Vocabulary Test - I (EPVT) was given individually to the six to seven year old group while the ten to eleven year old group received the EPVT, Test-II. From each age group 30 children were randomly placed in two experimental groups and one control group. Three types of lessons were constructed based on social studies content; advance organizer lessons (AO) in which high-order rules for hierarchical classification were included, subsequent lessons (SL) were used for learning content since content was thought to be significant, and introductory lessons (IL) which provided an introduction to specific facts and lower order concepts. Pre- and posttest tasks consisted of ten sentence completion questions, the first five were designed to elicit the causal "because" and the second five, the logical "because". Each subject was requested to read the story. Following this each child was asked to think of good endings to open-ended sentences. Group lessons were then taught. The findings showed that both groups completed few of the pretest items correctly. Subjects were found to lack construction of a conceptual framework needed to establish the relations.

They tended to leap to conclusions, a salient characteristic of syncretism. Results showed that the experimental group performed significantly better than the control group on the posttest. Also, the ten to eleven year group performed significantly better than the six to seven year group. In terms of the specific types of lessons, the AO treatment had a significant effect, the AO and the SL provided a greater learning effect than AO, and there was an improvement in performance with age. Five weeks after the posttest the study was replicated to determine if there was a transfer in learning from the first study. Findings from Study 1 were maintained throughout both pre- and posttests of Study 2. Thus, results showed that the child's use of causal and logical connectives increases with age and subject familiarity.

On the basis of the developmental work on causal connectives, the decision was made in this study to include subjects who would likely have reached Piaget's concrete operations stage to help ensure a basic understanding of causal connectives in oral language. This decision to use fourth grade subjects was reinforced by a recent study by Fagan (1978) within the context of the Semantic Potential Theory of Language. Fagan examined children's use of various types of linguistic information. He found that children aged nine, ten and eleven made most use of conjunctions and some use of conditional connectives. Other connectives such as disjunction, temporal conjunction, temporal disjunction, contrast, comparison, and spatial were used infrequently. In Fagan's study he classified "because" as a conditional connective.

Connectives and Written Language

While Fagan's (1978) study focused upon oral language, many other studies concentrate on written language. Robertson's (1966) classic study investigated the relationship between understanding connectives and reading achievement. She first analysed the language of three basal readers used in grades four, five, and six. Connectives used in the readers were classified in the following way: subordinate clause (although, because, if, so, that, when, where), relative pronouns (that, which, who), co-ordinate clause (and, but, for, yet), sentence linkers (thus, however), and "absent". Using the sentence structures which were present in the basal readers, she constructed connectives reading and connectives writing tests. Following administration of these tests, a significant relationship between the understanding of connectives and reading ability was found. She also found that there was an increase in knowledge of the connectives from grades four to six. A significant difference was determined for understanding of connectives within each grade when achievement groups were compared. On the Connectives Reading Test 60 per cent of the grade four pupils, 69 per cent for grade five, and eight per cent for grade six had the correct answers for the connective "because".

Based on Robertson's (1966) findings, Rogers (1974) examined textbooks used by students in grades six and twelve to determine which connectives were most frequently used and to find out if authors in one subject area make use of connectives more than authors in a different area. He examined first-grade children's understanding of twenty connectives that linked ideas. Two-thirds of the 74 children

did not know in spite of, yet, for used as because, although, nevertheless, still, thus, and however. About half knew although, consequently, unfortunately, even if, and because. Because and although were more difficult at the beginning of the sentence than in the medial position. Rogers then examined 35 textbooks from sixth through twelfth grade. Sixteen connectives each used 1000 or more times were as follows: but, if, because, when, however, as, although, thus, then, while, for example, since, also, therefore, so, and even.

Neilsen (1978) considered the effects of passage structure and connectives in terms of comprehension of written discourse. He used 216 students, 72 each in the fifth grade, ninth grade, and college. All students were average or above in terms of reading ability. Students from each level were randomly assigned to one of three experimental tasks; wh-question probes, sentence recognition, and oral recall. One of the treatment conditions involved varying passages according to presence or absence of linguistic connectives. He found that the presence or absence of linguistic connectives had no significant effect on any of the experimental tasks for any age group.

As a follow-up to this study, Neilsen and Brown (1978) compared good and poor readers to determine if understanding abstract relational terms is a factor involved in the reading process that separates good and poor readers. They also examined the ability of students in grades four and six to understand abstract relational terms. Two experimental passages were constructed, one with causal connectives explicitly stated and one with these connectives removed. Subjects were assigned to the reading achievement groups according to the results

of the Gates-McGinitie Survey Test - Level D. The subjects which were selected had vocabulary scores within ± 0.5 grade equivalent of grade placement. Good readers were defined as those who had comprehension scores of 0.5 grade equivalents or more above grade placement while poor readers scored 0.5 grade equivalents or more below grade placement. In the study, 68 subjects were used. Ten passages of approximately 55 words each were read by each subject. Prior to reading the passage, each subject was given the topic and asked to complete a word association task to measure topic knowledge. Upon completion of reading the passage, three multiple choice questions were asked to determine if causal relationships had been established for both implicit and explicit versions. Each question had four choices each marked by a connective. Findings showed that the good readers performed better than the poor readers and the sixth graders better than subjects in grade four on passages both with and without causal connectives. Marking of connectives did not have a significant effect on performance. Also, prior knowledge as determined by word association tasks was not significantly related to comprehension.

Also, examining how certain aspects of text affected comprehension, Marshall and Glock (1978) considered the if-then relation. These relations were either explicitly or implicitly stated in the text. One hundred and sixty college students were selected; 112 from Auburn Community College, New York and 48 from Cornell University. Sixteen versions of two topics were constructed to represent the different independent variables and were similar in terms of number of propositions in text base (71) and number of words (115). Following reading

of the passage, subjects were asked to give a free recall which was followed by 20 open-ended questions. This procedure was repeated for the second topic. The results showed a significant difference in the completeness of the recall, Cornell subjects having more complete recalls. They also found that the Auburn students relied more on the surface structure for their recall. Marshall and Glock concluded that if the if-then was explicitly stated in the text base then the recalls were more complete. They also stated that the Cornell students went directly to the meaning even if the if-then relation was not explicit in the text.

Two recent studies of text information were based upon Fagan's (1978) Semantic Potential Theory of Language. Adams (1979) examined six commercial reading series currently being used in grades four, five, and six. The purpose of his study was to determine the nature of the language used in each of these reading series, and then to compare the nature of the language used in the reading series with language used by students in grades four, five, and six. Six passages of approximately the same length were selected from the basal readers at each grade level. Information within each passage was classified according to Fagan's initial categories of denotational, relational, sentential, and contextual information. Adams found little evidence of progressive increase in language complexity across the grade levels. It was also found that children's oral and written language contained less information of every type than language used by the authors. More logical information was found in children's oral and written language than in the author's written language because of the

children's use of "and". Often there was more similarity between the author's and children's written language than between the children's written and oral language.

Using the results from Adam's (1979) study, Forester (1978) examined text cues in connected discourse. Forester's investigation included the analysis of twenty grade four students oral recalls of stories read silently. He was concerned with the number and types of text cues contained in the oral recalls compared to number and types present in the original passage. Passages were selected from those which were previously analyzed by Adams. He constructed three passages from grade four basal readers. One was "typical" (a) in that it contained the mean number of referential and logical cues found by Adams. The "atypical more" (b) passage contained 32 per cent more referential and logical cues, and the "atypical less" (c) passage contained 32 per cent less of these cues. His findings showed a significant difference between passages a, b, c for the recall of the number of referential category one cues (pronoun, complementizer, repetition, and synonym). However, the results showed few significant differences between reading achievement for the number of propositions recalled and all categories one, two, three and four which were recalled. Significant relationships occurred for logical connectives (categories three and four). These differences occurred only in Passages A (typical) and C (atypical less). Thus, it seems that the high reading achievement group may be more effective in understanding logical connectives when few were present in the text since a significant relationship did not occur in Passage B (atypical more).

Most studies in the past have focused upon the effect of connectives on the quantity of information recalled. This study attempts to focus on the difference in the nature or quality of comprehension as well.

System for Analyzing Unaided Recalls

In the past, studies have focused on the product of reading. Such things as reading skills or correlates of reading have been central to these studies. Recently, however, the focus has shifted to the process of reading, more specifically the processes an individual uses when reading. The problem which researchers face is how to determine what processes the child is using.

One way to get some indication of the processes the child employs is through analyzing the nature of information included in unaided recalls. The subjects are asked to recall (orally) all the information they can from the passage they have just read. Each unaided recall is taped and later transcribed in order that it may be analyzed.

One such study using unaided recalls was completed by Drum and Lantaff (1977). In their study, they examined the text structure and then scored each protocol in categories. Protocols were first divided into clausal, attributive, or rhetorical propositions. Each propositional unit was then analyzed in terms of the following categories:

1. retention of the given information (text specific)
2. inferences bounded by text information, which may also indicate sufficient prior knowledge (experience) to arrange the text element in a valid manner (text entailed)

3. inferences not bounded by the text which may or may not be accurate representations of the general content and can indicate either inadequate prior knowledge and/or poorly constructed texts (text elicited)
4. general responses that are so vague that the subject's ability to read the text or to understand the content are probably lacking (text evoked)
5. parenthetical remarks and repetitions that appear to be characteristic of relating or writing information from memory without a chance to edit or revise (text external)."
(p. 6).

The 16 eighth graders, both good and poor readers, used in the study were asked to read two social science and two science passages. One week later a delayed recall was taken. Their findings showed that the more proficient readers recalled more text specific and entailed information as well as more external comments. They recalled less material in text elicited and text evoked categories. Drum and Lantaff also speculated that prior knowledge of subject content may have been a factor within the achievement groups.

This system was adapted and used in Furniss's (1978) study. She compared free recall behavior of proficient sixth grade readers on narrative and informational passages. The thirty-two subjects each read and recalled two passages which differed in topic and structure. In a later session, each subject was required to recall the passages they had read and recalled a week earlier. This was followed by several questions. The subject's recalls were divided and categorized according to specific categories which were modelled after Drum and Lantaff's (1977) category system. The categories used by Furniss were as follows: text specific, text entailed, text evoked, and text external. Findings revealed that the subjects recalled more text evoked and text

external information than information of the other two types. She also found that text structure (narrative or informational) did not affect the amount of information recalled within each category when the material is narrative in nature.

Despite some difference in results, the system developed by Drum and Lantaff and adapted by Furniss does appear to have potential for differentiating performance of good and poor readers.

Summary

This study is based on Fagan's (1978) Semantic Potential Theory of Language. This theory seems to offer a viable way in which text relations can be analyzed in order to assess their effect on comprehension.

Most investigators in the past seemed to be concerned with at what age or stage of development children are first able to understand and use logical connectives in verbal reasoning. It is thought that the onset of Piaget's stage of concrete operations (7-11 years) is a necessary prerequisite for the usage and understanding of the logical connective "because".

Studies which examine use of connectives in written language have also been completed. They have found that connectives do occur in textbooks used in elementary classrooms, although there is no systematic increase in language complexity across grade units. Students' ability to deal with logical connectives has been examined in studies comparing the performance of high and low readers and students in different grades. Results indicate that knowledge of connectives increases

with age and reading experience. It has generally been found that the presence or absence of connectives in passages has little effect on reading comprehension although this may be a result of the tools used for assessment.

Because Furniss's (1978) system for analyzing unaided recalls provides a method of getting some indication of the processes of reading, it was used in this study. With this system, one method of examining the effect of causal connectives will be attempted. The design of the study will be presented in the next chapter.

CHAPTER III

The Experimental Design

This chapter will describe the selection of the sample, the selection of the testing instruments, the construction and administration of experimental test instruments, coding of data, reliability, and analysis of the data.

The Selection of the Sample

The major purpose of this study was to compare comprehension of high and low readers on passages where logical connectives were present or absent. The logical text relation which is examined in the study is causality. The study compares both quantity and quality of information recalled. As well there is a comparison of the number of logical connectives used by students in oral recall.

The population of this study was drawn from five elementary schools in the Edmonton Separate School System. These schools have been classified by officials as middle-class on the socio-economic scale.

Thirty-two students were selected for the study from six classrooms. Students were selected and grouped according to results of the following tests: Gates-MacGinitie Reading Test administered in June 1978, and the Canadian Lorge-Thorndike Intelligence Test administered in October, 1978.

To determine the achievement groups, results on the Gates-MacGinitie Reading Test were used. Students who scored at the seventieth percentile and above were placed in the high achievement group while students who

scored at the thirtieth percentile and below were placed in the low achievement group. These boundaries were selected as cut-off points to ensure a good contrast of reading comprehension abilities.

The Canadian Lorge-Thorndike Intelligence Test was used to select students which fall within the average or above average range (90-125) of intellectual ability. Only the nonverbal battery score was used in selection to ensure that the I.Q. score did not reflect reading difficulties since the verbal battery requires the student to read. This test was used as a control to make sure that differences between high and low readers were not attributable to differences in intellectual ability.

An attempt was made at using an equal number of girls and boys; however, due to the difficulty of selecting the sample, the high achievers group contained more males than females.

The teacher of each subject used in the study was questioned about the pupil's ability to handle the English language. Teachers of all subjects confirmed this ability.

Tables 3.1 and 3.2 indicate the comprehension scores on the Gates-MacGinitie Reading Test, Primary C (1978), non-verbal scores on the Canadian Lorge Thorndike Intelligence Test, the sex and chronological age for each subject (Table 3.1 for the low achievers and Table 3.2 for the high achievers). The mean chronological age for the low achievers was 9.63 years and for the high achievers it was 9.47 years. The mean I.Q. scores for low and high achievement groups were 104.88 and 105.56 respectively.

Table 3.1

Background Information on Low Grade Four Achievers

Subject	Sex	Comprehension Percentile Score (Gates- MacGinitie)	Non-verbal I.Q. Score (Lorge- Thorndike)	C.A. (May 1979)
01	M	07	101	9.1
02	M	07	97	9.2
03	F	20	109	9.0
04	F	20	111	9.4
05	M	20	99	10.1
06	F	10	110	9.8
07	F	15	97	10.2
08	F	15	94	10.1
09	M	15	111	10.0
10	F	15	93	10.2
11	F	20	108	9.6
12	M	15	98	9.5
13	M	15	125	9.7
14	F	25	100	9.4
15	M	30	113	9.6
16	M	30	112	9.2

Table 3.2

Background Information on High Grade Four Achievers

Subject	Sex	Comprehension Percentile Score (Gates- MacGinitie)	Non-verbal I.Q. Score (Lorge- Thorndike)	C.A. (May 1979)
17	M	99	116	9.6
18	M	76	97	9.1
19	M	80	97	9.0
20	F	70	103	9.2
21	F	75	99	10.0
22	M	85	119	9.1
23	F	95	112	10.2
24	M	90	116	9.7
25	F	85	112	9.2
26	N	75	109	9.2
27	F	70	91	10.3
28	M	70	94	9.5
29	M	80	112	9.6
30	M	95	93	9.6
31	M	90	112	9.0
32	M	95	107	9.2

Testing Instruments

Results from the following two standardized tests were used in this study: the Gates-MacGinitie Reading Test (1968), Primary C, Form 2 and the Canadian Lorge-Thorndike Intelligence Test (1967), Form 1. These results were obtained from the student record cards kept at each school. The Gates-MacGinitie Reading Test was given in June, 1978. The Canadian Lorge-Thorndike Intelligence Test was given in October, 1978. Both tests were administered by classroom teachers.

In order to obtain a measure of each subject's reading achievement, results from the Gates-MacGinitie Reading Test, Primary C, Form 2 were used. This test consists of two parts, vocabulary and comprehension. The comprehension test measures the child's ability to get meaning from whole sentences and paragraphs. Following each paragraph are two questions and four alternative answers for each question. This test has two forms. It was normed using approximately 40,000 pupils in 38 communities in the United States in 1965. The split half reliability for the vocabulary subtest is 0.85 while for the comprehension subtest it is 0.87.

To obtain a measure of each student's intellectual ability, results from the Canadian Lorge-Thorndike Intelligence Test (1967) Level B, were used. This test consists of two batteries, verbal and nonverbal. Only the results from the nonverbal battery were used in the sample selection. The nonverbal battery contains pictorial or numerical items. The test was normed on a stratified random sample of 31,739 pupils in grades three to nine from across Canada. The odd-even reliability for levels A-F of the verbal battery ranges from 0.830 to 0.945 while for the nonverbal it ranges from 0.894 to 0.931. The

intercorrelations between the verbal and nonverbal batteries for levels A-F are reported from 0.558 to 0.681.

Construction and Administration of Experimental Test Instruments

Passages were selected from one of the reading series currently recommended for use in Alberta schools (Language Experience Reading Program, Level Four). These passages were at the grade two level to ensure that the subjects were not reading at frustration level. The content was fanciful in nature so that the children had to rely more on the text rather than background experience to establish causal relationships. Two passages containing causal relationships were selected and modified so that there were five causal relationships in one passage and six in the other passage. Each passage was then rewritten so causal relationships were explicitly indicated by causal connectives in one version; in the other causal connectives for test items were removed. The causal connective used was "because". This connective was selected because it is frequently used in oral language, and in Robertson's study (1966) "because" was found to be one of the easily understood connectives. Only one connective was used in the study in order that this variable be kept constant. For each story why questions were formulated to probe each causal relationship. Questions requested the subject to state the effect of each cause.

The passage "Gibble Gabble the Goblin" has 306 words and 67 basic structures while the "Woodman's axe" contains 299 words and has 80 basic structures. (See Appendix A for complete passages and questions). The ratios of test items to basic structures were 1/12 and 1/13 for the passages respectively. It was hoped that by keeping the ratio of

test items to basic structures low the passages would be very similar to those in the reading series thus enabling the results to be more generalizable than if very short passages with several causal relationships had been used.

The subjects were asked to silently read the passages. Following each passage they were requested to give an unaided recall (they were asked to tell all they could remember about the story). Subjects were then asked the probe questions. Each administration was done on an individual basis. The responses were tape recorded and at a later time transcribed.

In order to control for order effects of either passage number or presence of connectives, subjects in each reading achievement group were randomly assigned to four subgroups for test administration (Figure 1).

Group	Order of Presentation	
	1	2
A	P ₁ C+	P ₂ C-
B	P ₁ C-	P ₂ C+
C	P ₂ C+	P ₁ C-
D	P ₂ C-	P ₁ C+

Figure 1

Administration of Test Instrument

P = passage (1 or 2)

C = connectives present(+) or absent (-)

Coding of Data

Following the transcription of the unaided recalls, the protocols were broken into basic structures including both basic and alternate t- units. The basic t- unit is the simplest independent predication which may be used to convey information. Alternate syntactic structures have a basic t- unit make up and with the addition or substitution of words could become a basic t- unit (Fagan, 1978). For example "Gibble Gabble was a goblin who was mischievous" has a basic t- unit and alternate syntactic structure. The basic t- unit is "Gibble Gabble was a goblin" and the alternate syntactic structure is "who was mischievous" (relative clause).

Basic t- units may be represented as follows:

- | | | | |
|----|------------------|---|---|
| 1. | (D)NV (Adj)(Adv) | - | Mrs. Goblin wept
The woodman was poor
The woodman worked hard
Gibble Gabble swam quickly |
| 2. | (D)NV(Adj)(N)(N) | - | The woodman chops wood
Gibble Gabble remembered his bell
The fairy gave the woodman an axe |
| 3. | (D)NV(PP) | - | Gibble Gabble was in the cucumber patch |

A complete list and examples of alternate t- units appears in Appendix B.

Each basic structure was categorized using the system used by Furniss (1978). In Table 3.4 each category is defined and then explained further by means of examples taken from the protocols used in the study.

Table 3.4

Examples of Recall Categories

- A. Text Specific Information - Protocol basic structures which are text specific are the same, or synonymous with text units.
- A1. Verbatim recall of basic structures in text
- A2. Synonymy of elements in basic structures of text
Text: She came up with an axe in her hand. It was an axe of shining gold.
Protocol: "The water fairy came out of the water carrying a gold axe." (Subject 2)
"The Woodman's Axe"
- A3. Substitution of pronouns if the referent is present in recall
- A4. Propositional contractions
Text: One day, he was working near a stream. His axe fell into the water.
Protocol: "The axe fell into the stream" (Subject 6)
"The Woodman's axe."
- B. Text Entailed Information - Protocol basic structures which summarize information from two or more text propositions, put together text specific information in new ways, or add text related information that is semantically entailed by the text (i.e., text connecting inferences).
- B1. Inferences entailed by the text:
Text: She went home weeping. She was sure she lost Gobble Gobble for evermore.
Protocol: "His mother started going home because she thought he was lost forever." (Subject 9)
"Gobble Gobble the Goblin"
- B2. Case related information involves the inclusion of reasonable information in terms of the context of the stimulus passage. A content expert may be required to judge the adequacy of such prior information as represented in a recall protocol.
Text: He was gathered with the cucumbers just as his mother said he would be.
Protocol: The farmer picked him (Subject 6).
"Gobble Gobble the Goblin"
- B3. Local summary: Protocol basic structures which summarize basic structures in the text.
Text: She had warned Gobble Gobble to keep away from the cucumber bed. One day Gobble Gobble broke his promise. He went to the cucumber bed.
Protocol: "One day he went where he wasn't supposed to go (Subject 16).
"Gobble Gobble the Goblin"

- B4. Predicate expansion of basic structures in text
 Text: He was gathered with the cucumbers just as his mother said he would be.
 Protocol: "The farmer was picking some cucumbers and picked Gibble Gabble because he was all green like the cucumbers" (Subject 21)
 "Gibble Gabble the Goblin"
- B5. Argument/Attribute expansion of basic structures in text
 Text: Gibble Gabble didn't know the farmer was deaf.
 Protocol: "He started ringing his bell but the farmer couldn't hear him because he was deaf." (Subject 24)
 "Gibble Gabble the Goblin"
- C. Text Evoked Information - Protocol basic structures which are peripheral to text basic structures, generalizations without specific text relationships and erroneous responses.
- C1. Faulty Inference
 Text: Gibble Gabble was a goblin who was always getting into some kind of mischief.
 Protocol: There was these two boys. (Subject 15)
 "Gibble Gabble the Goblin"
- C2. Erroneous expansion of basic structures in text
 None occurred in the protocols in this study.
- C3. Unacceptable substitution of basic structures in text and errors.
 Text: Now indeed he was happy again.
 Protocol: "She gave all the axes to him and he was rich." (Subject 29)
 "The Woodman's Axe"
- C4. Experiential intrusions.
 None occurred in the protocols in this study.
- C5. Generalizations with no specific relationship to basic structures in text.
 Text: She had warned Gibble Gabble to keep away from the cucumber bed.
 Protocol: And they remembered their mother said "be careful" because there is other things there." (Subject 2).
 "Gibble Gabble the Goblin"
- C6. Arguments from basic structures in text recalled without predicates or with predicates that are related to story telling conventions.
 Text: Many years ago a poor woodman lived with his family in a little house in the forest.
 Protocol: "There was this woodman ..." (Subject 14)

D. Text External Information - Protocol information which has no relationship to basic structures in text, is a repetition of previously recalled statements, or a false start.

D1. Story telling conventions which relate to experimental situation

Text: She had warned Gobble Gobble to keep away from the cucumber bed.

Protocol: And she warned him about the, it starts with C, something that ends with bed, I don't know the word. (Subject 1).

"Gobble Gobble the Goblin"

D2. Repetitions of previous statements in recall.

The system used to break the protocols into basic t- units has been found useful in studies of both oral language (Fagan 1978) and written language (Adams, 1979; Forster, 1978). This system has the advantage over Kintsch's propositional analysis used in Furniss's study in that inter-rater reliability is fairly easy to establish. Furniss's adaptation of the Drum and Lantoff's categories was used to determine quality of comprehension because it differentiates information recalled in terms of literal and inferential comprehension. This was of particular interest in this study because connectives were explicitly stated in one form of the passages and implicit in the others.

In order to assure the reliability of the above coding by the researcher, an independent judge also analyzed the recalls of eight subjects (four for basic structures and four for categories). Inter-rater agreement was calculated by using the Arrington Formula as outlined by Feifel and Lorge (1950) where the number of scores agreed upon by each observer is doubled and then divided by this total plus the disagreements.

$$\text{i.e.} \quad \frac{2 \times \text{Agreements}}{(2 \times \text{Agreements}) + \text{Disagreements}}$$

The calculation is then expressed as a percent. The percentage agreement between the researcher and the independent judge is 96.17 for the basic structures and 94.67 for the recall categories.

Protocols were also checked for the use of the causal connective "because". Also it was noted informally that other connectives were used to denote causal relationships (i.e. since, so). (See Appendix C for a sample of the recalls which has been coded for basic structures and recall categories analyzed).

The probe questions were marked to determine the number of correct responses. Only those answers which demonstrated a clear understanding of the causal relationships were considered to be correct.

Analysis of Data

The Division of Educational Research Services at the University of Alberta were consulted for the use of proper statistical analysis. To get the means, standard deviations, and correlations among the variables the DEST 02 program was used. Because each passage contained a different number of basic structures the scores were presented as proportions.

T-tests (ANOV 10) for independent means were used to determine whether there were significant differences between the groups. T-tests (ANOV 12) for dependent means were used to test for significant differences within the groups.

Summary

A sample of thirty-two grade four readers was selected from five schools in the Edmonton Separate School system. Students were selected according to results of the Gates-MacGinitie Reading Test given

in June 1978 and the Canadian Lorge-Thorndike given in October 1978.

According to these results subjects were assigned to the high achievement group and the low achievement group.

Two passages were constructed and administered to each subject individually. All subjects' responses were tape-recorded and transcribed into protocols. These protocols were then analyzed. Each protocol was divided into basic structures and in turn each basic structure was then categorized.

Statistical treatment of the data involved t-tests for dependent and independent means.

CHAPTER IV

Findings and Discussion

This chapter contains the results of the study in relation to the null hypotheses re-stated from Chapter 1, followed by a discussion of the results.

Performance of the High Group on Test Passages

Mean scores were compared to determine differences in the comprehension of subjects in the high group on passages with causal connectives present and passages with these connectives absent. Results were analyzed to determine differences in the nature or quality of comprehension on the two types of passages, in the quantity of comprehension questions answered correctly, and in the number of causal connectives spontaneously generated in the unaided recalls.

Results Relating to Hypothesis 1

In order to assess the significance of the above differences, Hypothesis 1 was formulated.

Hypothesis 1

There will be no significant differences in the performance of the high reading group on the passage with connectives and the passage with the connectives removed for

- a. the number of basic structures produced in each recall category
- b. the number of logical connectives produced in the recall

c. the number of questions answered correctly.

The number of structures recalled in each category by the high reading group was compared for the passage with connectives present and the passage with connectives removed by t-tests for dependent means. The results of the analysis did not reveal significant differences in the categories produced (Table 4.1), and hypothesis 1a was not rejected. This implies that for high readers the presence or absence of connectives did not affect the proportion of information produced in each category.

TABLE 4.1

T-TEST FOR HIGH GROUP ON CATEGORIES OF RECALL

RECALL	CATEGORIES	C+ Passages		C- Passages		T-VALUES	PROB (Two Tail)
		MEANS	SD	MEANS	SD		
TEXT	SPECIFIC	.505	0.122	0.573	0.117	1.705	0.1089
TEXT	ENTAILED	.290	0.103	0.252	0.080	-1.131	0.2757
TEXT	EVOKED	.165	0.096	0.114	0.091	-1.401	0.1816
TEXT	EXTERNAL	.040	0.034	0.061	0.053	1.375	0.1893

The number of logical connectives produced in the recall and the number of questions answered correctly was compared for passages with connectives present and absent by t-tests for dependent means. No significant differences were found (Table 4.2), and hence, hypotheses 1b and 1c could not be rejected. This suggests that the presence or absence of connectives in the passages had little effect on the number of logical connectives produced in the recall or on the number of comprehension questions answered correctly.

TABLE 4.2

T-TEST FOR HIGH GROUP ON NUMBER OF LOGICAL CONNECTIVES,

PRODUCED AND QUESTIONS ANSWERED CORRECTLY

	C+ Passages N=16		C- Passages DF=15		T-VALUE	PROB (Two Tail)
	MEAN	SD	MEAN	SD		
CONNECTIVES	2.563	1.903	2.188	1.775	-0.446	0.6620
QUESTIONS	3.813	1.073	3.813	1.285	0.0	1.000

Discussion of Results

Results suggest that presence or absence of the causal connective "because" affected neither the quantity nor quality of comprehension of passages read by the high achievement group. This finding is consistent with that of Marshall and Glock (1978) who used university students in their study. While Marshall and Glock did not use question probes, they did, however, use unaided recalls. They found little variability in the quantity of information recalled by the Cornell subjects suggesting that the more able readers comprehend the information equally well for passages with and without explicitly stated connectives.

Neilsen (1978) who also used proficient readers found that the presence or absence of linguistic connectives did not cause the performance to vary significantly when presented with WH-question probes, sentence recognition tasks, and oral recalls. It seems that if the logical connectives are removed the proficient readers are able to infer the relationships without the aid of the signal words.

As a follow-up to this study, Neilsen and Braun (1978) compared good grade four readers and poor grade six readers. They found no

significant differences for ability groups, grade placement, and marking of connectives.

Performance of the Low Group on Test Passages

Differences in the comprehension of the low group was compared on passages with causal connectives present and passages with these connectives removed. Results were analyzed to determine differences in the quality of comprehension on the two types of passages, in the quantity of comprehension questions answered correctly, and in the number of causal connectives stated in the unaided recalls.

Results Relating to Hypothesis 2

The following hypothesis was generated to determine differences in performance of the low achievement group on the two types of test passages.

Hypothesis 2:

There will be no significant difference in the performance of the low reading group on the passages with connectives and the passage with the connectives removed for

- a. the number of basic structures produced in each recall category
- b. the number of logical connectives produced in the recall
- c. the number of questions answered correctly.

The number of structures produced in each category by the low reading group was compared for the passage with connectives present and the passage with connectives removed by t-tests for dependent means. The results of the analysis did not reveal significant differences in

the categories produced (Table 4.3), and hypothesis 2a was not rejected. Thus, the presence or absence of connectives did not affect the proportion of information produced in each category.

TABLE 4.3

T-TEST FOR LOW GROUP ON CATEGORIES OF RECALL

N=16 DF=15

RECALL	CATEGORIES	C+ Passages		C- Passages		T-VALUES	PROB (Two Tail)
		MEANS	SD	MEANS	SD		
TEXT	SPECIFIC	0.435	0.174	0.412	0.173	-0.357	0.7263
TEXT	ENTAILED	0.231	0.129	0.233	0.115	0.034	0.9731
TEXT	EVOKED	0.234	0.151	0.272	0.213	0.507	0.6197
TEXT	EXTERNAL	0.102	0.088	0.083	0.059	-0.641	0.5312

The number of questions answered correctly and the number of logical connectives produced in the recalls of the low reading group were compared on both test passages. T-tests for dependent means were used in the analysis. The results showed no significant differences in the number of logical connectives produced or questions answered correctly (Table 4.4), suggesting that the presence or absence of connectives had little effect on these variables for the low group. Hence hypotheses 2b and 2c were not rejected.

TABLE 4.4

T-TEST FOR LOW GROUP ON NUMBER OF LOGICAL CONNECTIVES
PRODUCED AND QUESTIONS ANSWERED CORRECTLY

N=16 DF=15

	C+ Passages		C- Passages		T-VALUE	PROB (Two Tail)
	MEAN	SD	MEAN	SD		
CONNECTIVES	1.375	1.053	1.688	1.927	0.557	0.5855
QUESTIONS	3.500	2.031	3.438	1.580	-0.084	0.9342

Discussion of Results

Results suggest that the low achievement group's performance was not affected by the presence or absence of the causal connective "because". These findings are supported by Marshall and Glock's (1978) study. The subjects from Auburn Community College made up the "not-so-fluent" readers. They produced recalls which had more variety in amount of information recalled, however, not enough within the group to cause significant differences.

Comparing the results of Hypothesis 1 and 2, it is apparent that within each achievement group there are no significant differences in the quantity or quality of comprehension when logical connectives are present or absent.

Comparison of Achievement Groups On Passages With Connectives

Mean scores were compared to determine differences between low and high reading achievement groups on the passages with the causal connectives present. Results were analyzed to determine differences in the nature or quality of comprehension of both achievement groups, in the quantity of comprehension questions answered correctly, and in the unaided recalls.

Results Related to Hypothesis 3

In order to assess the significance of the above differences Hypothesis 3 was generated.

Hypothesis 3.

There will be no significant difference between the low and high reading achievement groups on the passage with logical connectives present for

- a. the number of basic structures produced in each recall category
- b. the number of logical connectives produced in the recall
- c. the number of questions answered correctly.

No significant differences were revealed between high and low achievement groups for recall categories except text external when logical connectives were present in the passage (Table 4.5). The results indicate that the low group had more basic structures in the text external category. Hence, hypothesis 3a was rejected for the category text external and was not rejected for the remaining categories.

TABLE 4.5

T-TEST FOR LOW AND HIGH READING GROUPS ON CATEGORIES
OF RECALL WHEN LOGICAL CONNECTIVES ARE PRESENT

N=32 DF=30

RECALL	CATEGORIES	Low Groups		High Groups		T-VALUES	PROB (TWO-TAIL)
		MEAN	SD	MEAN	SD		
TEXT	SPECIFIC	0.4349	0.1800	0.5054	0.1258	-1.2842	0.20890
TEXT	ENTAILED	0.2310	0.1333	0.2897	0.1060	-1.3797	0.17788
TEXT	EVOKEO	0.2339	0.1563	0.1648	0.0995	1.4922	0.14609
TEXT	EXTERNAL	0.1024	0.0912	0.0400	0.0349	2.5577	0.01583*

* P. < .05

A significant difference was revealed when t-tests for independent means were carried out in order to test for differences between low and high reading groups on their ability to state logical connectives in recalls when connectives were present in the passage. Differences were not significant on number of questions answered correctly (Table 4.6). Thus, hypothesis 4b was rejected while hypothesis 4c was not rejected.

TABLE 4.6

T-TEST FOR LOW AND HIGH READING GROUPS ON NUMBER OF LOGICAL CONNECTIVES RECALLED AND QUESTIONS ANSWERED CORRECTLY WHEN LOGICAL CONNECTIVES ARE PRESENT

	N=32		DF=30		T-Value	Prob (Two-Tail)
	Low Group		High Group			
	Mean	SD	Mean	SD		
CONNECTIVES RECALLED	1.3750	1.0878	2.5625	1.9653	-2.1146	0.04288*
QUESTIONS CORRECT	3.5000	2.0976	3.8125	1.1087	-0.5269	0.60218

* P. < .05

Discussion of Results

Results suggest that differences between the low and high achievement groups on passages with connectives present were few. In terms of the categories produced the only significant difference which resulted was in the text external category. The low group produced more information in this category which contains such information as story telling conventions, repetitions of previous statements, and false starts or incomplete sentences. It is possible that the low group may have used this type of information as a kind of holder in their language production in order to have time to reorganize thoughts, or a type of "thinking out loud" organizational strategy. This function of mazes and repetitions were suggested in Fagan's (1978) study of the oral language of upper elementary students.

Significant differences also resulted on the recall of causal connectives. The high reading achievement group stated more (2.5625) logical connectives than the low reading group (1.0873) when logical connectives were present. This suggests that subjects in the high group are better able to recall cues to causal relationships when the cues are explicitly stated in the text.

Comparison of Achievement Groups on Passages

Without Connectives

Mean scores were compared to determine differences between low and high reading achievement groups on the passages with the causal connectives removed. Results were analyzed to determine differences in the nature or quality of comprehension of both achievement groups,

in the quantity of comprehension questions answered correctly, and in the unaided recalls.

Results Related to Hypothesis 4

The following hypothesis was produced to determine significant differences between the low and high achievement groups on the passage without connectives.

Hypothesis 4

There will be no significant difference between the low and high reading achievement groups on the passage with logical connectives absent for

- a. the number of basic structures produced in each recall category
- b. the number of logical connectives produced in the recall
- c. the number of questions answered correctly.

This hypothesis was not rejected for the text entailed and text external categories, while the hypothesis was rejected for text specific and text evoked categories (Table 4.7).

TABLE 4.7

T TEST FOR LOW AND HIGH READING GROUPS ON CATEGORIES
OF RECALL WHEN LOGICAL CONNECTIVES ARE ABSENT

N=32 DF=30

RECALL	CATEGORIES	Low Group		High Group		T-VALUES	PROB (TWO-TAIL)
		MEAN	SD	MEAN	SD		
TEXT	SPECIFIC	0.4117	0.1789	0.5729	0.1204	-2.9904	0.005524*
TEXT	ENTAILED	0.2327	0.1186	0.2516	0.0825	-0.5242	0.60397
TEXT	EVOKED	0.2720	0.2199	0.1139	0.1941	2.6436	0.01292*
TEXT	EXTERNAL	0.0834	0.0609	0.0614	0.0552	1.0708	0.29280

*P. < .01

There were no significant differences between the low and high groups on the passage with logical connectives absent for the number of logical connectives recalled and the number of questions answered correctly (Table 4.8). Hypotheses 4b and 4c were not rejected. T-tests for independent means were used.

TABLE 4.8

T-TEST FOR LOW AND HIGH READING GROUPS AND NUMBER OF LOGICAL CONNECTIVES RECALLED AND QUESTIONS ANSWERED CORRECTLY WHEN LOGICAL CONNECTIVES ARE ABSENT

	N=32		DF=30		T-VALUE	PROB (TWO-TAIL)
	Low Group		High Group			
	MEAN	SD	MEAN	SD		
CONNECTIVES	1.6875	1.9906	2.1875	1.8337	-0.7390	0.46567
QUESTIONS	3.4375	1.6317	3.8125	1.3276	-0.7131	0.48131

Discussion of Results

The performance of the high and low achievement groups was compared on the passage with logical connectives removed. Significant differences resulted between high and low readers in the text specific and text evoked categories. The low group produced more information in the text evoked category than the high group. The category of text evoked information involves faulty inferences, erroneous expansion of text, experiential intrusions and generalizations with no specific relationship to the text. It appears that when the logical connectives were not present to act as signal devices, the less able readers were more likely to give faulty or incorrect information.

Findings also indicate that the subjects in the high reading achievement group recalled more text specific information than did the low readers. It appears that when causal connectives were not explicitly stated the low reading achievement group relied more on their background experience and thus, produced less specific information from the text.

Drum and Lantaff's (1977) results are somewhat but not totally consistent with these findings. They found that the more able readers produced more text specific and text entailed information than did poor readers and less of the other types of information. Differences reached significance on only two of the recall categories in the present study. These differences occurred in the text specific and text evoked categories. The correlation coefficient ($r=-0.851$) between these two categories indicates a high negative correlation. As more text specific information was recalled the amount of text evoked information declined.

The findings of Marshall and Glock (1978) are also consistent with differences on the recall categories between good and poor readers. They noted that the 'truly fluent' readers were able to infer accurate information from incomplete information in the text base. The 'not-so-fluent' readers, however, cannot infer from the text base unless structures are explicitly stated. (p. 51).

This study did not find significant differences between good and poor readers in the number of comprehension questions correctly answered. Neilsen and Braun (1978) obtained similar results in that they found no significant differences between achievement groups for

the marking of logical connectives. They used three multiple choice questions as a means of determining whether marking by the use of connectives had a significant effect. It appears that when the test is highly structured by use of questions both good and poor readers are able to establish causal relationships regardless of whether the connectives are implicit or explicit in the text.

Comparing results on hypotheses three and four, there were more differences between achievement groups on the nature of information produced in recalls when connectives were absent than when they were present. On both types of passages, the high group produced more structures which were verbatim or synonymous with the text (text specific) than did the low group but differences reached significance only on passages with connectives absent. This suggests that the presence of connectives aided the low readers in producing text specific information. The usefulness of causal connectives to the low group was also reflected in performance on the text evoked category which includes incorrect inferences, erroneous expansion, unacceptable substitutions, etc. When connectives were present there was no significant differences between achievement groups on this variable; when connectives were absent the low group produced more basic structures in the text evoked category. This suggests that when connectives were removed from the text, the low readers relied more heavily on their background knowledge when producing story recalls than did the high group who continued to be more constrained by the text. When connectives were present only one difference between achievement groups on categories of recall was significant and that was on the text external

category. This category appears to involve holders in language production rather than reflect what the children are attempting to recall.

When results on hypotheses three and four are compared in terms of number of causal connectives produced in the recall, the high reading achievement group produced more connectives than the low reading achievement group when the logical connectives were present in the text. This seems to reflect an awareness of and an ability to recall these logical connectives when they are present. There were no differences between achievement groups on passages with causal connectives absent.

Significant differences did not result in the number of questions answered correctly for high and low reading achievement groups when connectives were present or absent. This task seems to reflect what is often done in current instruction when the student reads a passage and then is required to answer questions relating to it. It appears that both groups deal equally well with this type of task; both can use the information and structure provided in the questions along with information in the passage to provide correct answers. Performance on the unaided recalls, however, may be a more accurate reflection of comprehension in an independent reading situation. If this is the case, presence of the connective "because" would have a more significant impact on comprehension when students read independently than in the instructional situation.

Summary

Subjects were presented with a passage that had connectives

present and a passage that had the connectives removed, and results on unaided recalls and open-ended questions were compared for high and low achievement groups.

Findings on the tasks showed that when comparing behavior of high and low groups some significant differences were revealed. When logical connectives were present the low reading group produced significantly more information in the text external category than the high reading group. Results also indicated that the high reading group produced more logical connectives in their recalls when connectives were present in the passage. Differences also occurred on the passages with connectives removed for the number of basic structures produced in two of the categories. The high achievement group produced more information in the text specific category than the low achievement group, and the low group produced more text evoked information than the high group.

No significant differences were found for other variables measured. Comparing performance on passages with and without connectives for low and high groups separately, insignificant results were found for the number of basic structures recalled in each recall category or in the quantity of comprehension questions answered correctly. In addition, on passages with connectives present, no significant differences between low and high reading groups results for text specific, text entailed, and text evoked categories. As well, no significant differences were found for the number of questions answered correctly. When connectives were absent, insignificant results occurred for text entailed and text external recall categories, for

number of connectives spontaneously produced in recalls, and for quantity of comprehension questions answered correctly.

CHAPTER V

Summary, Conclusions, and Implications

This chapter will present a summary of the study, the main findings, and conclusions. Implications for the teaching of reading and suggestions for further research will also be presented.

Summary of the Study

The major purpose of this study was to compare comprehension of high and low readers on passages where logical connectives were present or absent.

The sample consisted of thirty-two subjects drawn from fourth-grade classrooms in the Edmonton Separate School System. Subjects were selected on the basis of comprehension scores on the Gates-MacGinitie Reading Test, Primary C, and the nonverbal scores on the Canadian Lorge - Thorndike Intelligence Test, Form 1. Subjects formed two equal groups, a low achievement group and a high achievement group.

Each subject was tested individually by the researcher using two passages of different content, one version of each passage with causal connectives present and one with these connectives absent. Each subject was asked to silently read one of the passages. An unaided recall was requested which was followed by questions designed to probe for understanding of each cause-effect relationship in the passage. This procedure was repeated for the second passage.

The unaided recalls were tape-recorded and later transcribed into protocols for analysis according to basic structures and type of recall.

The data were analyzed using t-tests for dependent and independent means to compare performance on passages with and without causal connectives present, and to compare performance of high and low readers.

Main Findings

Analysis of the data revealed several main findings.

1. For the high reading achievement group no significant differences in performance on passages with causal connectives present or absent were found for the following:

- a. the type of information included in the unaided recall
- b. the number of causal connectives produced in the recall
- c. the number of questions answered correctly.

2. For the low reading group no significant differences in performance on passages with or without causal connectives were found for the following:

- a. the type of information included in the unaided recall
- b. the number of causal connectives produced in the recall
- c. the number of questions answered correctly.

3. When causal connectives were present few significant differences were revealed in comparing the performance of low and high reading groups. Significant differences resulted in the following areas:

- a. the low group had more basic structures in the text external category of the recall categories.

- b. the high group stated more causal connectives in their recalls

No significant differences between high and low achievement groups were found in the following areas:

- a. the number of basic structures produced in text specific, text-entailed, and text evoked categories
- b. the number of questions answered correctly.

4. When logical connectives were absent the following differences in performance of high and low groups were significant:

- a. the low group produced more basic structures in the text evoked category
- b. the high group produced more information in the text specific category.

Differences between high and low groups were not significant for:

- a. the number of basic structures produced in text entailed and text external categories
- b. the number of logical connectives recalled
- c. the number of questions answered correctly.

General Conclusions

Subjects in the high group were able to comprehend passages with and without causal connectives present equally well. Subjects in the low group also performed similarly on passages with causal relationships signalled by connectives and passages without these connectives. There were, however, some significant differences between the performance of the high and low achievement groups, with these differences occurring in the nature of comprehension rather than in the number of comprehension questions answered correctly. Both groups were able to

answer questions about causal relationships when structure was provided by questions.

On unaided recalls of passages without causal connectives, the high group recalled more information than the low group in the text specific category. This category includes basic structures which are the same as, or synonymous with text units. The low group recalled more information in the text evoked category than did the high group. The text evoked category includes basic structures which are peripheral to text structures, generalizations without specific text relationships, and erroneous responses. The production of more information in the text specific category indicates a favorable balance between the print and the subject's background knowledge. When more information is produced in the text evoked category, there is an indication of heavy reliance on background knowledge rather than making use of information contained in the text.

When causal connectives were present, there was only one significant difference between achievement groups in the nature of information recalled. The low group produced more repetitions, false starts, and storytelling conventions in an apparent attempt to gain time to organize ideas for recall. These results indicate that there were fewer differences between high and low readers on passages with causal connectives absent than on those with connectives present when the nature of information produced in story recalls was considered. It appears, then, that although the presence of causal connectives was of some assistance to low readers, they did not perform significantly better on passages with than without these connectives present. This

may be related to greater awareness of connectives by subjects in the high reading achievement group who spontaneously recalled more explicitly stated causal connectives than did the low reading achievement group when reading passages.

Limitation

In addition to those limitations cited in Chapter 1, the following limitation became apparent during the process of the study. One of the passages, "The Woodman's Axe" is an Aesop Fable and several of the subjects indicated that they were familiar with the story.

Implications of the Study

The findings of this study suggest several implications for the teaching of reading. Proficient readers are aware of the causal connective "because" and are able to adequately comprehend passages containing causal relationships regardless of whether or not these relationships are signalled by connectives. Therefore, it does not appear imperative that specific instruction beyond that suggested in currently used basal readers be provided in this area for most proficient readers in the fourth grade. However, for low readers the situation is different. The results of this study indicated differences in the nature of information recalled by the low reading achievement group and members in the high group. When causal connectives were not present in the material being read, the low group tended to rely heavily on background knowledge and recalled less information directly from the text than did the high group. When causal connectives

were present, the recalls of the low group were more similar to those of the high group, although the low readers produced fewer causal connectives in their recalls. It would appear that students in the low reading group would benefit from instruction to develop conscious awareness of causal connectives used by authors to signal these relationships, and from instruction aimed at comprehension of passages containing cause-effect relationships, particularly when these are not signalled by connectives and when the students are reading independently. It would appear also that the focus should be on developing a balance in use of background knowledge and text information.

This study is of importance to people involved in the sphere of production and selection of instructional materials for both reading and the content areas. In the area of reading, getting meaning is the prime concern, and the reader must establish the relationships that were intended by the author if meaning is to be achieved. These relationships must be understood both when signalled by connectives and when connectives are omitted. The results of this study suggest that guide books which accompany instructional materials should provide specific sections devoted to the use of causal connectives and to comprehension of causal relationships both when they are signalled by connectives and when they are not.

In the content areas, such as Social Studies and Science, it is particularly important that the student be able to establish relationships between the concepts. Roger's (1974) study suggests that textbooks used in the content areas contain many connectives. The results of this study suggest that authors continue to use these connectives;

however, instruction for less able readers would be important for understanding of logical relationships.

Finally this study has implications for reading assessment. Fagan's (1978) system for dividing recall protocols into units and Furniss (1978) system for categorizing the units were used to analyze oral recalls. It seems that both of these systems of analysis could be used profitably by clinicians to assist them in assessing processes of comprehension.

Suggestions for Further Research

The following suggestions are made for further research into the use of logical connectives.

1. This study dealt with only one connective "because". Studies using different causal connectives are necessary to determine if similar behavior can be expected for other connectives. In addition, other logical relationships should be considered. Fagan (1978) outlines several types of logical information; conjunction, disjunction, temporal conjunction, temporal disjunction, contrast, comparison, and spatial. This would give an indication as to how readers make use of different types of logical information.

2. The subjects in this study were probably in Piaget's stage of concrete operations in their cognitive development. It would be interesting to do similar studies with younger and older subjects.

3. In light of the findings of this study it would be useful to conduct a study in which the researcher is involved in teaching a low group of subjects to use and understand logical connectives. In

teaching these subjects, it would be necessary to examine situations in which logical connectives are present and removed from the passages. Behavior before and following the teaching would be sampled and the subject's ability to use and understand logical connectives would be determined.

Concluding Statement

This study compared high and low grade four readers on their use of logical connectives. It was concerned with reading situations in which logical connectives were present in the text material and when these connectives were absent from the text.

Results suggest that within the high and low achievement groups no significant differences occurred when connectives were present and absent. There were some differences between achievement groups, however, with these differences more apparent when the causal connectives were removed from the passages, than when they were present. These results suggest that instruction in use and understanding of causal connectives is necessary for the low achievement group.

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APPENDIX A

Passage 1 C+

Gibble Gabble the Goblin

Gibble Gabble was a goblin who was always getting into some kind of mischief. Mrs. Goblin tied a bell around Gibble Gable's neck.

Mrs. Goblin became very excited because she could not hear the bell. She ran into the deep woods. The music had last come from there. She found Gibble Gabble swimming. The bell made no sound because he was swimming in the water. Mrs. Goblin gave a sign of relief.

Gherkins were another thing Mrs. Goblin worried about. She had warned Gibble Gabble to keep away from the cucumber bed.

"Because you're just the color of a cucumber, Gibble Gabble," she said "you could easily be picked for one".

"I'd run away, Mum," Gibble Gabble answered.

"You would be gathered with a bunch of cucumbers and tossed into a basket. You would not be able to run away. Now remember keep out of the cucumber bed".

Gibble Gabble had promised before he had his bell. "It would be safe enough to go now," he said to himself. "Because the farmer wouldn't pick me now. He'd hear my bell. He knows cucumbers don't ring".

Gibble Gabble didn't know the farmer was deaf. He couldn't hear a thing.

One day Gibble Gabble broke his promise. He went to the cucumber bed. He was gathered with the cucumbers just as his mother said he would be. He squealed for help. He rang his bell frantically. His

mother in the kitchen heard it. She thought Gibble Gabble was diving into the woodland pool. It didn't bother her head a bit. She went on with her baking.

That evening Mrs. Goblin began to worry because Gibble Gabble did not come home. She thought of the cucumber bed. Running to it she saw the cucumbers were gathered. She went home weeping. She was sure she lost Gibble Gabble for evermore.

Passage 1 C-

Gibble Gabble the Goblin

Gibble Gabble was a goblin who was always getting into some kind of mischief. Mrs. Goblin tied a bell around Gibble Gabble's neck.

Mrs. Goblin became very excited. She could not hear the bell. She ran into the deep woods. The music had last come from there. She found Gibble Gabble swimming. The bell made no sound. He was swimming in the water. Mrs. Goblin gave a sign of relief.

Gherkins were another thing Mrs. Goblin worried about. She had warned Gibble Gabble to keep away from the cucumber bed. "You're just the color of a cucumber, Gibble Gabble" she said. "You could easily be picked for one".

"I'd run away, Mum," Gibble Gabble answered.

"You would be gathered with a bunch of cucumbers and tossed into a basket. You would not be able to run away. Now remember, keep out of the cucumber bed".

Gibble Gabble had promised before he had his bell. "It would be safe enough to go now", he said to himself. "The farmer wouldn't pick

me now. He'd hear my bell. He knows cucumbers don't ring.

Gibble Gabble didn't know the farmer was deaf. He couldn't hear a thing.

One day Gibble Gabble broke his promise. He went to the cucumber bed. He was gathered with the cucumbers just as his mother said he would be. He squealed for help. He rang his bell frantically. His mother in the kitchen heard it. She thought Gibble Gabble was diving into the woodland pool. It didn't bother her head a bit, she went on with her baking.

That evening Mrs. Goblin began to worry. Gibble Gabble did not come home. She thought of the cucumber bed. Running to it she saw the cucumbers were gathered. She went home weeping. She was sure she lost Gibble Gabble for evermore.

Questions for Passage 1

Gibble Gabble the Goblin

1. At the beginning of the story why did Mrs. Goblin become very excited?
2. Why did the bell make no sound?
3. Why could Gibble Gabble be easily picked as a cucumber?
4. Why wouldn't the farmer pick Gibble Gabble?
5. Why did Mrs. Goblin begin to worry that evening?

Passage 2 C+

The Woodman's Axe

Many years ago a poor woodman lived with his family in a little house in the forest. He was poor. He worked from early morning until late at night because he had to get enough food for his children.

One day, he was working near a stream. His axe fell into the water. "Oh, my good axe!" he said. "Whatever shall I do without my axe?"

He heard a sweet voice saying, "What is it, poor man? Why are you unhappy?"

"I have lost my axe," he said. "It is all I have to work with, because I cannot buy another".

The water fairy spoke to the woodman. He told the fairy his trouble. She went down, down into the stream. She came up with an axe in her hand. It was an axe of shinning gold.

"Is this your axe?" she asked.

"No, no," said the woodman. "My axe is not gold. Because it is gold, it would buy many of mine."

The fairy went down again. She came up with another axe. This time it was made of silver.

"Is this yours?" she asked.

"No, no!" said the woodman. "This axe is much finer than mine because my axe was made of iron".

The fairy went down again. This time she brought up the woodman's axe.

"That is it," he cried. "Oh, thank you, thank you, good water fairy!"

"Yes," said the fairy, "this is your axe, because you are a good man, both the other axes are yours as well".

Then the woodman thanked the fairy many times. He hurried home to show the beautiful axes to his family.

Now indeed he was happy again. Because there would be money to spend for food and warm clothes. Never again would his children be cold and hungry.

Passage 2 C-

The Woodman's Axe

Many years ago a poor woodman lived with his family in a little house in the forest. He was poor. He worked from early morning until late at night. He had to get enough food for his children.

One day, he was working near a stream. His axe fell into the water.

"Oh, my good axe!", he said. "Whatever shall I do without my axe?"

He heard a sweet voice saying, "What is it, poor man? Why are you unhappy?"

"I have lost my axe," he said. "It is all I have to work with. I cannot buy another".

The water fairy spoke to the woodman. He told the fairy his trouble. She went down, down into the stream. She came up with an axe in her hand. It was an axe of shining gold.

"Is this your axe?" she asked.

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"That is it," he cried. "Oh, thank you, thank you, good water fairy!"

"Yes," said the fairy, "this is your axe. You are a good man, both the other axes are yours as well".

Then the woodman thanked the fairy many times. He hurried home to show the beautiful axes to his family.

Now indeed he was happy again. There would be money to spend for food and warm clothes. Never again would his children be cold and hungry.

Questions for Passage 2

The Woodman's Axe

1. Why did the woodman work from early morning until late at night?
2. When the woodman lost his axe, why was he upset?
3. Why was the first axe the water fairy brought up not the woodman's axe?

4. Why was the second axe much finer than the woodman's?
5. Why did the woodman get all three axes?
6. Why was the woodman happy again?

APPENDIX B

Alternate t-Units

(Fagan, 1978)

The alternate structures which were analyzed are as follows:

Relative Clause:

Gibble Gabble was a goblin who was always getting into mischief.

That + S as Object/Subject/Complement:

He promised that he would keep the bell on.
She was happy that he hadn't got lost.

WH + S as Object/Subject:

Mrs. Goblin knew what Gibble Gabble was up to.
What was going on, didn't please Mrs. Goblin.

Infinitive as Object:

He went out to the lake.

Infinitive of Purpose:

The farmer went in the cucumber patch to pick cucumbers.

Ing-Nominalization:

The farmer started picking the cucumbers.

Ing-Nominalization of Purpose:

His mother put a bell around him so she could hear him coming home.

Adverbial Expansion of Man + S:

Mrs. Goblin became excited so quickly that she left her baking and went to the cucumber patch.

Adverbial Expansion-1 in Place/Time/Manner/Cause:

She asked where they were going?
She heard it when he went to the pool.
He rang the bell as if his life depended on it.
He was not there so she went home.

Adverbial Expansion-2:

When Gobble Gobble went to the cucumber patch and had broken his promise, he got picked.

Common Elements:

This refers to a structure which by itself is incomplete as a basic t-unit but could easily be expressed as such.

The woodman was kind and honest.

The water fairy brought up gold and silver axes.

WH:

Gobble Gobble has a bell he wants to show-you.

WH + Auxiliary/Verb:

He went swimming in the place called the woodland pool.

We saw the woodman cutting down the trees.

Mrs. Goblin tied a bell around his neck.

(That) + S as Object:

She thought they got him.

That + S as Object quotation (the quotation must contain a verb):

The water fairy said, "You are a good man".

Gobble Gobble answered, "I'd run away, Mum".

Comparative 1:

He swims as fast as the other goblins swim.

Comparative 2:

He looked just like a cucumber.

That axe is finer than mine.

With Phrase:

The goblin with a bell started swimming.

Adjective (only in front of the noun):

Gobble Gobble was a mischievous goblin.

The gold axe is not the woodman's axe.

Participle (only in front of the noun; otherwise it is classed as a WH Auxiliary/Verb):

His weeping mother went home.

Genitive:

The gold axe is not the woodman's axe.

APPENDIX C

Sample of Analyzed Recall

The Woodman's Axe

There was a man/ and he lived in the woods/ and he had an axe/
 and he had a (/small/) house/ and one day he was going by a creek/
 or pond/ or something/ and the axe fell out of his hand/ and went into
 the water/ and he was really feeling bad/ because if he didn't work/
 he wouldn't have enough money/ for his family/ so then this fairy came
 along/ and she asked him/ what was wrong/ and he said/ that he lost
 his axe/ and so she went down./ She came up with a (/gold/) axe/ and
 he said/ that it wasn't his/ because it was (/too/) good to be his/
 and his was made of iron/ so she came back up with a (/silver/) one/
 and he said/ it wasn't his/ and so she went back down/ and got an
 (/iron/) one up/ and it was his/ and he thanked the fairy/ a (/whole
 bunch of/) times/ and then he went home/ and he was glad/ and he could
 make money/ for his family./

Basic Structures: 42

Recall Categories:

A - text specific	A - 22
B - text entailed	B - 17
C - text evoked	C - 2
D - text external	C - 1