THE EFFECT OF SENTENCE-REDUCTION AND SENTENCE-EXPANSION PRACTICE ON THE READING COMPREHENSION OF FOURTH-GRADE STUDENTS

A Thesis

Submitted to the Faculty of the Graduate School

of the University of Manitoba

In Partial Fulfillment

of the Requirements for the Degree of

Master of Education

by

Inez Blanche Striemer

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ABSTRACT

The purpose of the study was to investigate the effects of practice in sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion on the reading comprehension of fourth-grade students. Sentence-reduction and sentence-expansion are considered to be procedures which illustrate the association of surface structure to deep structure. Since reading comprehension can be hypothesized to be a similar procedure, its relationship to sentence-reduction and sentence-expansion was the object of this study.

The subjects were 120 fourth-grade students in a suburban, Winnipeg, Canada, school division. First the subjects were assigned to high, middle, and low ability groups based on scores obtained on a structural and a lexical cloze pre-test and then the subjects were randomly assigned to one of four groups--sentence-reduction, sentence-expansion, a combination of both sentence-reduction and sentence-expansion, or control. Each treatment group received ten lessons of 30 minutes each. The control group did not depart from the regular program or timetable. The sentences used for practice were selected from fourth-grade basal readers according to the following criteria: (1) sentences containing structures which elementary-grade students find difficult, and (2) sentence structures which occurred frequently in fourth-grade readers. A structural and a lexical cloze test were administered as post-tests.

Analyses of variance with the factors treatment, ability, and time (gain) indicated no significant interactions among the three factors but there were significant ability by gain interactions. Multiple t-tests with

the Tukey criterion of significance were used to probe the significant interactions and selected nonsignificant treatment by ability interactions.

Qualitative analyses consisting of type to token ratio counts of selected responses were done to investigate the differences in responding to structural and lexical cloze tests. A comparison of noun and verb exact replacements made by the sentence-expansion group revealed that twice as many verbs were correctly replaced on the lexical cloze post-test as had been replaced on the pre-test.

The results of the study led the investigator to conclude that: (1) sentence-reduction and sentence-expansion practice improved the reading comprehension of middle and low ability fourth-grade students, (2) to assess and teach reading efficiently may require tests and instructional materials that match students' instructional level and level of syntactic development, (3) lexical cloze tests result in more accurate responses than structural cloze tests, and (4) qualitative analyses showed that answers to structural cloze tests varied more than answers to lexical cloze tests and that more verbs were correctly replaced in the lexical cloze.

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PURPOSE AND SIGNIFICANCE OF THE STUDY

Purpose

The purpose of this study was to examine the effects of practice in sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion on fourth-grade students' reading comprehension. Since it has been shown that instruction in sentence-combining (sentence-expansion), significantly affects syntactic maturity in writing performance (Mellon, 1969; O'Hare, 1973; Combs, 1975), investigators have hypothesized that sentence-expansion practice may also have a positive effect on syntactic competence in receptive language such as reading comprehension. Others, such as Fagan (1971) and Pflaum (1974) have suggested that teaching children to find the kernel sentences in more complex sentences (sentence-reduction) may also significantly affect reading comprehension.

The aim of sentence-reduction practice was to assist students in breaking down complex sentences into simple or kernel sentences. The aim of sentence-expansion practice was to assist students in combining two or more kernel sentences to produce a compound or a complex sentence. A combination of both sentence-reduction and sentence-expansion practice was aimed at assisting students in breaking down complex sentences into kernel sentences and then recombining them to form paraphrases of the original sentence. The sentences chosen for practice were selected from fourth-grade reading textbooks in Manitoba schools. The sentence-reduction

and sentence-expansion practice involved the manipulation of main and subordinate clauses.

Four general questions were considered in order to examine the above purpose. They were:

1. Will practice in sentence-reduction (finding the kernel sentences in compound or complex sentences) have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

2. Will practice in sentence-expansion (combining kernel sentences to make compound or complex sentences) have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

3. Will practice in breaking down compound or complex sentences into kernel sentences and then recombining them to form either the original sentence or paraphrases of the original sentence have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

4. What is the relationship among the three treatments--sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion--for fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

Each question generated a number of specific hypotheses; these are presented in Chapter 3.

Significance of the Study

The present study was designed to investigate instructional

approaches that would build up students' facility with certain specific language structures which appear in their reading materials. During the past ten years developments in the fields of psycholinguistics and transformational grammar have prompted investigations of the effect of the grammatical structure of language on reading comprehension. Since most mature writers use more grammatically complex structures in writing than in speaking, written language cannot be viewed simply as oral language written down.

> In general, written language is more deliberate, more complex, more heavily edited, and less redundant than spoken language. It also offers no opportunity to question the writer in order to seek clarification of his statements unlike many of the situations in which spoken language is used (Wardhaugh, 1974:110).

The structural complexity of reading material is usually controlled by using readability formulas which measure average sentence length and the number of difficult words (Dale and Chall, 1948; Spache, 1953). The difficulty level of children's reading material can be increased or decreased along these two dimensions. Realizing that average sentence length alone is not an adequate measure of syntactic complexity, efforts have been made to find better methods of measuring syntactic influences on the reading process. Yngve (1960) devised a method of deriving word depth through analysis of the syntactic constituent structure of a sentence and Bormuth (1966) found that linguistic variables such as words per independent clause and pronoun/conjunction and verb/conjunction measures affected readability. In the absence of reliable and valid guides to control the syntactic density of reading materials, Botel et al (1973) and Golub (1975) developed formulas to measure the syntactic complexity of reading materials. Our present

understanding of grammar indicates that certain types of shorter sentences may be much more complex and difficult to understand than longer sentences of a less complex syntactic structure (Granowsky and Botel, 1974). There is a need, therefore, to examine the difficulty level of children's reading materials in conjunction with their level of syntactic competence.

Researchers have found that sentence patterns may be of critical importance to the degree of understanding which a child derives from what he reads (Strickland, 1962; Ruddell, 1963; Smith, 1971; Fagan, 1971). There is evidence to suggest that the oral and written syntactic growth of children continues throughout the school years (O'Donnell, Griffin and Norris, 1967; Chomsky, 1972; Loban, 1976) and that the rate of acquisition of syntactic structures varies enormously (Loban, 1963; 1976). A psycholinguistic view of reading such as held by Goodman (1976) and Smith (1973) suggests that a knowledge of syntax is a basic prerequisite for writing and reading comprehension.

Researchers and educators (Strickland, 1962; Pflaum, 1974) who have examined basal readers have found no scheme for control over sentence structure of ". . . growth factor related to language development in . . . stories" (Pflaum, p. 8). Various syntactical structures appeared to be introduced in a rather haphazard manner and longer sentences with higher clause density often occurred at lower grade levels than at higher levels. Fagan (1971) found that samples from three Canadian basal reading series contained numerous complex structures and that students found many of these structures difficult to understand. Findings such as the above have led to the conclusion that children's reading

comprehension might be improved not only through more careful control of syntactic complexity of their reading materials, but also by helping them to acquire more explicit knowledge of basic syntactic units. Pflaum (1974) states, ". . . I do not feel that all difficult structures should be eliminated from written materials since reading is a major source for language growth; it is simply that we should present ways for understanding them."

A review of research investigating the effects of sentence-reduction and sentence-expansion practice on reading comprehension has shown a need for further study. Kurushima (1979) found that sentence-expansion practice significantly affected the reading comprehension of third-grade students as measured by experimenter-constructed cloze tests but Combs (1975), Levine (1976) and Straw (1978) obtained both significant and non-significant results, depending on the type of comprehension test used. Although Simons (1970) demonstrated that there was a relationship between children's skill at recovering the deep structure of sentences and their reading comprehension, very few researchers have investigated this relationship. Straw (1978) found that subjects receiving sentence-reduction instruction performed significantly better than subjects following a textbook approach but they did not differ significantly from subjects receiving sentence-combining treatment. A few experimenters (Stedman, 1971; Fisher, 1973; O'Donnell and King, 1974) have investigated the effects of both sentence-reduction and sentence-expansion practice on students' reading comprehension. In the Stedman and Fisher studies some subjects showed significant gains while others did not but O'Donnell and King found no significant gains.

The following concerns prompted the author to undertake this study: (1) complex sentence structures are not edited out of children's reading textbooks, (2) not all children understand the sentence structures used in their reading textbooks, and (3) although research evidence has indicated that both sentence-reduction and sentence-expansion practice may positively affect students' reading comprehension, results have remained inconclusive. While a few researchers have investigated the effect of both sentence-reduction and sentence-expansion on reading comprehension and some have investigated the effect of either sentence-reduction or sentence-expansion, none, to the author's knowledge, have considered which of the approaches has a greater effect--sentence-reduction, sentence-expansion or a combination of both sentence-reduction and sentence-expansion practice.

This study sought to investigate the above approaches by comparing the results obtained by three experimental groups and a control group on measures of reading comprehension after the experimental groups had participated in practicing either sentence-reduction, sentence-expansion or a combination of both sentence-reduction and sentence-expansion. This study also differed from other studies in that practice sentences were taken directly from the students' reading materials to determine the effect of instruction which utilized student-materials. This does not appear to have been previously investigated. Further, two types of cloze tests (lexical and structural) were used in an effort to assess results more accurately.

Theoretical Foundations

Instruction and practice in sentence-reduction and sentence-

expansion may assist students in understanding the grammatical signals conveyed in written language and thus improve reading comprehension. The assumptions underlying instruction in sentence-reduction and sentence-expansion are based on theories of transformational grammar and psycho-linguistic theories of reading.

Chomsky's (1965) theory of syntax expressed in a transformational-generative grammar has had far-reaching implications in explaining how individuals speak and understand sentences. In this theory a grammar must generate, specify, and predict the possible sentences of a language and explicitly indicate what the possible sentences of a language are. A generative grammar attempts to make a comprehensive account of the rules which are employed either consciously or unconsciously by a speaker. Chomsky's tripartite structure includes deep structure, transformational rules, and surface structure. Abstract representations which most clearly reflect the meaning of a sentence are the deep structures of sentences. They are acted upon by transformations to produce surface structures, which are then acted upon by phonological rules to produce the sentences which speakers utter.

A kernel sentence is an aspect of the deep structure which represents the various acceptable strings to which transformational rules may be applied. Thus, from a small set of basic sentences (kernel sentences) all other sentences (non-kernel) may be derived through various transformations. The meaning of a sentence is represented by its deep structure while the form in which a sentence emerges in speech or writing is represented in its surface structure.

Transformational analysis has provided an effective method of

linguistic analysis. Researchers of language development have found evidence to suggest that the frequency and complexity of transformations used in producing sentences provide a means of measuring linguistic maturity (e.g. O'Donnell, Griffin and Norris, 1967; O'Donnell, 1974).

Investigations into the effects of transformed syntactic structures on reading indicate that many children have difficulty in comprehending some of the most basic structures by which information is conveyed in language (Bormuth et al, 1970; Smith, 1970; Fagan, 1971). C. Chomsky (1972) also found high correlations between sophistication of language knowledge and reading experience. According to Hunt (1965) and Fagan (1971), it is the number and types of transformations that affect reading comprehension. The surface structures of sentences provide listeners and readers with the substance from which underlying forms are processed but it is at the deep structure level that sentences must be interpreted. While sentences are perceived at the level of surface structure they are comprehended at the level of deep structure. Readers and listeners must reconstruct the underlying deep structures (Wardhaugh, 1969:68). It seems logical to conclude that instruction which is designed to assist students in understanding written language structures would also improve their reading comprehension.

According to Fodor, Bever, and Garrett (1974:313), ". . . it is a primary goal of theory construction in psycholinguistics to provide recognition models for the recovery of each psychologically real level of linguistic structure." The approaches that have been proposed operate on the assumption that sentence recognition or perceptual analysis of sentences involves the recovery of deep structures from

strings of words (surface structure). The analysis-by-analysis model suggests that in recognizing sentences the rules of generative grammar are applied backward. Fodor, Bever, and Garrett (1974:314) state: "In the analysis-by-analysis approach, at each stage of the recognition process, we search through the rules of syntax until we find one with a range satisfied by the tree [structure] under examination. The tree [structure] is then rewritten so as to satisfy the domain of the rule in question." This model of reverse transformations implies a relationship between sentence-expansion ability and reading comprehension, that is, the reader combines various deep structures (kernels) to construct the surface form of a message.

The analysis-by-analysis procedure assumes the existence of a recognition device employing a "preanalyzer." The preanalyzer assigns surface structure to lexical strings and is a component which is not found in generative grammar. The difficulty with this model then, is the question of how the preanalyzer is constructed.

Another perceptual device for syntax recognition is the analysis-by-synthesis model. In this model the grammar is used to search for potential structural descriptions which are tested against the input strings. When a match is made between the internally generated signal and the input, the search stops. The structural analysis of the input is determined by the grammatical rules used in producing the successful matching signal. "Thus, on the analysis-by-synthesis account, a grammar is literally a part of a sentence recognizer, and the grammatical generation of a sentence is literally part of recognizing it" (Fodor, Bever, and Garrett, 1974:316). Neisser (1967:252) explains: "We deal with the

sentences we hear by reformulating them for ourselves; we grasp their structure with the same apparatus that structures our own utterances." Thus, the analysis-by-synthesis model implies a relationship between sentence-reduction ability and reading comprehension. The reader determines the deep structures (kernels) of a sentence and matches them against the surface structure. Goodman (1976:498), using similar reasoning, suggests that the efficient reader develops ". . . skill in selecting the fewest, most productive cues necessary to produce guesses which are right the first time."

Fodor, Bever, and Garrett have criticized the analysis-by-synthesis procedure because it makes inefficient use of input data in formulating hypotheses and searching the possible matches. Both the analysis-by-analysis and analysis-by-synthesis models predict a direct relationship between the number of grammatical operations in generating a sentence and the complexity level of the sentence. A number of psycholinguistic studies of generative grammar have investigated this relationship--termed the Derivational Theory of Complexity (DTC).

In the experiments reviewed by Fodor, Bever, and Garrett the results showed that sentences involving fewer transformations required less storage and thus supported the DTC as well as the analysis-by-analysis and analysis-by-synthesis accounts of the sentence recognition process. However, studies such as that of Slobin (1966) have shown that difficulty level of a sentence is affected by the type of transformation rather than by the length of the sentence. Thus, a decisive resolution has not been provided by the DTC or the analysis-by-analysis and analysis-by-synthesis models.

Since the deep structure of a sentence can be hypothesized as a tree, or constituent structure, composed of one or more "sentoids," the process of recovering the deep structure of a sentence may be viewed as grouping together words which belong to a common sentoid. Experiments investigating the effects of surface clause boundaries have supported the hypothesis which suggests that clausal structure determines the units of perceptual analysis in sentence processing (Fodor et al, 1974:341; Massaro, 1975:403). In this theory, the clause functions as a perceptual unit because within this structure the hearer is able to use his knowledge of linguistic redundancies to make successful predictions about the content of the sentence. But further study has revealed that segmenting sentences into clauses did not account for proper comprehension. Comprehension also involved labeling grammatical relations among phrases contained in clauses and specifying the relations of subordination and superordination among clauses (Fodor et al, 1974:356). As well, there was a relation between the surface order of main and subordinate clauses and the comprehensibility of sentences (Clark and Clark, 1968).

Theoretical and experimental arguments for a perceptual model which concretely recognizes grammar in sentence recognition appears to be somewhat dubious. No one knows how recognition devices work or what linguistic universals describe psychologically real systems. There is a need to develop paradigms that more closely reflect the demands placed on a subject in processing speech and text for meaning (Massaro, 1975:427).

To summarize, this section has discussed some theoretical

concerns related to the grammatical rules which sentence recognition procedures employ. The limitations of the proposed models indicate the necessity for further empirical investigation. Researchers in reading have suggested at least two possible instructional approaches to assist students in processing the underlying forms of sentences: (1) enhancing children's syntactic skills through sentence-combining exercises (Mellon, 1967; Miller and Ney, 1968; O'Hare, 1973; Straw, 1978) as suggested by the analysis-by-analysis model, and (2) teaching children how to analyze difficult structures into components or kernel sentences (Fagan, 1971; Pflaum, 1974) as suggested by the analysis-by-synthesis model. The effects which these instructional approaches may have on reading comprehension are the objects of investigation in this study.

Definition of Terms

The following operational terms have been used throughout this study and have been defined as follows:

1. Syntactic Growth: Syntactic growth refers to a language user's acquisition of the syntactic properties of a language resulting in the ability to produce and understand syntactic structures.

2. Syntactic Complexity: Syntactic complexity reflects the amount of subordination or number of sentence-embedding transformations in a sentence.

3. Kernel Sentence: A kernel sentence is a simple, basic sentence containing a single subject and a single finite verb.

4. Deep Structure: Wardhaugh (1969:152) defines deep structure as "the abstract structure postulated as underlying a sentence. It contains all the information necessary for the semantic interpretation of

that sentence." A kernel sentence is an aspect of the deep structure which represents the various acceptable strings to which transformational rules may be applied.

5. Surface Structure: Surface structure refers to "the relationships among words of an actually observed sentence" (Wardhaugh, 1969:160). The surface structure, generally, is made up of one or more transformations of the deep structure.

6. Compound Sentence: A compound sentence contains two or more sentences conjoined by a coordinate conjunction.

7. Complex Sentence: A complex sentence contains one or more subordinated or embedded sentences.

8. Embedding: Embedding refers to the inclusion of one sentence in another sentence. Structurally, an embedded sentence cannot stand along since it is a subordinate constituent of another sentence.

9. Deletion: Deletion refers to the omission of certain words such as those marking the beginning of a clause, or omitting common elements of sentences when one sentence is embedded in another sentence.

10. Transformation: From basic kernel sentences, variations can be generated by moving or adding appropriate parts of speech.

11. Sentence-Expansion: Sentence-expansion is the process of combining two or more simple sentences to form a compound sentence or embedding one or more sentences in another sentence by means of transformations to form a complex sentence.

12. Sentence-Reduction: Sentence-reduction is the process of reducing a compound or complex sentence to two or more simple sentences.

13. Structural Cloze Test: For the purposes of this study, a

structural cloze test is one in which every fifth word has been deleted according to an "any word" procedure (Taylor, 1957; Weaver, 1977).

14. Lexical Cloze Test: For the purposes of this study, a lexical cloze test is one in which nouns (including pronouns), verbs (including auxilliaries), adjectives and adverbs have been deleted on a predetermined basis.

Limitations of the Study

1. The investigation was limited to analyzing data for fourth-grade students in two schools in one suburban school division and cannot be generalized beyond this setting.

2. Due to time constraints imposed by the school division, the study consisted of only ten lessons over a five-week period.

3. Measurement of the students' performance was limited to the accuracy and validity of the structural and lexical cloze tests used as measuring devices.

4. The experimenter administered the tests and instructed the experimental groups but did not instruct the reference group. Experimenter bias cannot be ruled out.

Assumptions

The following assumptions were made:

1. That the pre- and post-cloze tests used in the study were equivalent in readability level and syntactic complexity.

2. That the effectiveness of the various treatments was reflected by the students' performance on the post-test cloze scores.

3. That the students participating in the study were

representative of fourth-grade students in the school division in which the study was conducted.

Overview of the Study

This study examined the effects of practice in sentence-reduction and sentence-expansion on subsequent measures of fourth-grade students' reading comprehension.

Chapter 1 has stated the purpose of the study, discussed the significance of the problem, described the theoretical foundations for the study, defined terms of importance to the study and listed the limitations and assumptions of the study. The chapter concluded with an overview of the study.

Chapter 2 will review literature and research related to the study.

Chapter 3 will present a description of the pilot study, the sample, the design of the study and the research procedures and materials used in the study.

Chapter 4 will present an analysis of the data.

Chapter 5 will present a summary of the findings, conclusions drawn from these findings, implications for educational practice and suggestions for further research.

Chapter 2

REVIEW OF RELATED LITERATURE

The purpose of this study was to investigate the effects of practice in sentence manipulation, namely sentence-reduction and sentence-expansion, on subsequent measures of fourth-grade students' reading comprehension. This chapter will review, from a pedagogical perspective, studies which are relevant to that purpose and deal with the relationship of syntactic structure to reading comprehension. The first section will present studies concerned with the language development of school-aged children in speaking, writing and reading to provide insight to the continuing growth of language competence during this period. Next, the discussion will center on the effects of various language structures on reading comprehension and then studies dealing with the effects of sentence-expansion and sentence-reduction practice on reading comprehension are reported.

Language Development of School-aged Children in Speaking, Writing, and Reading

Much research on the syntactic structure of language has focused on oral language and beginning language acquisition. Studies taking a transformational-generative perspective such as Menyuk (1963) have suggested an orderly development of syntactic transformations and stages. Investigations of the oral and written language of school-aged children have produced evidence of continued syntactic growth in speaking and writing as well as developmental stages in syntactic growth (C. Chomsky,

1972; Loban, 1976) throughout the school years. The possibility of a relationship between the differing syntactic patterns and the comprehension of written language (Strickland, 1962; Ruddell, 1963) has led to the idea that if instruction were geared to enhance the syntactic growth of children it might also improve their reading comprehension. The availability of units of analysis from modern theories in structural and transformational linguistics has provoked interest in exploring the effects of various syntactic structures upon the reading process.

The first major investigators to use a structural linguistic approach to examine the relationship between reading and oral syntactic facility were Strickland (1962), Ruddell (1963), and Loban (1963; 1976). Strickland analyzed the structure of children's language in the second through the sixth grade and compared it with the structure of language in the books used to teach children to read. She did not measure the readability of textbook material but rather compared a descriptive analysis of the structure of the sentences used by children with the structure of sentences in selected samples of textbook material for the same grade level.

Strickland devised a new method of analyzing oral language samples by using an approximate sentence called a phonological unit. The phonological unit was a unit of speech ending with a distinct falling intonation which signaled a terminal point. Analysis of children's language revealed that children at all grade levels used a wide range of language patterns. Although there were no significant correlations between children's oral language patterns and reading achievement in the primary grades, there were a few significant correlations between these

variables by the sixth grade. Superior readers used long sentences in oral production and more linguistic patterns.

Loban's (1976) longitudinal study of children's language and the relationships between speaking, listening, writing and reading has made a significant contribution to research on linguistic maturity. Samples of children's language were collected at regular intervals for thirteen years, from kindergarten through grade twelve.

The major purposes of Loban's investigation were to determine the differences between those who use language effectively and those who do not and to determine whether children's language follows predictable sequences. He found that the development of power over language varies among children and that ". . . linguistic 'stages' are no more discrete, no more sudden, than the stages of physical growth . . ." but if primary school language development is compared to that of grades 7 to 9 or grades 10 to 12 then ". . . the degree of development is as apparent as physical growth" (p. 85). From combining his findings with those of Watts (1948), Hunt (1965) and O'Donnell, Griffin and Norris (1967), Loban (1976) was able to draw up an age chart of sequence and stages of language development (see Figure 2.1).

In oral language there was a steady growth in the average number of words per communication unit, the average number of dependent clauses per communication unit, and total elaboration of subject and predicate during the elementary school years. In grades seven, eight, and nine (and sometimes continuing into grade ten) this growth slowed down or entered a plateau which was usually followed by greater velocity in growth in senior high school.

Ages 5 and 6	Ages 6 and 7	Ages 7 and 8
Oral communication:	Oral communication:	Oral communication:
Settle use of pronouns and verbs (present and past tense, inflections)	Further progress in using complex sentences (adjectival clauses)	Use relative pronouns as objects in subordinate adjectival clauses; gerund phrase as an object of a verb
More frequent use of complex sentences	Clauses beginning with if	Clauses beginning with when, if, and because
Conditionality and causality expressed by why, because and if	Average number of words per communication unit is 7.5, range is 6.6 to 8.1	Average number of words per communication unit is 7.6, range is 7 to 8.3
Average number of words per communication unit is 6.8 to 7, range is 4 to 9.5	Written communication (grade two):	Written communication (grade three):
	Average number of words per communication unit ranges from 6.9 to 8.3	Average number of words per communication unit is 6 and 7

Figure 2.1

Age Chart of Sequence and Stages of Language Development Combining the Findings of Watts, Hunt, O'Donnell et al, and Loban as reported by Loban (1976)

Figure 2.1 (continued)

Ages 8, 9 and 10	Ages 10, 11 and 12
Oral communication:	Oral communication:
Use connectors such as meanwhile, unless, even if; approximately 50% use although correctly	Use complex sentences with subordinate clauses introduced by connectives like provided that, nevertheless, in spite of, unless
Begin to use the present participle active, perfect participle, and the gerund as the object of a preposition	More frequent use of auxiliary verbs like might, could, and should
Average number of words per communication unit is 9, range is 7.5 to 9.3	Emergence of if this, then (probably) that as applied to temporal things
Written communication:	Average number of words per communication unit is about 9.5, range is 8 to 10.5
Average number of words per communication unit for boys is 8.1 and for girls is 9.0, range is 6 to 9	Written communication:
Compared to twelfth grade, fourth-graders have achieved 46% of their total growth	Average number of words per communication unit is 9, range is 6.2 to 10.2, depending on verbal proficiency

In written language there were plateaus and spurts in the growth of the average number of words per communication unit in the secondary schools. The High group excelled on the average number of clauses per communication unit from grade four to grade eight while the Low and Random groups accelerated at eighth grade. All groups showed rapid growth in writing from grade nine to grade ten. In grade ten, eleven, and twelve the Low and Random groups caught up to the High group in the written use of dependent clauses but the High group developed a more sophisticated strategy of replacing dependent clauses with more efficient subordination. The High group spurted ahead with increased velocity in grade twelve.

Loban found that subjects proficient in oral language excelled both in reading and in written language. Those who were superior in language in kindergarten and grade one excelled in reading and writing by the time they were in sixth grade. He found a positive relationship of success among the language arts.

Hunt (1965) studied the written language of skilled adults and school children in grades four, eight, and twelve to search for developmental trends in the frequency of various grammatical structures written by students (Figure 2.2). He introduced a new measure, the "minimal terminal unit" or T-unit, which included one main clause plus all the subordinate clauses attached to, or embedded within it, and used it as an index to determine syntactic maturity.

Hunt found that as children matured from grades four to twelve, they wrote an increasing number of words per clause as well as more clauses and more words per T-unit. The number of sentence-combining

	Grade 4	Grade 8	Grade 12
Average length of clauses	6.6 words	8.1 words	8.6 words
Achievement	77%	94%	100%
Average length of T-units	8.6 words	11.5 words	14.4 words
Achievement	60%	80%	100%
Average sentence length	13.5 words	15.9 words	16.9 words
Achievement	80%	94%	100%

Figure 2.2

Language Development of Written Structures
(Hunt, 1965)

transformations also increased with age as children wrote fewer T-units per sentence. Since adults used a much greater number of transformations in combining and embedding sentences per clause and per T-unit, Hunt concluded that the increase in clause length was due to maturity.

In another investigation, Hunt (1970) studied the ability of students in grades four, six, eight, ten, and twelve and skilled adults to use sentence-combining transformations. The subjects were asked to rewrite a passage written in the form of extremely short kernel sentences in order to provide many opportunities for the use of sentence-combining transformations.

The findings of this study revealed that fourth-grade students retained 31 of 32 kernels while sixth-graders retained only 16. Eighth-graders retained 9 clauses and the adults retained 6. The process of selecting main clauses became sharper during the eight school years with increasing sense of which clauses deserve main clause status. According to Hunt, "linguistic maturity consists chiefly in the ability to make many embedments per clause and wider variety of transformations" (p. 36).

O'Donnell, Griffin and Norris (1967) used Hunt's T-unit as one of their measures of syntactic maturity for both the oral and written language of children in grades three, five, and seven. The language samples consisted of children's oral and written responses to two short movie films. The findings were similar to those of Hunt, indicating that as children mature they are able to use more complex syntactic structures. In writing, subordinate clauses per T-unit as well as T-unit length increased with each grade level. The findings for oral

language samples were similar to those for written samples, with the number of T-units and the number of words per clause also increasing at each grade level. Researchers investigating the language growth of children in the primary grades have found rapid growth at this level as well (Ciani, 1976).

Carol Chomsky (1972) studied linguistic competence in children aged six to ten years with respect to certain complex aspects of English syntax. She tested children's comprehension of nine complex structures by eliciting information by direct interview. In all structures the listener was required to fill in a missing item in order to understand the sentence. The listener was given only the surface structure of the sentence, requiring recreation of its underlying form. If a child had not yet mastered the rules governing deletions from the underlying surface structures, the wrong interpretations would be made.

Chomsky found that children interpreted unfamiliar language structures in the same way as those familiar to them and that grammatical development proceeded from simple to complex structures according to an invariant sequence. Contrary to previous assumptions (Menyuk, 1977:90) her findings showed that syntactic development is not almost completed by age five and that it continues long after this age. In surveying children's reading background, Chomsky also found a strong correlation between language development and reading experiences (.05 level).

It has been clearly demonstrated that growth in syntactic ability occurs in all areas of language development during the school years. This ". . . realization that syntax acquisition is not totally a preschool phenomenon has raised questions about its relationship to reading

achievement that research has not satisfactorily answered" (Harris, 1975). The possibility that children may be at a level of syntactic development and competence that does not match the syntactic complexity level of their reading materials may bear a relationship to their reading achievement. Then one might ask: Would students benefit from instruction which promotes an understanding of syntactic structures found in their reading textbooks? This is a question which the present study attempts to examine.

Language Structure and Reading Comprehension

Ruddell (1963) studied the effect of oral and written patterns of language structure on the reading comprehension of fourth-grade students. Using the language patterns discovered by Strickland, he constructed six reading passages utilizing frequently used syntactic patterns in the oral language of fourth-grade children. Ruddell found a significant correlation (.68) between high and low frequency patterns of language structure and scores on reading comprehension. Following the basic methodology of Ruddell's study, Tatham (1970) confirmed these findings. The reading comprehension of fourth-graders was significantly greater on materials containing language patterns that appear with a high degree of frequency in their oral language.

Smith (1971) conducted a study to determine whether syntactically more complex structures increase reading difficulty or whether all children have the same syntactic skills and read material written at different levels of syntactic maturity with equal facility, provided vocabulary and content are held constant. The subjects were randomly selected from each of the grades four through twelve and test instruments were derived from a transformational analysis of the data from

Hunt's (1970) study. First, the "Aluminum" passage was constructed as rewritten by "typical" fourth-, eighth-, and twelfth-graders and skilled adults and then a cloze exercise was constructed in which every fifth word was deleted. Smith discovered that fourth-, fifth-, and sixth-grade students find fourth-grade writing easier to read than writing by more mature students but eleventh-grade students read fourth-grade writing with least facility. Students in grades eight through twelve found eighth-grade writing easier to read than either fourth-grade writing or the more complex writing of twelfth-graders or skilled adults.

Using the same subjects, Smith (1973) extended this study three months after the first experiment. From analysis of the students' written passages in the first experiment, conversion tables were constructed to allow the preparation of new passages representing the same levels of writing (fourth grade, eighth grade, twelfth grade and skilled adult). Content and vocabulary were the same for all passages. These new passages were read by the subjects and the results were compared to the previous study. There was a high correlation between the two studies and the same trends were observed. The results of Smith's studies lend support to those of Ruddell (1963) and Tatham (1970) which seem to indicate that a student's productive language level may determine the best receptive level. Reading comprehension may be best when the organization of textual materials matches the reader's own level of language development.

Using two samples of second-grade children, Nurss (1969) investigated the relationship between oral reading errors and sentence complexity to determine whether more complex syntactic structures

retard children's understanding of sentences more frequently than less complex sentences. The structural patterns in the reading passage were patterns present in the subject's oral language and the vocabulary was limited to words in their reading vocabularies. The sentences represented three levels of complexity as measured by Allen's (1964) analysis of structural depth. An analysis of errors revealed significant effects beyond the .05 level due to syntactic complexity for hesitations, self-correction and total errors. Sentences having high structural depth produced more oral errors indicating a possible relationship between the number of oral reading errors and the syntactic complexity of the sentences.

In an experiment using eye-movement photography, Froese, Braun, and Neilsen (1975) photographed seventh-graders during silent reading of three different passages. They found that the number of fixations increased and reading comprehension decreased on difficult selections. Analysis of the linguistic composition of the reading passages revealed little difference in the number of T-units per passage but there was a sharp increase in the number of sentence-combining transformations, suggesting the possibility of a relationship between linguistic structure and reading comprehension.

Isakson and Miller (1976) studied fourth-grade students to determine whether children of varying comprehension abilities also vary in the degree to which they perceive syntactic and semantic relationships. Readers having adequate word recognition ability but poor comprehension were compared with students having both adequate word recognition ability and adequate comprehension. Sensitivity to sentence

structure was determined by manipulating syntactic and semantic agreement between the main verb and other key parts of the sentence. An increase in reading errors when violations of constraints were encountered indicated that good comprehenders were sensitive to language constraints while poor comprehenders were not affected in their reading errors by the presence of semantic and syntactic violations. Since this study compares the reading behavior of subjects who differ on comprehension ability but not on word identification skill, the investigators attributed the difference between the two groups to the use they made of language structure.

Studies such as the ones presented in this section have firmly established the opinion that there is a positive relationship between the syntactic structure of written language and children's comprehension when the text contains familiar language patterns. Reading materials which contain complex syntactic structures are more difficult for children to comprehend.

Language Structures which Children Find Difficult to Comprehend

A number of researchers have attempted to determine the types of language structures which children find difficult. Bormuth, Manning, Carr, and Pearson (1970) examined fourth-grade children's literal comprehension of between-and-within sentence structures in passages written at or below a grade four level. They constructed four question types to test comprehension skill in responding to questions which delete one of the immediate constituents of a syntactic structure. The following types were examined: (1) a simple rote question (e.g. "Who

rode the steed?"); (2) a question that included one transformation (e.g. "By whom was the steed ridden?"); (3) a simple question involving a semantic substitute for one of the words in the first question type (e.g. "Who rode the horse?"); and (4) a compound question that included a semantic substitute as well as one transformation (e.g. "By whom was the horse ridden?"). Questions which children found most difficult were compound questions and transformed paraphrase questions. The most startling result for the investigators was that a large proportion of children were unable to demonstrate comprehension of the most basic syntactic structures. The variation between questions measuring different skills was significantly greater than the variation between items measuring the same skill. Since the structures and question types differed significantly in difficulty, the researchers considered this as evidence that many of these skills are also hierarchically related.

Using third- and fourth-grade students, Lesgold (1974) conducted a study similar to that of Bormuth et al in an attempt to replicate the order for anaphoric forms. Lesgold elicited oral responses rather than written responses and controlled the number of semantically plausible answers for each passage. The subjects in Bormuth's study comprehended some forms better than those in Lesgold's study and vice versa. These order differences led Lesgold to conclude that the difficulty ordering of syntactic structures is not stable and that more control of semantic factors is required before it is possible to find measures of "pure" syntax ability. Bormuth used a free response format while Lesgold constructed a multiple choice task. The radically different orderings of the anaphoric forms obtained by the two studies may suggest that when

sentence complexity is not held constant, it may affect the observed difficulty of these forms.

Robertson (1966) analyzed sentences in several fourth-, fifth- and sixth-grade basal readers and then constructed a 150-item multiple choice Connectives Reading Test to test the grammatical usage of seventeen subordinating and coordinating connectives among children in grades four through six. Distractors were constructed according to three categories: (1) semantically correct but incorporating a grammatical error; (2) a clause expressing a situation incongruent with the stem; and (3) a clause predicated on the use of an entirely different connective from the one being tested. The total group score on the test was 57% for grade four, 66% for grade five, and 75% for grade six with grammatical errors forming the largest category. It appeared that students who chose the distractor understood the meaning but may not have noticed the grammatical error. Indications are that children's understanding of connectives matures gradually throughout the school years, but it is not clear whether this understanding is syntactic or semantic or both.

Stoodt (1972) explored the relationship between fourth-grade students' understanding of grammatical conjunctions and reading comprehension. She designed a multiple-choice Comprehension of Conjunctions Test assessing many of the conjunctions tested by Robertson, to investigate the relationship between reading comprehension and comprehension of conjunctions. Stoodt's results correlated highly with data from the Stanford Achievement Test in reading and with mental ability as measured by The Pinter Mental Ability Test, but the order of difficulty which

Stoodt found differed from Robertson's. Stoodt's Comprehension of Connectives Test appears to be a vocabulary definition test rather than a test of understanding the grammatical function of conjunctions. This assumption was also supported by the high correlations with a traditional reading test such as the Stanford Achievement Test, since word knowledge is an important aspect of measurement in these tests (Simons, 1970). The grammatical knowledge of conjunctions may not have been tapped in Stoodt's test and may account for some of the differences between her findings and those of Robertson. Understanding the vocabulary meaning of a conjunction may not be equivalent to the grammatical knowledge of the relationship signalled by a conjunction.

Sauer (1970) investigated the relation between a knowledge of grammatical structure and reading comprehension of fourth-grade children by testing their ability to translate four basic sentence patterns from a nonsense language into English. Using Loban's (1963) delineation of basic sentence patterns, the following content patterns were used in the test sentences: (1) Noun-Verb; (2) Noun-linking Verb-linking Verb-complement (noun, adjective, adverb); (3) Noun-Verb-Object; and (4) Noun-Verb-Indirect Object-Direct Object or Noun-Verb-Object Complement. Translation of the nonsense language patterns into English sentences required the children to demonstrate sensitivity to the elements of word order and word form, to use these signals to assess the relationships of sentence parts, and to synthesize this information into total sentence meaning.

The most difficult language pattern for the children was pattern 4 (above). These findings are supported by those of Strickland

(1962) and Loban (1963; 1976), who found that patterns 1 and 3 were most commonly used by children and that patterns 2 and 4 were typical only of more sophisticated language users. Sauer's results also suggested the following sequence of structural complexity levels of sentences, from easiest to most difficult to translate: (1) sentences containing single words in pattern slots; (2) sentences with phrases in sentence slots; and (3) sentences containing clauses. These findings are in agreement with those of Hunt (1970) and O'Donnell et al (1967) who concluded that sophistication in language use is evidenced by the use of phrases or clauses to increase the information load of sentences.

The difficulty with which school children comprehend anaphoric forms has been demonstrated in studies by Bormuth et al (1970) and Lesgold (1974). Therefore, the frequency with which anaphora occur in primary and intermediate texts led Richek (1976a) to believe that a gap might exist between children's abilities to comprehend and the demands of the school curriculum. She suggested two possible solutions to the problem: either improving the linguistic abilities of children or manipulating reading materials to match children's skills.

Using third-grade children as subjects, Richek explored the latter mathod through use of paraphrase alterations. Two third-grade readers were surveyed and sentences used in the study were sentences actually found in one of the readers or adapted. Three anaphoric forms (noun, pronoun and null) were inserted into conjoined sentences containing two independent clauses joined by a connective. Four complexity variables were also incorporated into the experiment: kernels (zero or two); length (short or long); parallelism (parallel or switched) and question

(questioning of subject or non-subject). Children found the noun forms easiest, pronoun forms next most comprehensible and null forms least comprehensible. Of the four complexity factors, only the question variable significantly affected difficulty. Post hoc analysis of some of the data revealed that noun complements and sentences containing relative clauses correlated positively with errors at the .05 level. These findings indicate that school-aged children do not have complete mastery in comprehending the syntactic structures of their reading materials (such as those tested in this study).

Guthrie (1973) investigated to what extent syntactic cues are used differently by good and poor readers in silent reading and whether different form classes were comprehended with different degrees of proficiency. The subjects ranged in age from seven to ten years. In each reading passage there were four categories of slots for form classes: noun, verb, modifier and function. Students comprehended form classes with equal levels of proficiency, but the number of occurrences of syntactic responses was lower for nouns and modifiers ($p < .01$) and the number of lexical responses was higher ($p < .05$). These results led Guthrie to believe that the comprehension of verbs and function words in silent reading were determined by syntactic cues, while the comprehension of nouns and modifiers were determined by semantic cues.

In summary, some of the language structures which investigators have found to be difficult for children in the elementary grades include the following: (1) translating the noun-verb indirect object-direct object or noun-verb object-complement language patterns (Strickland, 1962; Loban, 1963; O'Donnell, Griffin and Norris, 1967; Sauer, 1970);

(2) comprehending transformed questions (Bormuth et al, 1970); (3) understanding some connectives--syntactically, semantically or both (Robertson, 1966; Stoodt, 1972); (4) comprehending anaphoric forms (Bormuth et al, 1970; Lesgold, 1974; Richek, 1976a); (5) understanding relative clauses and noun complements (Richek, 1976a); and (6) using syntactic cues in comprehending verbs and function words (Guthrie, 1973).

Transformations, Deep Structures and Surface Structures of Sentences, and Reading Comprehension

In 1966, Hunt stated:

> Little by little the evidence piles up that the reduction and consolidation of many clauses into one is ultimately related to syntactic growth both in writing and in reading. If writers must build up clauses, then readers must break them down. A whole new range of applications is opened up for approaching reading difficulty (p. 739).

Since that time, there has been considerable research concerning the "breaking down" of complex language structures.

Studies using a transformational-generative model of grammar have shown the importance of deep structure in sentence recall. Mehler (1963) studied the recall of English sentences among college students. The subjects had a tendency to simplify syntactic structures and to omit or apply transformations. He concluded that in recalling a sentence subjects analyze it syntactically and encode it as a kernel sentence plus appropriate transformations rather than repeating it verbatim.

Blumenthal (1967) studied the recall of two sentence types having similar surface structures but different final nouns which had different grammatical functions not evident from the surface structure. He found a significant difference in recall when the final noun was

given as a cue, leading him to conclude that recall differences corresponded to the differences in the underlying deep structures of the sentences.

Simons (1970) studied the relationship between children's skill at recovering the deep structure of sentences and reading comprehension by constructing and administering the Deep Structure Recovery Test to fifth-graders. First, Simons studied the relevance of deep structure to reading comprehension and then, he studied the lexical analysis strategy for recovery of deep structure and its relation to reading comprehension. The lexical analysis strategy involved the analysis of the main verb of a sentence to determine the deep structures with which it is compatible. The scores from the DSRT were correlated with the scores from a cloze test and a traditional comprehension test, the reading subtest of the Metropolitan Achievement Test.

Simons found that recovery of deep structure, as measured by the DSRT, was an important aspect of reading comprehension. He found it to be more important to the cloze test than to the MAT. The cloze test and the MAT appeared to be measuring different skills. Simons believed it reasonable to infer that recovery of deep structure was a necessary minimum to recover meaning in the cloze test since the blanks force one to predict meaning while such prediction may not be involved in a traditional multiple-choice comprehension test. Skill at making a lexical analysis of the main verb as a strategy for recovering deep structure was only slightly related to comprehension. Thus, Simons' attempt to replicate Fodor, Garrett and Bever (1968) was unsuccessful, which led him to believe that his measuring instrument

was not sensitive enough to pick up the differences in processing.

Fodor, Garrett and Bever (1968) had demonstrated that sentences containing verbs that can take either a complement or transitive deep structure are more difficult than sentences containing a main verb that can take only a transitive deep structure. The subjects' performance was strongly dependent on the nature of their assumptions concerning the relationship of the verb to the rest of the sentence, leading the experimenters to state: "It appears that the exploitation of the lexical analysis of the main verb of a sentence is a central heuristic in the strategy as used to recover its deep structure" (p. 459).

Fagan (1971) attempted to determine if the reading comprehension of fourth-, fifth- and sixth-graders was affected by the number and types of transformations found in their reading materials. A cloze procedure was used to test subjects on a number of passages taken from three fourth-grade basal readers which had previously been analyzed to determine the types of sentence transformations. Every story was written in four different forms, each containing twenty transformations. The major types of transformations were embedding, conjoining, deletion, and simple transformations. Structures which children found most difficult were appositives, ing-nominalizations, genetive pronouns, deletions, and negatives. Fagan also found that embedding and deletion transformations tended to make sentences and passages more difficult.

Marcus (1971) developed A Test of Sentence Meaning utilizing the theory of transformational-generative grammar to factor sentences into their underlying kernels and to compare transformations with equivalent meanings. He tested students in grades five through eight to diagnose

specific difficulties with basic syntactic structures. This test was similar to Simons' Deep Structure Recovery Test but had more variety and designated what structures were being tested. Marcus used two basic types of item format in his study. One measured the students' knowledge of transformations that gave equivalent meanings and one measured the students' knowledge of kernel sentences within subordinate or coordinate constructions. The students displayed a wide range of abilities in recognizing sentence transformations with equivalent meanings and kernel sentences of larger sentences. Eighty-six percent of the responses were correct on items of the easiest structure (eliptical structures of coordination) while only 46 percent of the responses were correct on items of the most difficult structure (prepositional phrase modifiers). An interruption of the subject-verb-object sequence by a relative clause in complex sentences caused more difficulty than if the sequence was not interrupted by a clause.

Takahashi (1975) studied students' comprehension of written syntactic structures using the Nelson Reading Test and Marcus' A Test of Sentence Meaning as test instruments. The subjects were slow and good ninth-graders and average sixth-graders. The most difficult structures for all three groups were prepositional phrase modifiers and sentences containing a combination of structures. Sixth-graders and slow ninth-graders experienced difficulty with relative clauses, pronoun reference, complex structures containing two relative clauses, the use of a clause as a part of speech, and transformations of nominalizations into active verbs.

In comparing sixth-graders with ninth-grade good readers, there

was improvement over the grades as Marcus (1971) and Richek (1976a) found in their studies. Takahashi's study also supported the results of other studies in finding that students had difficulty when the subject-verb-direct object sequence was interrupted by a clause or prepositional phrase. Sauer (1970), Richek (1976a), and Fagan (1971) also found that nominalizations, deletions, and embedding made sentences more difficult.

Wright (1969) found that answering questions about nouns in a passive sentence was more difficult only when the questions were active, not passive. The task was easier in a "match" situation where both statement and question were either active or passive rather than in a "mismatch" situation where one was passive and one active.

Layton and Simpson (1975) designed an experiment to investigate whether this match-mismatch situation would be observed when the task was made more difficult by increasing the demands on memory and whether subjects would then be unable to retain surface information and be forced to translate the deep structure representation. The subjects were students between the ages of 19 and 25 years of age. Findings revealed that when memory load was light, subjects were able to remember the sentences in their surface structure form but when required to retain more information, the subjects were forced to encode the sentences into their deep structure representations. The decoding of passive questions became progressively more difficult as the number of sentences to be remembered increased.

Richek (1976b) studied the effects of sentence complexity on the comprehension of specific syntactic structures of third-, fourth-, and fifth-grade children, using the syntactic structures suggested by Chomsky

(1972). The results of Chomsky's study indicated that mastery of the Minimum Distance Principle (Rosenbaum, 1967) was incomplete in five to ten year olds. The MDP states that the subject of a subordinated complement clause is the noun referent which most nearly precedes that clause. For example, in the sentence John persuaded Mary to drive the car, it is Mary who drives the car. In Chomsky's study comprehension was demonstrated orally while Richek investigated silent reading comprehension, examining subject identification of subordinate clauses which either conformed to or violated the MDP conditions.

The results of Richek's experiment confirmed Chomsky's findings and extended previous work by demonstrating this phenomenon in a reading context in which children were free to reinspect linguistic stimuli. Like Marcus (1971) and Takaashi (1975), Richek found performance to be hampered when sentential relationships were interrupted by the insertion of a relative clause. Since the physical separation by a relative clause did not markedly affect performance in the conforming MDP structures, Richek concluded that the difficulty of the MDP-violating structures was caused by the intervening noun. According to Richek, the results of her experiment show ". . . that performance within a given set of linguistic constraints is variable and dependent on the context of the linguistic structure." Her findings strongly suggest that researchers should consider the sentence context of linguistic variables when investigating linguistic maturity and that authors and educators should be aware of the difficulties which children encounter when several difficult structures are combined in one sentence.

It would appear from the foregoing research that: (1) the

recovery of the deep structures of sentences is related to reading comprehension; (2) children find many transformations such as embedding, conjoining, deletions, passives, negatives, nominalizations, genetive pronouns and appositives difficult; (3) transformations in which the subject-verb-object sequence is interrupted cause difficulty in comprehension for many children; (4) a mismatch between active statements and passive questions or vice versa makes comprehension difficult for some children; and (5) when the memory load becomes heavy it is difficult to remember the surface structure of sentences, forcing encoding into deep structure representations.

The Effect of Practice in Syntactic Manipulation on Reading Comprehension

The positive relationship of success among speaking, listening, reading, and writing (Loban, 1976) suggests the theoretical plausibility that growth in one area may be reflected in other areas (Stotsky, 1975). This thinking has induced investigators to develop instructional procedures aimed at promoting children's understanding of various syntactic structures in written language. Studies such as those of Miller and Ney (1968), Mellon (1969), and O'Hare (1970) which have shown that exercises in combining and embedding kernel sentences into a single sentence have significant positive effects in increasing syntactic fluency in children's writing, have instigated research into the possibility that these exercises might also improve reading comprehension. On the other hand, Simons' (1970) demonstration that there is a relation between children's skill at recovering the deep structure of sentences and their reading comprehension skill has prompted inquiry into the

effect of reversing the sentence-combining process to separate a complex sentence into the kernel sentences from which it was composed. Following his study, Fagan (1971) and Pflaum (1974) suggested such a procedure of sentence analysis. Since that time a few researchers have also investigated the effect of instruction in sentence-reduction practice (separating complex sentences into kernel sentences) on reading comprehension.

Sentence-Combining and Reading Comprehension

Sentence-combining instructional programs are based on Chomsky's (1965) theory of transformational-generative grammar. All sentences are either kernel sentences or transformations of kernel sentences. O'Donnell (1967) has described three major categories of transformations: (1) those that provide for the combination of elements as when past tense + verb is converted to verb + past tense (ed + walk is converted to walk + ed); (2) those that convert a kernel sentence into another sentence type such as passive, imperative, interrogative or negative; and (3) those which join strings or embed one string in another string. In order to perform such sentence-combining transformations on kernel sentences, it may be necessary to move around constituents in a sentence, or to delete, substitute or expand certain parts of sentences.

Among the first to investigate the effect of a writing program on reading comprehension was Crews (1971). She developed a year-long experimental program for fourth-graders to practice manipulating syntactic structures but did not specify the amount of actual writing practice. In writing, the experimental group showed a greater variety in structure over the controls ($p < .001$) but gains in reading, as

measured by pre- and post-tests on The Gates-MacGinitie Reading Test favored the control group at less than the .01 level. According to these results, studying English sentence structure had not contributed to skill in reading comprehension.

Shockley (1974) tested the effect of a twelve-week course in sentence-combining exercises on the reading comprehension of seventh-grade students with average I.Q.'s and a reading level one grade below seventh grade norms. There were significant increases in mean scores for both experimental and control groups but no significant differences between the two groups. Shockley concluded: "Training in syntax did not affect the ability to identify related syntactic structures. Syntactic structure training materials were as effective as traditional techniques for improving reading comprehension."

Hughes (1975) investigated the effect of ten weeks' practice in sentence-combining on fourth-grade students' reading comprehension. The experimental group made large gains in writing fluency but in reading comprehension gains were not significant as measured either by the cloze test or two subtests of the Gates-MacGinitie Reading Test. However, there were significant differences on the Miscue Inventory grammatical strength test suggesting that sentence-combining training may have some effect on linguistic or syntactic sompetence in processing language. Hughes hypothesized that ". . . sentence-combining removed syntactic roadblocks in reading comprehension, but that this removal did not always result in increased comprehension." Another interesting finding was that greatest gains in reading comprehension were made by the lower and middle groups of readers indicating a close link between

a student's reading level and his/her syntactic maturity level.

Using the basic transformations practiced by O'Hare's (1970) students, Combs (1975) devised experimental lessons in sentence-combining for seventh-graders. He investigated the relationship between sentence-combining ability and both writing and reading skills. Several methods of presentation were used with about one-quarter of the lessons completed orally. In writing, progress of the experimental group was significant at the .001 level for words per T-unit but about half this gain was eroded after eight weeks following treatment. Pre- and post-tests with the Gates MacGinitie Reading Test revealed significant gains in reading rate for both experimental and control groups but there was no growth for either group in reading comprehension. Combs also administered experimenter-constructed cloze tests. Two passages were written at levels of syntactic maturity and readability just above the subjects' productive level and two passages were considerably above their productive level. Again, there was no difference between the groups in reading rate but the experimental group was significantly superior ($p < .05$) to the control group in reading comprehension, showing that seventh-grade students could improve their reading comprehension with sentence-combining exercises. Combs himself found the results rather confusing but encouraging.

Using third-grade students, Levine (1976) taught 96 lessons in sentence-combining to determine whether instruction in manipulating grammatical structures is related to reading comprehension and to written composition and whether it is a linguistic skill common to both reading and writing. In writing, there were significant differences in the

number of communication units and the ratio of subordinate clauses to the total number of clauses for the experimental group. In reading comprehension there were significant differences for the experimental group as measured by a standardized reading test but not on a teacher-constructed cloze test. These results are somewhat contradictory to other studies where cloze tests have proven to be a more sensitive measure of the effect of sentence-combining practice on reading comprehension (Combs, 1975).

Klassen (1976) studied the effect of sentence-combining instruction on immigrant students at the secondary level. His experiment showed that syntactic development of ESL (English Second Language) students can be hastened and enhanced by sentence-combining exercises. In writing, experimental subjects were significantly superior in mean T-unit length over matched-pair control subjects and made impressive strides in catching up with native-speaking peers (gaining four years in written language growth). In reading comprehension, the mean scores of the experimental group exceeded those of the control group on cloze passages but the difference was not significant. However, the differences in the mean scores did support the speculation that the experimental subjects were moving towards greater proficiency in reading than the controls.

Straw (1978) investigated the effect of instruction in sentence-combining on the reading comprehension of fourth grade students. The subjects received one lesson each day for fifteen days. There was no significant effect for instruction as indicated by post-test scores on the Nelson Reading Skills Test. But on experimenter-constructed cloze test passages, written at three levels of complexity, reading

comprehension scores for subjects receiving sentence-combining instruction were significantly better ($p < .01$) than for those following a textbook approach to reading.

Kurushima (1979) studied the effect of eight sentence-combining lessons on written composition and reading comprehension of third-grade students. An analysis of scores obtained on experimenter-constructed cloze tests written at three levels of syntactic complexity showed that performance of the experimental group was significantly superior to that of the control group on the reading passage PL+4 in which complexity level was above their productive level. The sentence-combining treatment had no significant effect on mean T-unit length in the subjects' written compositions, a somewhat puzzling outcome, which is contrary to the findings of most other studies (Combs, 1975; Klassen, 1976; Levine, 1976; etc.).

The significant positive effects of practice in sentence-combining on students' written compositions has been well established by the many studies that have reported this finding. More recently, these results have instigated the publication of programs and textual materials which utilize sentence combining as an instructional method (Strong, 1973; O'Hare, 1975; Daiker, Kerek and Morenberg, 1979; Rippon and Meyers, 1979). One Canadian basal reading series (Starting Points in Language Arts, Ginn and Company, 1977) introduces sentence-combining activities as early as second grade. But the hypothesis that sentence-combining practice will have the same effect on reading comprehension is inconclusive, as noted in the varied findings of the studies which have been reported. What has become clear is that standardized tests of reading

comprehension do not seem to be adequate measures of syntactic growth in reading. Treatment effects appear to be more accurately measured by various experimenter-constructed tests. ". . . Further work is needed to link reading improvement more securely to sentence-combining" (Graves, 1977:456).

Sentence-Reduction and Reading Comprehension

Although educators and researchers have suggested that practice in reducing compound and complex sentences to kernel sentences may increase students' reading comprehension (Fagan, 1971; Pflaum, 1974; O'Donnell and King, 1974; Hunt, 1977), few have investigated this possibility.

Stedman (1971) studied the effect of the Hunt and O'Donnell (1970) curriculum on the reading comprehension of fourth-grade students. The curriculum covered seventeen sentence-combining transformations and included many multi-sentence embeddings. The subjects not only combined sentences as is done (hypothetically) in writing and speaking but also broke them back down as is done (hypothetically) in reading and listening. Stedman designed two cloze tests (Reading Structure Tests) in which words that contribute heavily to structural meaning (prepositions, conjunctions, modals, relative and interrogative pronouns, articles and adverbs) were deleted. He found a significant difference ($p < .05$) between the means of the experimental and control groups on these tests but when the races were considered separately the gain for black experimental subjects was significant at the .01 level while the gain for white experimental subjects was not significant. Stedman hypothesized that the black subjects gained from the curriculum, a reading comprehension of syntactic structures

which the white subjects already possessed, but the black subjects had previously not understood, possibly because of a deprived linguistic environment.

Fisher (1973) investigated the effect of sentence-combining exercises on the reading and writing of students in grades five, seven and nine. For pre- and post-tests, the subjects re-wrote paragraphs consisting of kernel sentences and completed both standardized reading tests and cloze comprehension tests. The lessons were conducted daily for five weeks. Sentence decomposition (sentence-reduction) was also taught towards the end of this time. The experimental students were significantly higher on writing output and maturity but on reading comprehension, only the fifth-grade experimental students showed significant gains over the controls. In this study, the mixed results for reading comprehension leave many unanswered questions.

O'Donnell and King (1974) conducted a study to determine whether children who lacked skill in recovering the deep structure of sentences could be aided in developing this skill and whether increased skill in recovering deep structure would be accompanied by improvement in reading comprehension. The subjects were 50 seventh-grade students, most of whom were below the twentieth percentile in reading comprehension. The experimenters used a technique combining sentence analysis and resynthesis. Their rationale for combining the two techniques arose from Simons' (1970) demonstration that there is a relation between children's skill at recovering the deep structure of sentences and their reading comprehension skill and the studies by Mellon (1966) and O'Hare (1971) which showed that exercises requiring synthesis of kernel structures resulted in

greater syntactic fluency in children's writing.

The subjects broke down sentences into constituent kernels and then recombined them to produce different surface structures. Identical forms of Simons' (1970) Deep Structure Recovery Test (DSRT) (with 15 additional items composed by the investigators) and the cloze tests used by Simons (1970) were used as pre- and post-tests. Different forms of the California Test of Basic Skills were used to measure reading comprehension. The results of this experiment indicated that skill at recovering deep structure as measured by the DSRT was not significant. The experimenters found that cloze abilities tended to influence both DSRT and reading comprehension test abilities. However, in the experimental group, the direction of this influence was negative. O'Donnell and King attributed this failure to the low morale of the students, hostility toward school activities, poor motivation, and the possibility that the students did not possess the prerequisites for profiting from instruction. They suggest that the study be replicated with groups of children more representative of the population and that the abilities measured by cloze tests be isolated.

In his 1978 study, Straw also investigated the effect of sentence-reduction on fourth-graders' reading comprehension. Scores obtained on the Nelson Reading Skills Test and experimenter-constructed cloze tests, written at three levels of syntactic complexity, were used to measure gains in reading comprehension. Subjects in the sentence-reduction group performed significantly better ($p < .05$) on the cloze tests than subjects following the textbook approach but they did not differ significantly from subjects receiving the sentence-combining treatment. Straw stated,

"From the results of the study, it cannot be concluded that any one level of treatment included in the study had an effect on student abilities to comprehend more complex syntax than any of the other levels" (p. 110).

Research regarding the effect of sentence-reduction practice on reading comprehension is not clear and requires further study before any conclusions can be drawn as to the effectiveness of this instruction. Of the studies reported here, only that of Straw (1978) has isolated sentence-reduction practice for investigation. The other studies have investigated some combination of the effects of both sentence-expansion (sentence-combining) and sentence-reduction practice on reading comprehension. In a search of the literature, no other studies of the effects of sentence-reduction practice on reading comprehension could be found.

Summary

A review of the literature has revealed that the linguistic competence of children continues to develop throughout the school years in all areas of the language arts and that there is an intercorrelation between speaking, listening, reading, and writing (Loban, 1963; 1976). School children have not completely mastered all the syntactic structures of their language in these areas, and as a result they find some sentence structures difficult to comprehend in reading. Researchers have found that these difficult structures often appear in the instructional materials used to teach children to read, leading them to believe that there may be a gap between children's comprehension ability and the materials of the school curriculum. Although some investigators suggest that reading materials may need to be controlled to more closely reflect the

structures used by children in their oral and written language (e.g. Ruddell, 1965; Tatham, 1968; Sauer, 1970; Smith, 1971; Richek, 1976a), educators such as Stotsky (1975) and Pflaum (1974) do not feel ". . . that all difficult structures should be eliminated from written materials since reading is a major source for language growth; it is simply that we should present ways for understanding them" (Pflaum, p. 13).

Investigations into the effects of deep structures and surface structures of sentences indicate that skill at recovering the deep structure of sentences may be related to reading comprehension. Hunt (1977: 102) states: "There is . . . evidence that curricula already known can enhance syntactic maturity and perhaps assist reading comprehension. One might reasonably hope that a period of rich and varied curricular experimentation would now commence." Researchers (such as O'Hare, 1971; Fagan, 1971; O'Donnell and King, 1974) have expressed the need for further research in two areas: (1) the effect of instruction in sentence-combining (sentence-expansion) on reading comprehension, and (2) the effect of instruction in sentence-reduction (recovery of the deep structure of sentences) on reading comprehension. Few investigators have studied the effects of sentence-reduction practice on reading comprehension while the studies of sentence-combining practice on reading comprehension have been inconclusive, inviting further research (Stotsky, 1975; Graves, 1977).

The purpose of this present study is to examine the effects of practice in sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion on the reading comprehension of fourth-grade students.

Chapter 3

DESIGN AND PROCEDURES

The purpose of this study was to examine the effects of practice in sentence-reduction, sentence-expansion, and a combination of practice in both sentence-reduction and sentence-expansion on the reading comprehension of fourth-graders. Four general questions were posed:

1. Will practice in sentence-reduction (finding the kernel sentences in compound or complex sentences) have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

2. Will practice in sentence-expansion (combining kernel sentences to make compound or complex sentences) have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

3. Will practice in breaking down compound or complex sentences into kernel sentences and then recombining them to form either the original sentence or paraphrases of the original sentence have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

4. What is the relationship among the treatments--sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion--for fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

The Study

Sample

The subjects in this study were 120 fourth-grade students in six classrooms (three classes in each of two schools) in one Greater Winnipeg school division. Fourth-grade students were selected as subjects for the following reasons: (1) research had indicated that the complexity of written syntax caught up to and surpassed the complexity of spoken syntax at about the fourth grade (O'Donnell, 1967:95); (2) many difficult syntactic structures were found in fourth-grade readers (Fagan, 1971; Pflaum, 1974); and (3) Cooper (1973:96) had suggested that ". . . beginning in Grade 4 there may be a distinct developmental gain in control of written syntax for most children if they are asked to direct their attention to syntax." The possibility that directed attention to syntax might also enhance the reading comprehension of fourth-grade students induced the experimenter to select fourth-graders as subjects for the present investigation.

The students were assigned to one of four groups. Each group contained 30 subjects. To achieve greater representativeness a method of proportional sampling was used. Subjects were assigned to three treatment groups and one reference group based on the scores obtained on two pre-tests in reading comprehension. The tests were a structural cloze test and a lexical cloze test. First, the students were assigned to either a high ability group, a middle ability group, or a low ability group. Approximately 25 percent of the students were assigned to the high ability group, 50 percent to the middle ability group, and 25 percent to the low ability group. For the structural cloze, subjects obtaining a score of 50 percent or greater on the pre-test were assigned

to the high ability group; subjects whose scores ranged from 38 to 49 percent on the pre-test were assigned to the middle ability group; and subjects whose scores were less than 37 percent on the pre-test were assigned to the low ability group. For the lexical cloze, subjects obtaining a score of 52 percent or greater on the pre-test were assigned to the high ability group; subjects whose scores ranged from 38 to 51 percent on the pre-test were assigned to the middle ability group; and subjects whose scores were less than 37 percent on the pre-test were assigned to the low ability group. Following the above assignments, the subjects were selected at random from each stratum to form three experimental treatment groups and one reference group of equal sizes (N=30).

The three experimental treatments were:

1. Sentence Reduction. The subjects in this group were taught to break down compound or complex sentences to two or more simple (kernel) sentences (i.e. sentences composed of a single independent clause).

2. Sentence Expansion. This group was taught to combine two or more simple sentences to form compound or complex sentences (i.e. conjoining independent clauses and embedding subordinate clauses within independent clauses).

3. Sentence Reduction and Sentence Expansion. This group received instruction in both sentence reduction and sentence expansion as described above. They first reduced compound or complex sentences to two or more simple sentences and then they combined the simple sentences to form the original sentences or paraphrases of the original sentences.

The subjects in each treatment group received instruction and

practice based on the same format and the same practice sentences. Essentially, the sentence-reduction and sentence-expansion treatments involved reversed procedures. The sentences used in these exercises are reproduced in Appendix C.

The treatment groups received instruction for 30 minutes every second day for a total of ten lessons between April 2, 1979 and May 2, 1979. This sequence was interrupted twice, once by a school holiday, and once by a day of in-service training for teachers in the school division. The pre-tests were administered ten days before instruction began and the post-tests were administered on the two days immediately following cessation of instruction.

The experimenter constructed and administered the tests. The experimenter also developed the instructional materials and taught the experimental treatment groups. The experimenter did not teach the reference group. These students did not depart from their regular reading program or timetable.

Instructional Materials

Five basal readers, authorized for use in Manitoba schools and published by three different companies, were surveyed to determine the various sentence structures used in these books. The readers contained many structures which researchers have found to be difficult for fourth-grade students. These include: (1) understanding relative clauses (Richek, 1976a); (2) understanding connectives (Robertson, 1966); (3) understanding genetive pronouns (Fagan, 1971); (4) the number of phrases or clauses embedded in a sentence (Fagan, 1971); and (5) deletion of common elements (Fagan, 1971).

Sentences for practice were selected from the readers according to the following criteria: (1) those structures which fourth-grade students found difficult, and (2) those which appeared with considerable frequency in fourth-grade basal readers. The selected practice sentences contained: (1) conjoined sentences; (2) left embedded clauses; (3) center embedded clauses; (4) right embedded clauses; and (5) a mixture of these, i.e. conjoined sentences containing embedded clauses or complex sentences with a number of embedded clauses. Also included in these sentences were structures containing genetive pronouns and those in which common elements were deleted.

Ten lessons, two for each sentence type, were developed to give students practice in sentence reduction, sentence expansion or practice in both sentence reduction and sentence expansion. The instruction and practice focused on clause embeddings, similar to that suggested by Cooper (1973:100). Students practiced conjoining independent clauses and embedding kernel sentences as subordinate clauses in independent clauses or removing the subordinate clauses embedded in independent clauses to form kernel sentences (sentence reduction).

The following is an example of sentences used in sentence-reduction and sentence-expansion practice:

> The road curved downward where the clover field ended, and ahead lay thick woods.

Sentence reduction would produce the following simple (kernel) sentences:

> The road curved downward.
> The clover field ended.
> Thick woods lay ahead.

Sentence-expansion (sentence combining) would produce the original sentence or paraphrases of the original sentence which retained the same

meaning. The following is an example of sentence-reduction and sentence-expansions produced by students:

Original sentence:	After helping Dad make beds, Pam went down for her roller skates.
Kernel sentences:	Pam went down for her roller skates. Pam helped her Dad make beds.
Paraphrases produced by students:	Pam helped Dad make beds before she went down for her roller skates.
	Before Pam went down for her roller skates she helped Dad make beds.
	Pam went down for her roller skates after she helped Dad make beds.
	After Pam helped Dad make beds she went down for her roller skates.

The sentences used for instruction and practice are presented in Appendix C.

Lesson Format

The lesson format was similar to that suggested by Daiker et al (1978:8) but adapted to fourth grade level. Oral discussion of the sentences and the processes and oral practice was a central part of each lesson for each treatment group. Students were encouraged to discover solutions and to discuss the meaning of different constructions. Attention was also directed to the various conjunctions and clause markers which may be added or deleted in expanding or reducing sentences.

Each lesson began with oral discussion of selected examples which were presented on the blackboard or on chart paper. Students were encouraged to present and discuss various solutions and were commended for participation and creativity. Individual written practice followed the group practice but students presented their solutions to the group for discussion

and selection of the best versions. The best versions were those which retained the meaning of the original sentence.

Test Instruments

Cloze Tests

Cloze tests have been recognized as reliable and valid measures of reading comprehension (Taylor, 1957; Bormuth, 1965; Ruddell, 1964; Horton, 1974-75). Cloze tests have also proven to be more sensitive measures of the ability to handle more syntactically difficult sentences (Simons, 1970; Fisher, 1973; Combs, 1975; Straw, 1978) than standardized reading tests which measure a more global comprehension ability. In a cloze test the reader must rely on context and may be forced to depend on the syntax of the text in order to supply the appropriate answer.

Weaver (1977b) found a high correlation between syntactic constraints and the structural elements of language and semantic constraints and the lexical language elements. Therefore, lexical and structural cloze tests may provide differentials between these elements. In cloze procedure, the "any word" deletion procedure corresponds to the present dichotomy of structural deletions while the lexical deletions usually involve ". . . the language units designated by traditional grammars as nouns, main verbs, sometimes adjectives, and more rarely adverbs" (Weaver, 1977b:24). Guthrie (1973) also included pronouns in the noun category and transitives, intransitives, and auxilliaries in the verb category.

In the present study, both structural and lexical cloze tests were used as pre- and post-tests in order to obtain a more sensitive measure of the subjects' reading comprehension abilities before and after the experimental treatment. The structural cloze tests followed the "any word"

deletion procedure. The tests consisted of 254 word passages in which every fifth word was deleted. The lexical cloze tests consisted of slightly longer than 250 word passages in which nouns, verbs and modifiers were deleted. The noun category included nouns and pronouns, the verb category included transitives, intransitives and auxilliaries, and the modifiers included adjectives and adverbs. The deletions occurred approximately every fifth word and there were not less than four words between blanks. The first sentence was left intact. For all cloze tests the blanks were equal to 14 typed spaces.

The passages for all cloze tests were selected from fourth-grade readers and were at a grade 4.5 readability level, as computed by the Dale and Chall (1948) Readability Formula. Golub's (1975) Syntactic Density Score was also computed for all the passages. The test passages, data on readability and syntactic complexity, and the method for computing Golub's Syntactic Density Score are presented in Appendix B. The tests were marked by the exact scoring method.

Two different forms of structural cloze and two different forms of lexical cloze were administered as pre- and post-tests. The subjects wrote both the pre- and post-tests in two sittings on two successive days. To control the effects of practice one-half of the subjects completed the structural cloze and one-half completed the lexical cloze at each sitting. The subjects were given 30 minutes (one class period) to complete each test. Before the first sitting an additional 15 minutes was allowed for instructions and practice in completing cloze exercises.

The Pilot Study

A pilot study was conducted to determine whether sampling, testing

and instructional procedures were operationally workable.

The subjects for the pilot study were 48 fourth grade students in one school in one Greater Winnipeg school division. Pre- and post-testing and experimental teaching was carried out between February 19, 1979 and March 12, 1979. The experimenter taught five sample lessons, one for each sentence type. The lessons were scheduled every second day but this sequence was interrupted by special school activities on one occasion. The pre-tests were administered on one day, one week before lessons began and the post-tests were administered the day following cessation of instruction. Each time the structural cloze test was administered first and the lexical cloze test was administered second. The subjects were allowed 30 minutes (one class period) to complete each test. Before the first sitting, an additional 15 minutes was allowed for instructions and practice in competing cloze exercises.

The hypotheses, design and procedure for the pilot study was identical to that of the present study except for the order of test presentation and the amount of instructional time which the experimental groups received. In the pilot study, lessons for the sentence-reduction group and the sentence-expansion group were each of 25 minutes duration, while lessons for the group practicing both sentence-reduction and sentence-expansion were of 40 minutes duration.

A three-way analysis of variance of the structural cloze test scores revealed a significant time x treatment x ability interaction ($p < .05$) but this interaction was not significant for the lexical cloze test ($p < .64$). Further post hoc analyses were made by using a t-test to compare the pre- and post-test means for each treatment and ability group with the reference group. The combination reduction/expansion

treatment for the middle ability group was significant at the .05 level and the combination reduction/expansion treatment for the low ability group was very nearly significant at the .05 level (t=2.771, required 2.776). The middle and low ability reference groups made no significant gains.

In comparing the means for the structural and lexical cloze tests, all groups (both treatment and reference) made some gains from pre- to post-tests as measured by the structural cloze but not as measured by the lexical cloze. On the structural cloze, the largest gain was made by the low ability reduction treatment group and the least gain was made by the low ability reference group. On the lexical cloze test, all groups suffered a loss from pre- to post-tests except the three low ability treatment groups and the high ability combination reduction/expansion treatment group (these groups made slight gains). The greatest loss was experienced by the high ability reduction treatment group and the high ability expansion treatment group (both having a difference of -7.00 in raw scores between pre- and post-tests).

From a comparison of the mean differences for the structural and lexical cloze tests, it appeared that the two tests were not measuring the same reading comprehension abilities. According to Weaver (1977c:151) ". . . lexical categories are open, and any particular member has a low frequency of occurrence. There is much room for variation. One would expect differences between structural and lexical categories on these bases." Therefore, it was surmized that instructional procedures which stress creativity and manipulation of language structures would produce a greater variety of responses which might account for the differences

in performance on the two types of cloze tests (structural and lexical). A brief review of some of the lexical error responses seemed to support this opinion. In general, subjects chose appropriate synonyms and correct syntactic alternatives for the cloze blanks, indicating that a more intensive examination of lexical responses might yield further information regarding the subjects' reading comprehension abilities.

As a result of the pilot study some changes were made in the tests, testing procedure, instructional time for the treatment groups and data analysis. The lexical cloze post-test was replaced because it was discovered that many of the students were familiar with the passage that had been selected. To control practice effects, one-half of the subjects completed the structural cloze and one-half completed the lexical cloze at each of the two pre-test and post-test sittings. The instructional time for each treatment was equalized to 30 minutes regardless of task. The significant time x treatment x ability interaction for the middle ability combination reduction/expansion treatment could have been due to this factor. Lastly, a more intensive examination of lexical cloze test responses was carried out.

Analysis of Data

Design

The basic experimental design was a three-way analysis of variance [(treatment x ability x time (gain)] with repeated measures on each of the two dependent variables, the structural cloze test and the lexical cloze test. Following the analyses of variance, multiple t-tests were computed to probe significant interactions. The rate of Type I error was controlled at $\alpha = .05$ by using the Tukey (1953) criterion of significance. Additional

post hoc measures and qualitative analyses were also performed on selected non-significant effects. More detailed descriptions of these procedures are presented in Chapter 4.

Hypotheses

The four general questions posed in this study will be presented with their accompanying specific hypotheses.

Question 1: Will practice in sentence-reduction (finding the kernel sentences in compound or complex sentences) have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

Hypothesis 1.1 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the high ability sentence-reduction group as compared to the high ability reference group.

Hypothesis 1.2 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the middle ability sentence-reduction group as compared to the middle ability reference group.

Hypothesis 1.3 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the low ability sentence-reduction group as compared to the low ability reference group.

Hypothesis 1.4 There are no significant differences in the mean gain scores in reading comprehension between the pre- and post- structural and lexical cloze tests when comparing the high, middle, and low ability sentence-reduction groups and when compared with the high, middle, and

low ability reference groups.

Question 2: Will practice in sentence-expansion (combining kernel sentences to make compound or complex sentences) have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

Hypothesis 2.1 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the high ability sentence-expansion group as compared to the high ability reference group.

Hypothesis 2.2 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the middle ability sentence-expansion group as compared to the middle ability reference group.

Hypothesis 2.3 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the low ability sentence-expansion group as compared to the low ability reference group.

Hypothesis 2.4 There are no significant differences in the mean gain scores in reading comprehension between the pre- and post- structural and lexical cloze tests when comparing the high, middle, and low ability sentence-expansion groups and when compared with the high, middle, and low ability reference groups.

Question 3: Will practice in breaking down compound or complex sentences into kernel sentences (sentence-reduction) and then recombining them (sentence-expansion) to form either the original sentences or paraphrases of the original sentences have an effect on the reading

comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

Hypothesis 3.1 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the high ability combination sentence-reduction and sentence-expansion group as compared to the high ability reference group.

Hypothesis 3.2 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the middle ability combination sentence-reduction and sentence-expansion group as compared to the middle ability reference group.

Hypothesis 3.3 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the low ability combination sentence-reduction and sentence-expansion group as compared to the low ability reference group.

Hypothesis 3.4 There are no significant differences in the mean gain scores in reading comprehension between the pre- and post- structural and lexical cloze tests when comparing the high, middle, and low ability combination sentence-reduction and sentence-expansion groups and when compared with the high, middle, and low ability reference groups.

Question 4: What is the relationship among the three treatments--sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion--for fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

Hypothesis 4.1 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the high ability treatment groups (sentence-reduction, sentence-expansion, or a combination of both sentence-reduction and sentence-expansion).

Hypothesis 4.2 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the middle ability treatment groups (sentence-reduction, sentence-expansion, or a combination of both sentence-reduction and sentence-expansion).

Hypothesis 4.3 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the low ability treatment groups (sentence-reduction, sentence-expansion, or a combination of both sentence-reduction and sentence-expansion).

Summary

This chapter identified the subjects that comprised the sample for this study and described the procedures used to assign the subjects to the treatment and reference groups. The test instruments, instructional materials, and procedures were also described as well as the design of the study, methods of data analysis, and hypotheses.

A pilot study was conducted to evaluate the sampling, testing, lesson format, and data collection procedures to be used.

The statistical analysis and findings will be presented in Chapter 4.

Chapter 4

ANALYSIS AND FINDINGS

The purpose of this study was to examine the effects of practice in sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion on the reading comprehension of fourth-grade students. Four general questions and their specific hypotheses were presented in Chapter 3. In this chapter the hypotheses will be restated together with a discussion of the findings relevant to each hypothesis.

The subjects in this study were 120 fourth-graders assigned to four groups--three treatment groups and one reference group. Each group contained 30 subjects. The subjects in one group were taught to break down compound or complex sentences into kernel sentences (sentence-reduction); the subjects in a second group were taught to combine two or more kernel sentences to form a compound or complex sentence (sentence-expansion); and the subjects in the third group received instruction in both sentence-reduction and sentence-expansion. Instruction for each group followed a similar format and used the same practice sentences. The reference group continued with the regular program, timetable, and teacher.

In presenting the data, the main effects will be discussed first. Next, the four general questions are presented together with the specific hypotheses which they generated. For each hypothesis a description of the data analysis is presented together with the findings

for each hypothesis. Lastly, the significant interactions will be presented followed by a qualitative analysis of cloze test responses.

Main Effects

The data were analyzed by applying a three-way analysis of variance (treatment x ability x time) with repeated measures on each of the two dependent variables, the structural cloze test and the lexical cloze test. The .05 level of significance was selected for the acceptance or rejection of all statistical tests.

General Question 1

Will practice in sentence-reduction (finding the kernel sentences in compound or complex sentences) have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

To answer this question the raw scores from the structural and lexical cloze tests were submitted to an analysis of variance. These results are presented in Tables 4.1 and 4.2. The analyses of variance showed that treatment was not a significant factor affecting either the structural or the lexical cloze tests. Reading ability (based on the structural and lexical cloze pre-tests) was a significant factor between subjects and time (from pre- to post-tests) was a significant factor within subjects, resulting in a significant time x ability interaction. The ability factor contained three levels--high, middle, and low--to which subjects were assigned on the basis of pre-test scores on each of the cloze tests (structural and lexical). The time factor contained two levels--pre-test time (Time 1) and post-test time (Time 2). These

Table 4.1

Analysis of Variance Performance on the Structural Cloze Pre- and Post-Tests

Source of Variation	Sum of Squares	df	Mean Square	F Ratio	Level of Significance
Between Ss					
Treatment	16.6987	3	5.5662	0.16	0.9261
Ability	9784.6402	2	4892.3201	142.54	0.0000*
Tr x A	334.9534	6	55.8255	1.63	0.1467
Error between	3706.8012	108	34.3222		
Within Ss					
Time	1287.5930	1	1287.5930	64.52	0.0000*
Ti x Tr	76.2719	3	25.4239	1.27	0.2871
Ti x A	403.6205	2	201.8102	10.11	0.0001*
Ti x Tr x A	138.6625	6	23.1104	1.16	0.3343
Error within	2155.4242	108	19.9576		

* $p < .05$

Table 4.2

Analysis of Variance of Performance on the Lexical Cloze Pre- and Post-Tests

Source of Variation	Sum of Squares	df	Mean Square	F Ratio	Level of Significance
Between Ss					
Treatment	228.3560	3	76.1186	1.26	0.2911
Ability	15985.1358	2	7992.5679	132.52	0.0000*
Tr x A	197.1674	6	32.8612	0.54	0.7730
Error between	6513.7204	108	60.3122		
Within Ss					
Time	1868.5817	1	1868.5817	55.04	0.0000*
Ti x Tr	121.1717	3	40.3905	1.19	0.3172
Ti x A	2979.1097	2	1489.5548	43.88	0.0000*
Ti x Tr x A	94.4564	6	15.7427	0.46	0.8338
Error within	3666.2891	108	33.9471		

* $p < .05$

interaction effects found here will be discussed later in this chapter under a separate heading.

Hypothesis 1.1 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the high ability sentence-reduction group as compared to the high ability reference group.

Since the results of the analyses of variance did not reveal a significant treatment x ability x time interaction for either the structural or the lexical cloze test, this hypothesis was accepted. There was no significant difference in mean scores between the high ability treatment group and the high ability reference group as a result of sentence-reduction practice.

An examination of the mean differences (Tables 4.3 and 4.4) indicates that on the structural cloze test the high ability sentence-reduction group made a small, statistically nonsignificant gain (2.29) from pre- to post-test time which was slightly greater than the gain made by the high ability reference group (1.67). On the lexical cloze test the high ability group showed a slight loss in the mean difference from pre- to post-test time (-.85) but this loss was less than that suffered by the reference group (-4.00).

Hypothesis 1.2 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the middle ability sentence-reduction group as compared to the middle ability reference group.

The results of the analyses of variance did not reveal a significant treatment x ability x time interaction for either the structural or the lexical cloze test, therefore this hypothesis was accepted. There was no significant difference in mean scores between the middle ability treatment group and the middle ability reference group as a

Table 4.3

Mean Differences on Pre- and Post-Tests Across Ability Levels
Structural Cloze

Source	Ability Levels: High $\bar{x}$	High S.D.	High N.	Middle $\bar{x}$	Middle S.D.	Middle N.	Low $\bar{x}$	Low S.D.	Low N.
Treatment Reduction									
Pre-Test	51.42	1.51	7	42.00	3.81	18	30.40	1.67	5
Post-Test	53.71	6.15	7	45.77	3.56	18	43.60	4.33	5
Gain	2.29			3.77			13.20		
Treatment Expansion									
Pre-Test	51.00	1.67	6	43.25	3.17	16	27.75	5.89	8
Post-Test	52.66	6.15	6	48.12	5.63	16	40.25	6.27	8
Gain	1.66			4.87			12.50		
Treatment Combination									
Pre-Test	53.25	2.81	8	43.41	3.29	17	28.40	6.06	5
Post-Test	55.00	7.63	8	49.17	7.97	17	33.20	3.63	5
Gain	1.75			5.76			4.80		
Treatment Reference									
Pre-Test	52.66	3.93	6	43.86	3.41	15	29.33	6.00	9
Post-Test	54.33	7.08	6	46.00	4.40	15	36.66	7.93	9
Gain	1.67			2.14			7.33		

Table 4.4

Mean Differences on Pre- and Post-Tests Across Ability Levels
Lexical Cloze

Source	Ability Levels: High $\bar{x}$	High S.D.	High N.	Middle $\bar{x}$	Middle S.D.	Middle N.	Low $\bar{x}$	Low S.D.	Low N.
Treatment Reduction									
Pre-Test	57.85	4.18	7	44.66	4.93	12	30.81	5.26	11
Post-Test	57.00	7.70	7	53.50	6.72	12	45.72	10.13	11
Gain	-.85			8.84			14.91		
Treatment Expansion									
Pre-Test	58.60	5.69	10	44.16	5.00	12	26.75	7.59	8
Post-Test	53.60	6.78	10	50.83	4.44	12	43.62	7.89	8
Gain	-5.00			6.67			16.87		
Treatment Combination									
Pre-Test	61.33	10.58	9	42.92	4.29	13	29.50	4.37	8
Post-Test	55.22	8.08	9	50.00	7.25	13	44.37	7.92	8
Gain	-6.11			7.08			14.87		
Treatment Control									
Pre-Test	59.88	7.20	9	43.33	4.11	12	28.22	7.17	9
Post-Test	55.88	9.15	9	47.25	4.18	12	39.22	10.53	9
Gain	-4.00			3.92			11.00		

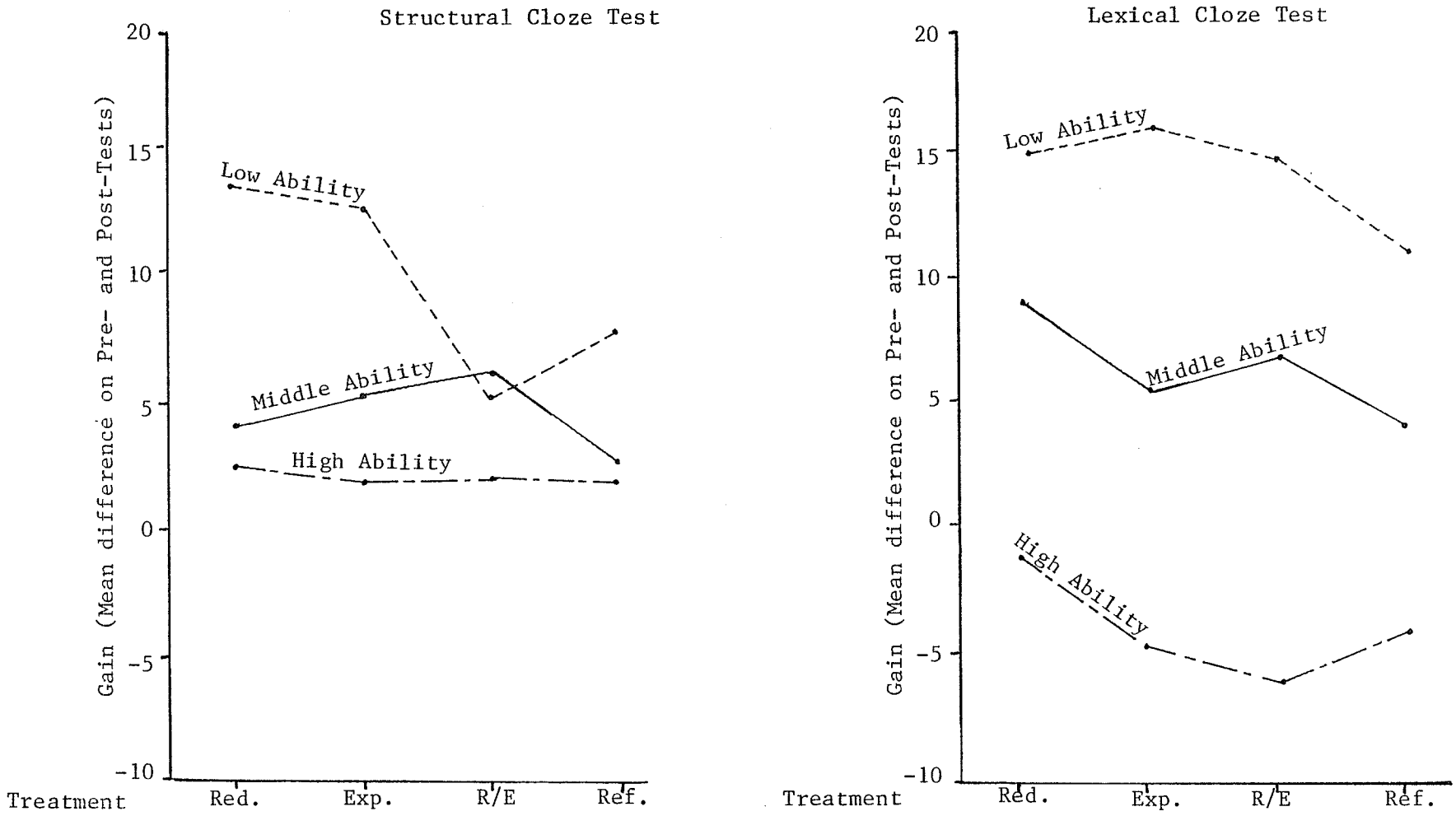

Figure 4.1

Treatment x Ability Interactions on Cloze Tests

result of sentence-reduction practice.

In comparing the mean differences (Tables 4.3 and 4.4), the middle ability sentence-reduction group made a small, nonsignificant gain (3.77) on the structural cloze from pre- to post-test time which was greater than the gain made by the middle ability reference group (2.14). On the lexical cloze test the middle ability sentence-reduction group also made greater gains (8.84) from pre- to post-test time than the middle ability reference group (3.92 gain).

Hypothesis 1.3 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the low ability sentence-reduction group as compared to the low ability reference group.

The results of the analyses of variance did not reveal a significant treatment x ability x time interaction for either the structural or the lexical cloze test, therefore this hypothesis was accepted. There was no significant difference in mean scores between the low ability treatment group and the low ability reference group as a result of sentence-reduction practice. In comparing the mean differences (Tables 4.3 and 4.4), the low ability sentence-reduction group made greater but nonsignificant gains from pre- to post-test time on both the structural (13.20) and lexical (14.91) cloze tests than the low ability reference group (11.00).

Hypothesis 1.4 There are no significant differences in the mean gain scores in reading comprehension between the pre- and post-structural and lexical cloze tests when comparing the high, middle, and low ability sentence-reduction groups and when compared with the high, middle, and low ability reference groups.

Although the overall analyses of variance (Tables 4.1 and 4.2) did not indicate significant treatment x ability x time interactions the Behrens Fisher t-tests (and Welch solution for df) were performed

on selected, nonsignificant effects to further probe treatment x ability interactions. The rate of Type I error was controlled at $\alpha = .05$ by using the Tukey (1953) criterion of significance. These t-tests showed that there were some significant differences in the mean gain scores when comparing the high, middle, and low ability sentence-reduction treatment groups and when compared with the high, middle, and low reference groups. Therefore, this hypothesis was rejected.

For the structural cloze test the following comparisons were significant (Table 4.5): (1) the low ability sentence-reduction group made a significant gain when compared with the high ability sentence-reduction group ($t = 3.254$, $p < .05$) and when compared with the low vs. high reference groups, and (2) the low ability sentence-reduction group also made a significant gain when compared with the middle ability sentence-reduction group ($t = 3.293$, $p < .05$) and when compared with the low vs. middle reference groups. For the reference groups, the low ability group did not make a statistically significant gain when compared with the high ability reference group ($t = 1.655$, $p > .05$) or when compared with the middle ability reference group ($t = 2.356$, $p > .05$). These findings indicate that the sentence-reduction treatment, as measured by the structural cloze test, had a significant effect on reading comprehension for the low ability groups when compared with the high and middle ability groups.

For the lexical cloze test (Table 4.6) the low ability sentence-reduction group made a significant gain when compared with the high ability sentence-reduction group ($t = 3.534$, $p < .05$) but not when compared with the low vs. high reference group. Since the low vs. high

Table 4.5

Behrens Fisher t-Test (and Welch solution for df) for Treatment x Ability Interactions Structural Cloze Test

Comparison	Difference in Mean Gain	Critical Value at α.05 for 3, df_w	t
Reduction			
Low - High	10.915	2.801	3.254*
Low - Middle	9.423	2.865	3.293*
Expansion			
Low - High	10.834	2.750	3.509*
Low - Middle	7.625	2.589	3.062*
Reference			
Low - High	5.667	2.860	1.655
Low - Middle	5.200	2.589	2.356

* $p < .05$

Table 4.6

Behrens Fisher t-Test (and Welch solution for df) for Treatment x Ability Interactions Lexical Cloze Test

Comparison	Difference in Mean Gain	Critical Value at α .05 for 3, df_w	t
Reduction			
Low - High	15.766	2.645	3.534*
Expansion			
Low - High	21.875	2.589	7.365*
Low - Middle	10.209	2.588	4.011*
Middle - High	11.666	2.560	4.023*
Combination Reduction/Expansion			
Low - High	20.986	2.603	3.959*
Low - Middle	7.799	2.751	1.998
Middle - High	20.611	3.645	4.831*
Reference			
Low - High	15.000	2.645	3.549*
Low - Middle	7.083	2.574	1.655
Middle - High	7.916	2.752	2.051

* $p < .05$

ability reference group also made a significant gain ($t = 3.549$, $p < .05$) this gain cannot be attributed to treatment effect.

General Question 2

Will practice in sentence-expansion (combining kernel sentences to make compound or complex sentences) have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

Hypothesis 2.1 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the high ability sentence-expansion group as compared to the high ability reference group.

The results of the analyses of variance did not reveal a significant treatment x ability x time interaction for either the structural or the lexical cloze test, therefore this hypothesis was accepted. There was no significant difference in mean scores between the high ability sentence-expansion treatment group and the high ability reference group as a result of sentence-expansion practice.

An examination of the mean differences indicates that on the structural cloze test (Table 4.3) the gain made by the high ability sentence-expansion group (1.66) from pre- to post-test time was approximately the same as that of the high ability reference group (1.67). On the lexical cloze test (Table 4.4) both the high ability sentence-expansion group and the high ability reference group experienced a loss in mean difference but the treatment group suffered a greater loss than the reference group (-5.00 for the sentence-expansion group and -4.00 for the reference group).

Hypothesis 2.2 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the middle ability sentence-expansion group as compared to the middle ability reference group.

Since the results of the analyses of variance did not reveal a significant treatment x ability x time interaction for either the structural or the lexical cloze test, this hypothesis was accepted. There was no significant difference in mean scores between the middle ability sentence-expansion treatment group and the middle ability reference group as a result of sentence-expansion practice. In comparing the mean differences (Tables 4.3 and 4.4), the middle ability sentence-expansion group made greater gains from pre- to post-test time on both the structural cloze test (4.87) and the lexical cloze test (6.67) than did the middle ability reference group (2.14).

Hypothesis 2.3 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the low ability sentence-expansion group as compared to the low ability reference group.

The results of the analyses of variance did not reveal a significant treatment x ability x time interaction for either the structural or the lexical cloze test, therefore this hypothesis was accepted. There was no significant difference in mean scores between the low ability sentence-expansion treatment group and the low ability reference group as a result of sentence-expansion practice. In comparing the mean differences (Tables 4.3 and 4.4), the low ability sentence-expansion group made greater but nonsignificant gains from pre- to post-test time on both the structural (12.50) and the lexical (16.87) cloze tests than the low ability reference group (7.33).

Hypothesis 2.4 There are no significant differences in the mean gain scores in reading comprehension between the pre- and post- structural and lexical cloze tests when comparing the high, middle, and low ability sentence-expansion groups and when compared with the high, middle, and low ability reference groups.

The Behrens Fisher t-Tests showed that there were some significant differences in the mean gain scores when comparing the high, middle, and low ability sentence-expansion treatment groups and when compared with the high, middle, and low ability reference groups. Therefore, this hypothesis was rejected.

For the structural cloze test the following comparisons were significant (Table 4.5): (1) the low ability sentence-expansion group made a significant gain when compared with the high ability sentence-expansion group ($t = 3.509$, $p < .05$) and when compared with the low vs. high reference groups, and (2) the low ability sentence-expansion group also made a significant gain when compared with the middle ability sentence-expansion group ($t = 3.063$, $p < .05$) and when compared with the low vs. middle reference groups. The low ability reference group did not make a statistically significant gain when compared with the high ability reference group ($t = 1.566$, $p > .05$) or when compared with the middle ability reference group ($t = 2.356$, $p > .05$). These findings indicate that the sentence-expansion treatment, as measured by the structural cloze test, had a significant effect on reading comprehension for the low ability groups when compared with the high and middle ability groups.

For the lexical cloze test the following comparisons were significant (Table 4.6): (1) the low ability sentence-expansion group made a significant gain when compared with the middle ability sentence-expansion group ($t = 4.011$, $p < .05$) and when compared with the low vs.

middle reference group, and (2) the middle ability sentence-expansion group made a significant gain when compared with the high ability sentence-expansion group ($t = 4.023$, $p < .05$) and when compared with the middle vs. high ability reference group. For the reference groups, the low ability group did not make a statistically significant gain when compared with the middle ability group ($t = 1.655$, $p > .05$) and the middle ability group did not make a statistically significant gain when compared with the high ability group ($t = 2.051$, $p > .05$). These findings indicate that the sentence-expansion treatment, as measured by the lexical cloze test, had a significant effect on reading comprehension for the low ability group when compared with the middle ability group, and for the middle ability group when compared with the high ability group.

The low ability sentence-expansion group also made a significant gain when compared with the high ability sentence-expansion group ($t = 3.959$, $p < .05$) but not when compared with the low vs. high reference group. Since the low vs. high reference group also made a significant gain ($t = 3.549$, $p < .05$) this gain cannot be attributed to treatment effect.

General Question 3

Will practice in breaking down compound or complex sentences into kernel sentences (sentence-reduction) and then recombining them (sentence-expansion) to form either the original sentence or paraphrases of the original sentences have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

Hypothesis 3.1 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the high ability combination sentence-reduction and sentence-expansion group as compared to the high ability reference group.

The results of the analyses of variance did not reveal a significant treatment x ability x time interaction for either the structural or the lexical cloze test, therefore this hypothesis was accepted. There was no significant difference in mean scores between the high ability combination group and the high ability reference group as a result of sentence-reduction and sentence-expansion practice.

An examination of the mean differences indicates that on the structural cloze test (Table 4.3), the high ability combination group made only slightly greater gains from pre- to post-test times (1.75) than the high ability reference group (1.67). On the lexical cloze test (Table 4.4), both the high ability combination group and the high ability reference group suffered a loss in the mean difference from pre- to post-test time but the loss experienced by the treatment group was greater than that of the reference group (-6.11 for the combination group and -4.00 for the reference group).

Hypothesis 3.2 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the middle ability combination sentence-reduction and sentence-expansion group as compared to the middle ability reference group.

The results of the analyses of variance did not reveal a significant treatment x ability x time interaction for either the structural or the lexical cloze test, therefore this hypothesis was accepted. There was no significant difference in mean scores between the middle ability combination group and the middle ability reference group as a result of

sentence-reduction and sentence-expansion practice. In comparing the mean differences (Tables 4.3 and 4.4), the middle ability combination group made greater but nonsignificant gains from pre- to post-test time on both the structural cloze test (5.76) and the lexical cloze test (7.08) than the reference group (2.14).

Hypothesis 3.3 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the low ability combination sentence-reduction and sentence-expansion group as compared to the low ability reference group.

The results of the analyses of variance did not reveal a significant treatment x ability x time interaction for either the structural or the lexical cloze test, therefore this hypothesis was accepted. There was no significant difference in mean scores between the low ability combination group and the low ability reference group as a result of sentence-reduction and sentence-expansion practice. In comparing the mean differences from pre- to post-test time (Tables 4.3 and 4.4), the low ability combination treatment group made less gain than the low ability reference group on the structural cloze test (4.80 for the combination group and 7.33 for the reference group). On the lexical cloze test the combination treatment group made a greater gain from pre- to post-test time (14.87) than the reference group (11.00).

Hypothesis 3.4 There are no significant differences in the mean gain scores in reading comprehension between the pre- and post- structural and lexical cloze tests when comparing the high, middle, and low ability combination sentence-reduction and sentence-expansion groups and when compared with the high, middle, and low ability reference groups.

The Behrens Fisher t-Tests showed that there were some significant differences in mean scores when comparing the high, middle, and low ability combination sentence-reduction and sentence-expansion treatment

groups and when compared with the high, middle, and low ability reference groups. Therefore, this hypothesis was rejected.

For the structural cloze tests there were no statistically significant differences but for the lexical cloze test (Table 4.6), the middle ability combination group made a significant gain when compared with the high combination group ($t = 4.831$, $p < .05$) and when compared with the middle vs. high reference group. For the reference groups, the middle ability group did not make a statistically significant gain when compared with the high ability group ($t = 2.051$, $p > .05$).

The low ability combination group made a significant gain when compared with the high ability combination group ($t = 3,959$, $p < .05$) but not when compared with the low vs. high ability reference group. Since the low vs. high ability reference group also made a significant gain ($t = 3.549$, $p < .05$), this gain cannot be attributed to the effect of treatment.

General Question 4

What is the relationship among the three treatments--sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion--for fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

Hypothesis 4.1 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the high ability treatment groups (sentence-reduction, sentence-expansion, or a combination of both sentence-reduction and sentence-expansion).

Since the analyses of variance did not reveal a significant

treatment x ability x time interaction for either the structural or the lexical cloze test, this hypothesis was accepted. There was no significant difference between the mean scores for the high ability treatment groups as a result of the treatments.

An examination of the mean differences from pre- to post-test times for the high ability groups as measured by the structural cloze test (Table 4.3) indicates that the greatest but nonsignificant gain was made by the sentence-reduction treatment group (2.29) and that this gain was also greater than that of the reference group (1.67). The next greatest gain from pre- to post-test time was made by the combination treatment group (1.75) and this gain was also greater than that of the reference group (1.67). The least gain from pre- to post-test time was made by the sentence-expansion treatment group (1.66), this being very slightly less than that of the reference group (1.67). On the lexical cloze test all high ability groups experienced a loss in mean differences between pre- and post-test times (Table 4.4). The sentence-reduction treatment group experienced the least loss from pre- to post-test time (-.85) and this was less than that suffered by the reference group (-4.00). The combination treatment group had the greatest loss (-6.11) and the sentence-expansion group the next greatest (-5.00). Both of these treatment groups experienced a greater loss than the reference group (-4.00).

Hypothesis 4.2 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the middle ability treatment groups (sentence-reduction, sentence-expansion, or a combination of both sentence-reduction and sentence-expansion).

The analyses of variance did not reveal a significant treatment x ability x time interaction for either the structural or the lexical cloze

test, therefore this hypothesis was accepted. There was no significant difference between the mean scores for the high ability treatment groups as a result of the treatments.

In comparing the mean differences from pre- to post-test times for the middle ability groups as measured by the structural cloze test (Table 4.3), we see that all treatment groups made greater but nonsignificant gains (3.77, 4.87 and 5.76) than the reference group (2.14) but these gains were not significant. Among the treatment groups, the greatest but nonsignificant gain was experienced by the combination treatment group (5.76), the next greatest by the sentence-expansion group (4.87), and the least gain was made by the sentence-reduction group (3.77).

On the lexical cloze test (Table 4.4), all middle ability treatment groups made greater but nonsignificant gains from pre- to post-test time than the middle ability reference group (3.92). Among the treatment groups, the greatest but nonsignificant gain was made by the sentence-reduction group (8.84), followed by the combination group (7.08) and sentence-expansion group (6.67).

Hypothesis 4.3 There are no significant differences in the mean structural and lexical cloze reading comprehension scores when considering the pre- and post-tests for the low ability treatment groups (sentence-reduction, sentence-expansion, or a combination of both sentence-reduction and sentence-expansion).

The analyses of variance did not reveal a significant treatment x ability x time interaction, therefore this hypothesis was accepted. There was no significant difference between the mean scores for the low ability treatment groups as a result of the treatments.

In comparing the mean differences from pre- to post-test times

for the low ability groups as measured by the structural cloze test (Table 4.3), we see that the greatest but nonsignificant gain was made by the sentence-reduction group (13.20) and that this gain was also greater than that made by the low ability reference group (7.33). The next greatest gain from pre- to post-test time was made by the sentence-expansion treatment group (12.50) with this gain also being greater than that made by the low ability reference group. The least gain was made by the combination treatment group (4.80), this being less than that of the reference group (7.33).

In comparing the mean differences from pre- to post-test times for the low ability groups as measured by the lexical cloze test (Table 4.4), we find that all treatment groups made greater but nonsignificant gains than the low ability reference group (11.00). Among the treatment groups, the greatest gain was made by the sentence-expansion group (16.87) followed by the sentence-reduction group (14.91), and the combination group (14.87). There was only a very slight difference in gains experienced by the sentence-reduction and combination groups (14.91 compared to 14.87).

Interactions

Following the analyses of variance, multiple t-tests were computed to probe the time x ability interaction. The means for each ability group were compared at pre- and post-test times (T_1 and T_2). The rate of Type I error was controlled at $\alpha = .05$ by using the Tukey (1953) criterion of significance. Thus, a difference was judged statistically significant if the absolute value of the difference exceeded the

Tukey critical value (c.v.), that is, $q/\sqrt{2}$, where q is the upper .05 percentile point of the studentized range distribution. The results of the t-tests for the time x ability interaction within groups are presented in Tables 4.7 and 4.8 and the between groups comparisons are presented in Tables 4.9 and 4.10.

The time x ability interaction within groups was significant for the middle and low ability groups as measured by both the structural and lexical cloze tests. This interaction was not statistically significant for the high ability group as measured by the structural cloze test. This indicates that time between pre- and post-tests had a significant effect on reading comprehension as measured by the structural cloze test for the low and middle ability groups but not for the high ability groups.

On the lexical cloze test, the time x ability interaction was significant for all ability groups but for the high ability group this was a significant negative interaction. It would appear that the trend observed for the high and low groups on the structural cloze test (a decrease in mean differences for the high group and an increase for the low group) was even more evident in the results of the lexical cloze test.

These findings indicate that for both the structural and lexical cloze tests, time between the pre- and post-tests had a significant positive effect for the middle and low ability groups. For the high ability groups, the time between pre- and post-tests did not have a significant positive effect. The results for the high ability groups may indicate a possible ceiling effect in that many subjects were unable to achieve a

Table 4.7

t-Test for the Time x Ability Interaction Within Groups
Structural Cloze

Ability	Mean Difference between T_1 and T_2	t
High	1.852	1.524
Middle	4.182	5.380*
Low	9.481	7.803*

c.v. at α = .05 for df = 2, 108 = 1.99

Table 4.8

t-Test for the Time x Ability Interaction Within Groups
Lexical Cloze

Ability	Mean Difference between T_1 and T_2	t
High	-4.20	-3.010*
Middle	6.633	5.640*
Low	14.361	10.460*

c.v. at α = .05 for df = 2, 108 = 1.99

Table 4.9

t-Test for the Time x Ability Interaction Between Groups
Structural Cloze

Comparison	Mean Difference T_1	t	Mean Difference T_2	t
High - Middle	9.058	7.618*	6.728	5.653*
High - Low	23.259	16.414*	15.630	11.030*
Middle - Low	14.201	11.933*	8.902	7.480*

c.v. at α = .05 for df = 3,216 = 2.34

Table 4.10

t-Test for the Time x Ability Interaction Between Groups
Lexical Cloze

Comparison	Mean Difference T_1	t	Mean Difference T_2	t
High - Middle	15.73	9.324*	4.897	3.223*
High - Low	30.513	18.731*	11.952	7.337*
Middle - Low	14.783	9.816*	7.055	4.684*

c.v. at α = .05 for df = 3,216 = 2.34

higher score on the post-test than had been achieved on the pre-test. In particular, this seems to be quite evident for the lexical cloze test where 14 out of 35 high ability subjects achieved scores ranging from 60 to 83 percent on the pre-test.

A comparison of the time x ability between groups interaction was significant for all group comparisons. There were significant differences between the high, middle, and low ability groups both at pre-test time and at post-test time. These findings indicate that the three ability groups performed differently both on the cloze reading comprehension pre-tests, and the post-tests. These results were to be expected since the subjects were assigned to the reading ability groups according to the scores obtained on the structural and lexical cloze pre-tests.

Qualitative Analysis

Since statistical analyses of the pre- and post-test scores obtained by the subjects on the structural and lexical cloze tests showed that considerable differences may exist between the two tests (note Figure 4.1), two types of post hoc qualitative analyses were made of selected responses to determine what these differences might be. First, a type to token ratio count of responses for lexical deletions was conducted for ten randomly selected subjects across treatment groups. Following this, a comparison of responses for randomly selected noun and verb slots was made for the structural cloze pre- and post-tests and the lexical pre- and post-tests for all subjects in the sentence-expansion treatment group.

Type to Token Ratio Count

The type to token ratio may be used as an index of verbal

diversification (Froese, 1977). The count of different word responses (types) and total word responses (tokens) was based on exact responses for each selected slot. On both the structural and lexical cloze pre- and post-tests the selected slots were all nouns, verbs, adjectives, and adverbs. This type to token ratio count was carried out on the pre- and post-tests of ten randomly selected subjects across the treatment groups. These findings are presented in Tables 4.11 and 4.12.

By referring to Tables 4.11 and 4.12 it may be seen that there is more variability for lexical deletions in the structural cloze tests as evidenced by the higher ratio averages (.550 and .472). This suggests less constraint on these slots which results in fewer correct restorations. There is less variability for lexical deletions in the lexical cloze tests as evidenced by the lower ratio averages (.390 and .428), thus implying more constraint on these slots. This suggests that on the lexical cloze test there is less variability which results in more correct restorations. These findings indicate that the structural and lexical cloze tests are providing different measures of reading comprehension.

Comparison of Noun and Verb Responses

Six noun slots and three verb slots were randomly selected from each of the structural and lexical cloze pre- and post-tests and these responses were examined for each of the 30 subjects in the sentence-expansion treatment group. The exact responses for these slots were compared for the structural cloze pre- and post-tests and for the lexical cloze pre- and post-tests (see Table 4.13).

Table 4.13 shows that a greater percentage of nouns than verbs were correctly replaced on both the structural and lexical cloze tests.

Table 4.11

Pre-Test Type to Token Ratio of Responses for Lexical Deletions of Ten Randomly Selected Subjects

Responses	Structural Cloze	Lexical Cloze
Nouns	.478	.363
Verbs	.666	.470
Adjectives	.557	.428
Adverbs	.500	.300
Average	.550	.390

Table 4.12

Post-test Type to Token Ratio of Responses for Lexical Deletions of Ten Randomly Selected Subjects

Responses	Structural Cloze	Lexical Cloze
Nouns	.320	.331
Verbs	.600	.437
Adjectives	.466	.600
Adverbs	.500	.342
Average	.472	.428

Table 4.13

Comparison of Noun and Verb Responses for Sentence-Expansion Group Only
Percent Exact Responses

Word Slot	Structural Cloze Pre-Test	Structural Cloze Post-Test	Difference	Lexical Cloze Pre-Test	Lexical Cloze Post-Test	Difference
Nouns	29.44	43.33	13.89	50.55	62.22	11.67
Verbs	16.66	15.55	-1.11	10.00	20.00	10.00

Post-tests reveal opposite trends for the structural and lexical cloze tests. On the structural cloze post-tests there was a greater increase in the number of exact responses for nouns on the structural cloze than on the lexical cloze post-tests (13.89 vs. 11.67 percent increase) but for verbs there was an increase in the number of exact replacements for the lexical cloze post-tests and a slight decrease for the structural cloze post-tests (-1.11 decrease vs. 10 percent increase).

Summary

The specific statistical procedures which were used in analyzing the data for testing the various hypotheses and the results of these hypotheses have been described earlier in this chapter. The post hoc qualitative procedures which were used to analyze test responses have also been described.

General Findings. The overall analyses of variance (Tables 4.1 and 4.2) revealed that the sentence-reduction, sentence-expansion, and combination sentence-reduction and sentence-expansion treatments did not have a significant effect on the students' reading comprehension as measured by the structural and lexical cloze tests. However, the Behrens Fisher t-tests which were used to probe subaspects of selected nonsignificant general factors did indicate some significant effects. While comparisons between treatment and reference groups were not significant, there were significant comparisons within treatment groups from pre- to post-test scores.

Sentence-reduction and sentence-expansion practice significantly improved the reading comprehension of the low ability groups on the structural cloze test when compared with the middle or high ability groups

for each treatment (Table 4.5). Sentence-expansion practice also significantly improved the reading comprehension of the low ability group on the lexical cloze test when compared with the middle ability group (Table 4.6) and for the middle ability group when compared with the high ability group. The low ability sentence-expansion group obtained the lowest pre-test score (26.75) and experienced the largest gain in mean differences (16.87) from pre- to post-test time.

A combination of sentence-reduction and sentence-expansion practice significantly affected the reading comprehension of the middle ability group on the lexical cloze test when compared with the high ability group (Table 4.6).

Comparison of Means. A comparison of pre- and post-test mean scores for the three ability groups within each treatment group is presented in Figures 4.2 and 4.3. In comparing the mean scores of each ability group with Bormuth's (1967) criteria for instructional level (equals 75 to 85 percent on a multiple-choice test), it can be seen that at pre-test time all low ability groups were well below instructional level (45 to 52 percent) on both the structural and lexical cloze tests.

At post-test time the differences between the ability groups were reduced. For the low ability groups, the sentence-reduction group was closest to instructional level on the structural cloze test (having a mean score of 43.60 percent). On the lexical cloze test, only the low ability sentence-reduction group (with a mean score of 45.72 percent) reached instructional level. Although the low ability sentence-expansion group did not quite reach instructional level (having a mean score of 43.62 percent) they had the lowest mean score at pre-test time (26.75

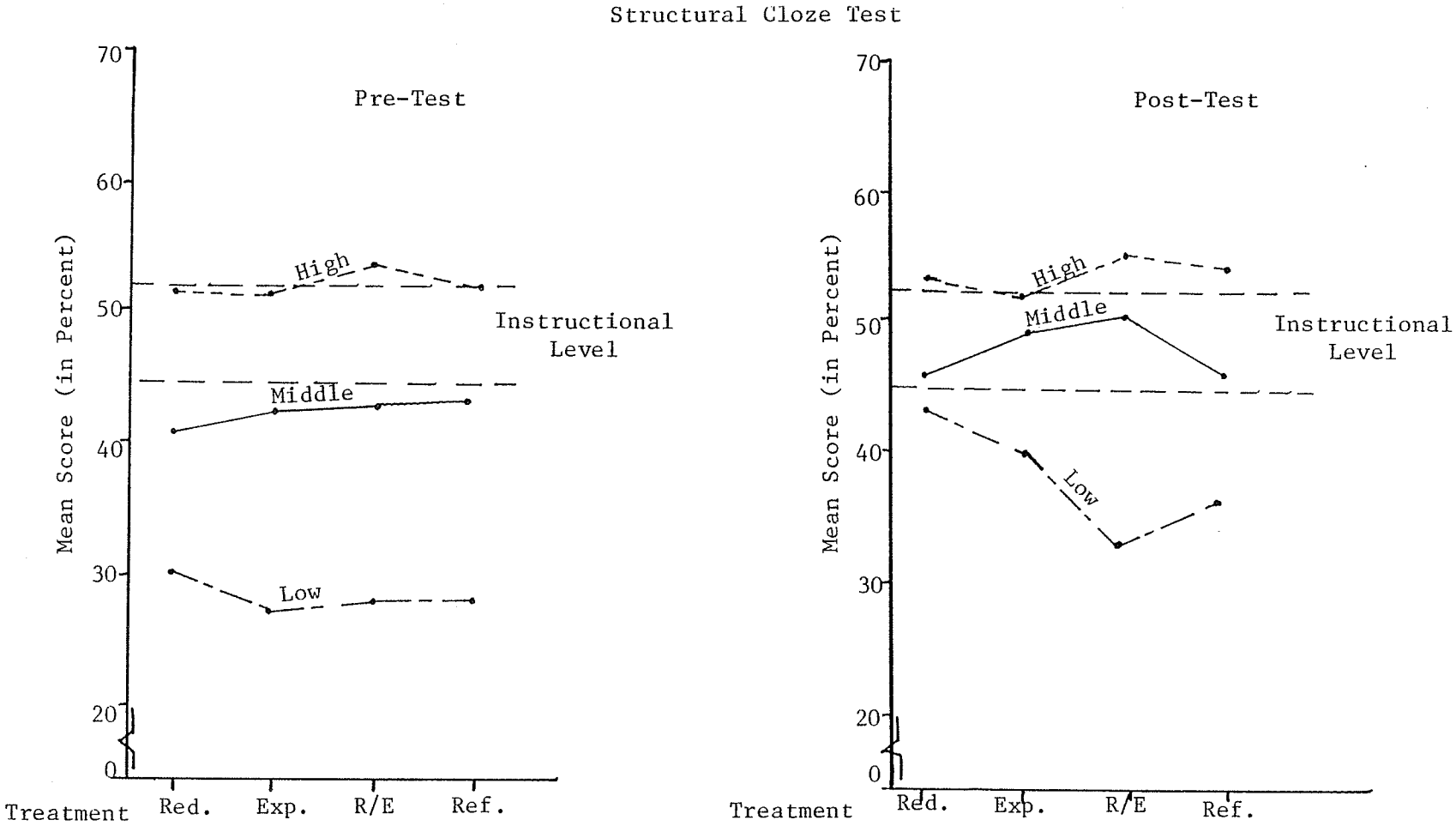

Figure 4.2

Comparison of Pre- and Post-test Mean Scores with Bormuth's (1967) Criteria for Instructional Reading Level (45 - 52 percent).

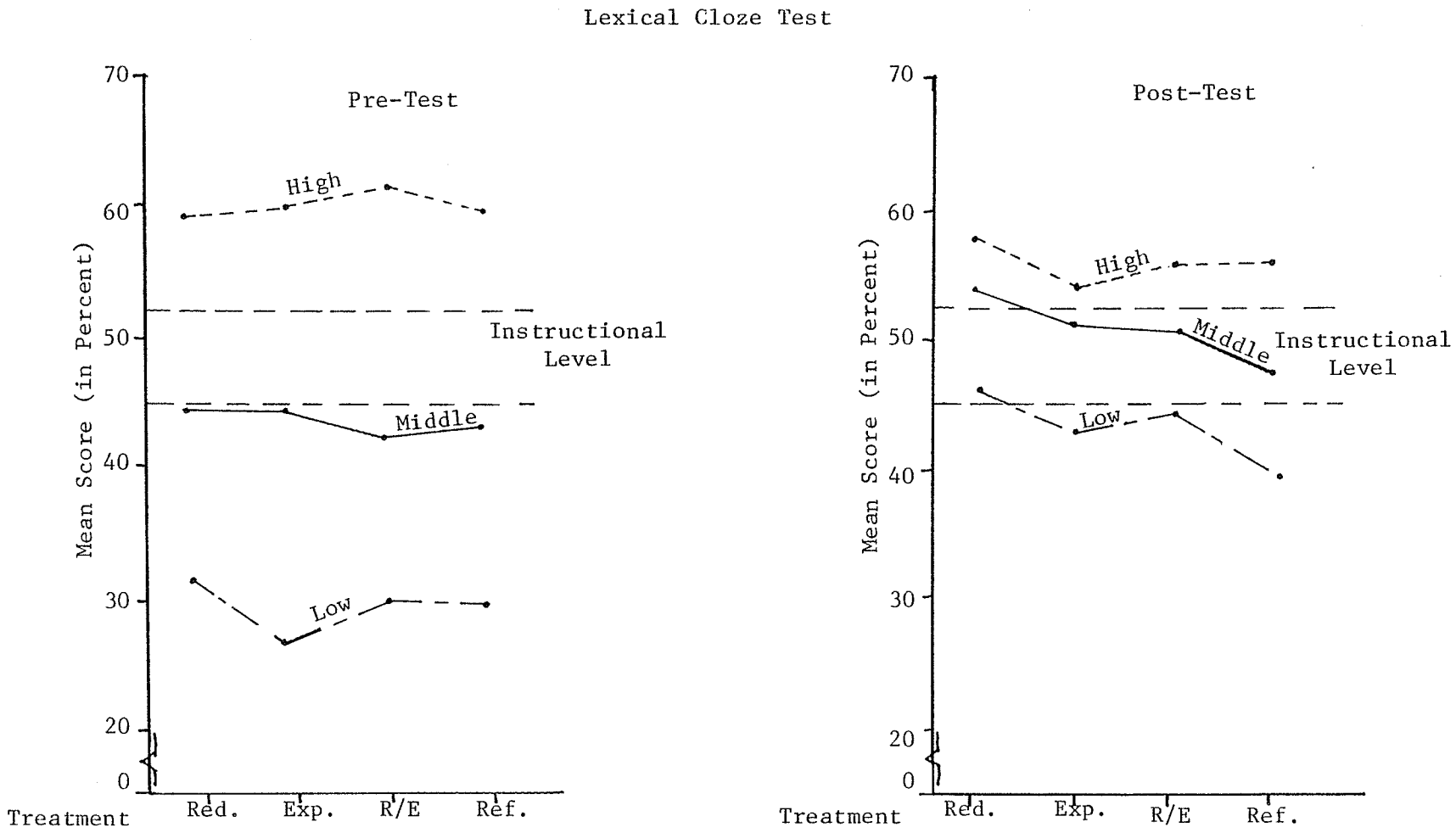

Figure 4.3

Comparison of Pre- and Post-test Mean Scores and Bormuth's (1967) Criteria for Instructional Reading Level (45 - 52 percent).

percent) and experienced the greatest gain in mean scores (16.87 percent) between pre- and post-tests. The low ability combination reduction-expansion group was also near instructional level (with a mean score of 44.37 percent) on the lexical cloze post-test while the low ability reference group was furthest from instructional level (with a mean score of 39.22 percent) on the post-test.

Although there were no statistically significant differences between the treatment groups, Figure 4.2 does indicate that within treatment groups the sentence-reduction practice was most effective for the low ability groups and a combination of sentence-reduction and sentence-expansion practice was most effective for the middle ability groups as measured by the structural cloze test. On the lexical cloze test, the low ability sentence-expansion group and the middle ability sentence-reduction group made the greatest gains from pre- to post-test time.

Pre- to post-test gains were a significant factor between groups but within groups it was a significant positive factor only for the low and middle ability groups. The treatment x ability interaction within group comparisons also confirmed the ability x time (gains) interactions which indicated that the time between pre- and post-tests was a significant factor for the low and middle ability groups but not for the high ability groups. Figures 4.2 and 4.3 show that all high ability groups were at, or above instructional level at pre-test time and their performance on the structural cloze improved only slightly at post-test time. On the lexical cloze, pre-test performance was very high and post-test performance was lower than at pre-test time. These results indicated a ceiling effect for the high ability group in that it was unlikely that

many subjects would be able to achieve a higher score at post-test time. For 14 out of 35 subjects pre-test scores ranged from 60 to 83 percent; these are unusually high cloze scores.

The fact that between groups comparisons for treatment effect were not a significant factor in the present study may be due to the short treatment period of only ten lessons or that the test instruments were not sensitive to measuring such differences.

Relationship to Other Findings. Previous research findings regarding the effects of sentence-expansion (sentence-combining) or sentence-reduction on reading comprehension have remained inconclusive. Shockley (1974) found no significant increase in students' reading comprehension after twelve weeks of sentence-combining instruction while Hughes (1975) and Klassen (1976) reported results similar to those of the present study. After sentence-combining practice, experimental subjects exceeded the control subjects on mean scores of reading comprehension but then gains were not statistically significant. Kurushima (1979) found that sentence-combining instruction significantly influenced third-graders' reading comprehension after eight lessons. Straw (1978) also found both sentence-reduction and sentence-expansion instruction to have a significant effect on reading comprehension. The present study adds to the above findings in that it provides some additional insights as to the effectiveness of sentence-reduction and sentence-expansion practice for students of varying levels of reading ability.

O'Donnell and King (1974) found that sentence analysis (sentence-reduction) and resynthesis (sentence-expansion) practice had no significant effect on the reading comprehension of low ability readers in the

seventh grade. In the present study, low ability readers made significant gains in reading comprehension when compared with high and/or middle ability readers. Some of the middle ability groups also made significant gains in reading comprehension when compared with high ability readers. This indicated that low and middle ability readers in this fourth-grade sample did benefit from sentence-reduction and sentence-expansion practice. These results may be due to the fact that the sentences which were used for practice were taken directly from fourth-grade reading materials, thus assisting students in developing an understanding of the syntactic structures which are found in these materials.

The qualitative analysis revealed differences between the structural and lexical cloze tests which are supported by Weaver's (1977b; 1977c) findings. Weaver found that structural deletions correlated with vocabulary while lexical deletions correlated with story comprehension. In the present study, lexical response slots in the structural cloze test were more constrained than lexical slots on the lexical cloze test on both pre- and post-tests. According to Weaver (1977b) one might expect fewer exact replacements and more synonym replacements on a lexical cloze test but in this study this was not the case. Whether these results can be attributed merely to test peculiarity or to treatment effect would only be conjecture and would require further study. However, other findings which are discussed below, do suggest the possibility of treatment effect.

A revealing or enlightening finding on the lexical cloze test was that twice as many verbs were correctly replaced on the post-test as had been replaced on the pre-test (Table 4.13). These results were not true

for the structural cloze where there was little mean difference (-1.11) between pre- and post-tests. Froese (1977) reported that verb restorations were less consistent than noun restorations. In view of these findings, the increase in correct verb replacement on the lexical cloze by subjects in the present study is very encouraging and suggests that practice in manipulating the syntactic structures of sentences had a positive effect on the reading comprehension of these fourth-grade students. According to Simons (1970), determination of main verbs is considered to be necessary for the recovery of deep structure in sentences and it is an important aspect of reading comprehension. Guthrie's (1973) findings that the comprehension of verbs and function words in silent reading were determined by syntactic cues also lends support to these assumptions.

In this chapter, the four general questions posed at the beginning of the study and their accompanying specific hypotheses have been evaluated and discussed in detail. The conclusions based on these findings, applications to educational practice, and suggestions for further research are presented in Chapter 5.

Chapter 5

SUMMARY AND CONCLUSIONS

The major purpose of this study was to investigate the effects of practice in sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion on the reading comprehension of fourth-grade students. Since previous research has shown that practice in sentence-combining (or sentence-expansion) affects the syntactic maturity of elementary grade students' performance in written language (Mellon, 1969; O'Hare, 1973; Combs, 1975), it has been hypothesized that it may also have a positive effect on reading comprehension. Other research (Fagan, 1971) has led to the opinion that practice in sentence-reduction might also affect the reading comprehension of students in the elementary grades.

The purpose of sentence-reduction practice was to assist students in breaking down compound or complex sentences into simple, kernel sentences and the purpose of sentence-expansion was to assist students in combining two or more simple sentences to produce compound sentences (two or more independent clauses) or complex sentences (one independent clause and one or more dependent clauses). A combination of both sentence-reduction and sentence-expansion practice was aimed at assisting students in breaking down complex sentences to simple sentences and then recombining them to form either the original sentence or paraphrases of the original sentence.

In this study, answers were sought for four general questions:

1. Will practice in sentence-reduction (finding the kernel sentences in compound or complex sentences) have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural (deletion of every fifth word) and lexical (deletion of nouns, verbs, adjectives, and adverbs) cloze tests?

2. Will practice in sentence-expansion (combining kernel sentences to make compound or complex sentences) have an effect on the reading comprehension of fourth-grade students within high, middle and low ability groups based on structural and lexical cloze tests?

3. Will practice in breaking down compound or complex sentences into kernel sentences and then recombining them to form either the original sentence or paraphrases of the original sentence have an effect on the reading comprehension of fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

4. What is the relationship among the treatments--sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion--for fourth-grade students within high, middle, and low ability groups based on structural and lexical cloze tests?

Summary of the Design

The subjects in this study were 120 fourth-grade students in two schools in one greater Winnipeg, Manitoba, Canada school division. The subjects were assigned to three treatment groups--sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion--and one reference group. Each of the three treatment groups and the reference group contained 30 students who were

randomly assigned to high, middle, and low reading ability groups based on scores obtained on two different pre-tests in reading comprehension. The tests were a structural cloze test and a lexical cloze test. For the structural cloze test, subjects obtaining a score of 50 percent or greater on the pre-test were assigned to the high ability group; subjects whose scores ranged from 38 to 49 percent were assigned to the middle ability group; and subjects whose scores were less than 37 percent were assigned to the low ability group. For the lexical cloze test, subjects obtaining a score of 52 percent or greater on the pre-test were assigned to the high ability group; subjects whose scores ranged from 38 to 51 percent were assigned to the middle ability group; and subjects whose scores were less than 37 percent were assigned to the low ability group.

Treatment for the sentence-reduction group consisted of practice in reducing compound or complex sentences to simple, kernel sentences. The sentence-expansion group treatment consisted of practice in combining (expanding) simple sentences to form compound or complex sentences. The subjects in the combination sentence-reduction and sentence-expansion treatment group practiced both of the above operations. The instructional materials were comprised of sentences which were selected from fourth-grade basal readers according to the following criteria: sentences containing structures which fourth-grade students found difficult and sentences containing structures which appeared with considerable frequency in fourth-grade readers. Both a structural and a lexical cloze test were administered as post-tests immediately following the treatment period (ten lessons of 30 minutes each).

Summary of Findings and Conclusions

The findings and conclusions are summarized as follows:

1. A three way analysis of variance using the factors treatment, ability, and test-time (gains) were computed for the structural cloze test (deletion of every fifth word) and the lexical cloze test (deletion of nouns and pronouns, verbs including auxilliaries, adjectives, and adverbs). There were no significant treatment by ability by gain interactions between the four groups (three treatment groups and one reference group) and it was concluded that there were no significant effects between groups for the treatments--sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion. (Pre- to post-test gains were referred to as "time" in Tables 4.7 and 4.8.)

2. There were significant ability by gain interactions on the analyses of variance and multiple t-tests (with the Tukey criterion of significance) were used to probe these interactions. There were significant differences between the high, middle, and low ability groups in each treatment group at pre-test time and at post-test time. This indicates that the high ability groups were different from the middle and low ability groups and the middle ability groups differed from the low ability groups at pre-test time and these differences were still apparent at post-test time. Since the subjects in the ability groups had been selected according to scores obtained on two pre-tests, these results were to be expected.

3. There were significant ability by gain interactions within the treatment groups. Multiple t-tests (using the Tukey criterion of significance) were computed to probe these interactions. On the

structural cloze test, gains from pre- to post-tests were significant for the middle and low ability groups. On the lexical cloze test, gains were significant for all groups but for the high ability group this was a significant negative interaction. This negative interaction was attributed to a ceiling effect experienced by some high-ability group subjects who obtained very high scores on the lexical cloze pre-test. When scores are at the extreme of a distribution they have a greater probability of shifting toward the mean in a pretest-posttest design. This shift to the mean may have resulted in the lower post-test scores for the high ability group.

4. Although the overall analyses of variance did not indicate significant treatment by ability by gain interactions, the Behrens Fisher t-tests with Welch solution for degrees of freedom were performed on selected, nonsignificant effects to further probe the treatment by ability interactions. The results of these t-tests confirmed the findings of the ability by gain interactions.

For the structural cloze test, the low ability sentence-reduction and sentence-expansion treatment groups made significant gains in reading comprehension when compared with the high ability group and when compared with the low versus the high ability reference groups. The low ability sentence-reduction and sentence-expansion treatment groups also made significant gains in reading comprehension when compared with the middle ability group and when compared with the low versus the middle reference groups.

For the lexical cloze test, the low ability sentence-expansion group made a significant gain when compared with the middle ability group

and when compared with the low versus the middle ability reference group. The middle ability sentence-expansion group also made a significant gain on reading comprehension when compared with the high ability group and when compared with the middle versus the high ability reference groups. The middle ability combination treatment group made a significant gain in reading comprehension when compared with the high ability group and when compared with the middle versus high ability reference groups.

These results indicate that except for the low ability combination treatment group, the middle and low ability treatment groups have made significant gains in reading comprehension when compared with the middle versus low ability reference groups.

5. No statistically significant differences were found among the three treatments--sentence-reduction, sentence-expansion, and a combination of both sentence-reduction and sentence-expansion--for students within high, middle, and low ability groups. No one treatment was statistically better than any other treatment for students in this sample. This finding agrees with that of Straw (1978) who also found no statistically significant differences to exist between the sentence-reduction and sentence-expansion treatments for the fourth-grade subjects in his sample.

6. A type to token ratio count of selected responses on the structural and lexical cloze tests indicated that the two tests were measuring different effects. The structural cloze slots were found to be less constrained than the lexical cloze slots for the subjects in this sample. This finding is somewhat in disagreement with Weaver's (1977c) finding that there is a greater variation of responses to lexical

cloze items. On the other hand, cues to determine lexical slots may be further apart and hence may provide more context as in the following examples from the lexical and structural cloze pre-tests in this study.

Example 1, Lexical Cloze: "The first part of the __(flight)__ was to the space __(station)__ which travelled through space between the __(earth)__ and moon."

Example 2, Structural Cloze: "Patches had always lived __(in)__ cities but now __(the)__ family had come to __(Grandfather's)__ farm to live for __(a)__ while."

From these examples it can be seen that in the lexical cloze all of the deletions were nouns whereas in the structural cloze a variety of parts of speech was deleted. Whether the findings of this study were due to test peculiarity or to treatment effect is not clear.

7. A comparison of noun and verb exact replications made by the sentence-expansion group indicated that on both the structural and lexical cloze tests more nouns were correctly replaced on the post-tests (43.33 and 62.22 percent) than on the pre-tests (29.44 and 50.55 percent). For verb replacements, there was a slight decrease in correctly replaced responses on the structural cloze test (from 16.66 to 15.55 percent) but on the lexical cloze test twice as many verbs were correctly replaced on the post-test (20 percent) as had been replaced on the pre-test (10 percent). Since Froese (1977) found verbs to be most difficult to replace and Guthrie (1973) found that comprehension of verbs and function words was determined by syntactic cues, these results may indicate that the treatments were effective in improving the subjects' understanding of the syntactic structures of sentences, an important aspect of reading comprehension. However, Weaver (1977c) cautions that it may be difficult to separate the structural and lexical components of textual

materials. He states, "Structure is confounded . . . to an indeterminable degree with the lexical" (1977c).

Discussion

The findings of the present study should be interpreted in terms of previous theory and research which was discussed in Chapter 2.

Studies such as those of Strickland (1962), Ruddell (1963), and Loban (1963; 1976) have established that a relationship exists between children's grammatical knowledge and the comprehension of their reading materials. These findings have led to the suggestion that reading materials may need to reflect more closely the structures which children use in their oral and written language (Ruddell, 1963; Nurss, 1969; Tatham, 1970; Smith, 1971; 1973) or that reading instruction should be designed so as to provide assistance to children in understanding the language structures which occur in their reading materials (Fagan, 1971; Pflaum, 1974).

The present study has attempted to address this problem first by determining the structures which elementary-grade students found difficult (Robertson, 1966; Sauer, 1970; Fagan, 1971; Stoodt, 1972; Guthrie, 1973; Richeck, 1976a). Then, fourth-grade basal readers were surveyed to determine whether these structures occurred in the reading materials and last, sentences were selected directly from the readers based on those structures which children found difficult. Previous studies had been criticized for using artificial or contrived language in the reading materials constructed for experimental purposes (Tatham, 1970; Richeck, 1976b).

The finding that the low and middle ability treatment groups made

significant gains when compared with the high ability groups and the low and middle versus the high ability reference groups, may be due to the fact that instructional materials were selected according to criteria which took into account the structures which students found difficult. This compares with Hughes' (1975) findings. Hughes suggested that the gains made by the low and middle ability readers indicated a close link between a student's reading level and his or her syntactic maturity level. However, for the high ability groups, these materials may not have matched their developmental or instructional levels, thus reducing or inhibiting gains.

The theory that recovery of deep structure is necessary for the comprehension of sentences (Chomsky, 1965; Fodor, Bever, and Garrett, 1974) has led to investigations of this concept (Simons, 1970) and to the development of instructional methods such as sentence-reduction and sentence-expansion as a means of developing deep structure recovery abilities in children.

The findings of numerous research studies have provided evidence that sentence-combining (sentence-expansion) significantly affects the syntactic maturity of students' performance in written language (Mellon, 1969; O'Hare, 1973; Combs, 1975). The significant results of these studies combined with theoretical constructs have led researchers to also investigate the effect of sentence-combining practice on reading comprehension but the findings have remained inconclusive. Mixed results have been reported, with significant effects occurring on some measures of reading comprehension and nonsignificant effects on other measures for the same subjects (Hughes, 1975; Combs, 1975; Levine, 1976; Straw, 1978).

Some investigators have found significant increases in mean scores but not statistically significant differences between treatment and control groups (Shockley, 1974; Klassen, 1976).

Studies investigating the effects of both sentence-expansion and sentence-reduction (Stedman, 1971; Fisher, 1973; O'Donnell and King, 1974) also report mixed results. Some subjects made significant gains in reading comprehension while others did not. In a study which included sentence-reduction practice as a separate treatment, Straw (1978) found that the experimental subjects performed significantly better on a lexical cloze reading comprehension test but not on the Nelson Reading Skills Test. There is a problem in that different tests appear to be measuring reading comprehension in different ways.

This study, like some reported above, noted an increase in mean scores from pre- to post-test time but these gains were not statistically significant when the treatment groups were compared with the reference group. Similar to Hughes' (1975) study, the low and middle reading ability groups within the treatment groups made significant gains.

Standardized multiple-choice tests of reading comprehension and the traditional "any word" deletions of every fifth word in cloze tests have not proven successful in determining the effects of treatment on reading comprehension (Combs, 1975; Levine, 1976; Klassen, 1976). Findings from the present study indicate that other measures such as lexical cloze tests and qualitative analyses of responses might prove to be more sensitive measures in determining the effects of treatments emphasizing the manipulation of syntactic structures in sentences. Straw (1978) and Kurushima (1979) have also had some encouraging results when subjects

were tested on several measures of reading comprehension written at different levels of syntactic complexity. Straw, in his study, used a lexical cloze test written at three levels of syntactic complexity.

It is evident that in order to measure the effects of programs designed to enhance students' syntactic skills, better measuring devices must be found and their use replicated as has been done in the measurement of written skills through the development of Hunt's T-unit (Hunt, 1965).

Limitations of the Study

The following limitations need to be recognized when considering the findings in this study. The limitations presented in Chapter 1 have been restated and further limitations as recognized by the investigator have been reported.

1. The investigation was limited to analyzing data for fourth-grade students in two schools in one suburban school division and cannot be generalized beyond this setting.

2. Due to time constraints imposed by the school division, the study consisted of only ten lessons over a five-week period.

3. Measurement of the students' performance was limited to the accuracy and validity of the structural and lexical cloze tests used as measuring devices.

4. The experimenter administered the tests and instructed the experimental groups but did not instruct the reference group. Experimenter bias cannot be ruled out.

5. The unequivalence of the cloze tests must be considered. The tests were initially equated according to one readability level and

one syntactic complexity level (see Appendix B). This may not be appropriate for students reading at different levels.

6. Readability formulas and other linguistic formulas may not be assessing the true difficulty level of the cloze tests.

7. Exact repetition of the instructional methods may be impossible to replicate because of the open-ended nature of the instructional procedure and therefore comparisons of the findings must be viewed with caution.

Implications for Educational Practice

A number of results from this study have implications for instructional practice.

1. Teachers require knowledge concerning the development of syntactic structures in the language of elementary-grade students in order to analyze and structure exercises in sentence-expansion and sentence-reduction.

2. There is a need to examine the basal readers to determine the structures which elementary-grade students find difficult. The following are examples of difficult structures taken from Driftwood and Dandelions, Thomas Nelson and Sons (Canada) Limited:

> Mrs. Gray was feeling very happy as she rushed into the wardrobe room where they found her a pretty blue dress (p. 57).
>
> They raced off, chasing each other up the path that wound between the painted frame houses on the fringe of the village, then clambered down from ledge to ledge of rusted brown and purple rock like mountain goats who thrive on heights (p. 18).

The first sentence contains one independent clause, a phrase, and two right-embedded, dependent clauses. The second sentence contains one independent clause; two deletions of the pronoun "they," several phrases,

the present participle "chasing," and three dependent clauses. From these examples it can be seen that a variety of syntactic structures is found in fourth-grade textual materials and that these structures differ in levels of complexity.

3. Instruction in sentence-reduction and sentence-expansion is of benefit to students of middle and low reading ability.

4. It is important to provide the proper level of instructional materials for students of varying reading abilities. From the results of this study, it appeared that the high reading ability students required materials of higher syntactic complexity.

5. The instructional level construct (Bormuth's 1967 criteria of 45 to 52 percent on cloze tests) is also an important one since students do score differently on materials written at different levels of syntactic complexity (also confirmed by Straw, 1978 and Kurushima, 1979).

Implications for Future Research and Development

This study has provided additional information regarding the effects of practice in sentence-reduction and sentence-expansion on the reading comprehension of fourth-grade students but it has also raised issues which require further investigation. Some of these are:

1. There is a need to operationally define and outline the instructional procedures that constitute sentence-reduction and sentence-expansion.

2. More refined measurement techniques and devices need to be developed to measure the effects of syntactic manipulation of sentence structures on reading comprehension and these methods must be of the type that can be replicated easily.

3. Results of the present study and that of Straw (1978) suggest that lexical cloze may be a more sensitive measure of students' understanding of syntactic structures than the "any word" deletion of every fifth word. This measure needs to be validated experimentally.

4. Experimental studies need to be extended to use materials more representative of classroom materials as a basis for sentence-reduction and sentence-expansion practice, rather than use materials developed purely for experimental purposes.

5. There is a need to investigate the feasibility of training classroom teachers in sentence-expansion and sentence-reduction so that they are able to develop instructional materials for their students.

6. Further comparisons of rhetorical approaches to sentence-expansion and sentence-reduction as used in this study, and arhetorical approaches need to be considered (Zamel, 1980).

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APPENDIX A

CLOZE TESTS

Structural Cloze Pre-Test

IN THE WOODS

Dan's face flushed with __(excitement)__ as he looked at __(the)__ green fields and rolling __(hills)__ ahead. It was a __(beautiful)__ bright day in early __(June)__. Slowly he wandered down __(the)__ dirt road enjoying the __(cool)__ feel of powdered dust __(between)__ his toes. From the __(nearby)__ field of clover came __(a)__ delicious smell of honey. __(Patches)__ was running ahead, barking __(eagerly)__.

But Dan didn't want __(to)__ go any faster. There __(was)__ too much to see! __(big)__, clumsy bumblebees hummed and __(bright)__ butterflies floated silently from __(blossom)__ to blossom. In the __(tall)__ grass a bird swayed __(joyously)__ as it sang a __(lively)__ tune. Dan took a __(deep)__ breath and whistled back __(at)__ the bird.

Then another __(whistle)__ close by made him __(stop)__. There, on a small __(mound)__ beside its hole, was __(a)__ strange little animal. It __(was)__ standing on its hind __(legs)__, wiggling its nose. Patches __(had)__ seen it too, but __(as)__ the dog bounded toward __(it)__ the woodchuck hurried down __(its)__ hole. The big white __(collie)__ was sniffing eagerly at __(the)__ hole, growling softly, and __(digging)__ with his claws. It __(was)__ not safe for the __(woodchuk)__ to come out when __(Patches)__ was around.

Dan and __(Patches)__ had a lot to __(learn)__ about the country. Dan __(and)__ Patches had always lived __(in)__ cities but now __(the)__ family had come to __(Grandfather's)__ farm to live for __(a)__ while. Living in the __(country)__ was a new experience __(for)__ him. Now he was __(an)__ explorer going through unknown __(lands)__, discovering strange new animals __(and)__ all sorts of things

Adapted from
"Wings in the Woods," Ventures Book 4,
W. J. Gage Limited, Toronto, Ontario, 1968, 212-214.

Structural Cloze Post-Test

THE SECRET CAVE

When breakfast was over, ___(Sammy)___ and Rex went off ___(to)___ the secret cave. Sammy ___(moved)___ the stones away from ___(the)___ opening and they wiggled ___(in)___. As soon as they ___(were)___ inside, Sammy pressed the ___(button)___ on his flashlight. It ___(shone)___ on a large room ___(with)___ shimmering, wet walls.

A ___(little)___ brook ran out of ___(a)___ deep crevice in the ___(back)___ wall. Sammy knew it ___(was)___ the same brook which ___(he)___ had followed to the ___(cave)___. There must be another ___(cave)___ on the other side ___(of)___ the wall, he thought. ___(If)___ he could dig under ___(the)___ wall, he might be ___(able)___ to crawl through there.

___(Sammy)___ put the flashlight down ___(gently)___ and went to work. ___(It)___ was easy digging along ___(the)___ sandy banks of the ___(brook)___ but he didn't have ___(much)___ luck in making the ___(opening)___ larger. As fast as ___(he)___ dug away the sand, ___(the)___ water spread out and ___(filled)___ the opening. At last ___(he)___ had to give up.

___(Just)___ then there was a ___(loud)___ crash. Sammy turned his ___(light)___ toward the sound. He ___(had)___ dug away the sand ___(on)___ which the rocks of ___(the)___ back wall were resting. ___(As)___ the brook washed away ___(the)___ sand, the rocks had ___(settled)___ down and one large ___(rock)___ had crashed to the ___(ground)___, leaving a large hole ___(in)___ the wall. Sammy climbed ___(up)___ and held his flashlight ___(to)___ the hole.

Sparkling in ___(the)___ light were walls which ___(looked)___ like pink coral and ___(strange)___, rocky columns. The cave ___(seemed)___ to stretch for miles ___(and)___ miles into the darkness.

Adapted from
"The Secret Cave," Roads to Everywhere,
Ginn and Company, Toronto, 1964, 24-26.

Lexical Cloze Pre-Test

A HOLIDAY IN SPACE

It was the summer of 1985. (School) had closed and Bob (wondered) what he would do for the (holidays). Bob's father was the (chief) engineer of outer space (experiments). Just now he was (working) on Moon Base. He (was) finishing some experiments on the (moon). Bob was proud of (his) father but as time (went) on, he missed him (more) and more.

Then, the (very) next day a message (arrived) from Moon Base. Bob's (father) would be returning to (earth) in a couple of (weeks) and he had requested (that) Bob join him for (his) last two weeks on the (moon). This would be the (most) exciting holiday he had (ever) had!

The next day (Bob) started on his journey to the (moon). The first part of the (flight) was to the space (station) which travelled through space between the (earth) and the moon. This (part) of the trip was (made) in a rocket ship (called) a ferry.

Before take-off, (Bob) put on a pressurized (space) suit and fastened his (seat) belt. At first Bob (couldn't) hear anything. Then he (turned) on the radio, which (was) part of the helmet, and (he) could hear everything that (went) on inside the rocket (ship).

In a few minutes (Bob) had reached the space (station). Although he had heard (his) father tell about the (space) station, it was even (more) wonderful than he had (dreamed) it could be. Most of (all) Bob liked to look (down) at all the brilliant (white) clouds between him and the (earth) below.

Adapted from
"To the Moon and Back," Roads to Everywhere,
The Ginn Basic Readers, Ginn and Company,
Toronto, Ontario, 1964, 155-158.

Lexical Cloze Post-Test

CLOSE PLAY AT HOME-BASE

Jack picked up his glove and ran out. ____(It)____ was an honor to ____(play)____ left field and he ____(wanted)____ to show the coach ____(that)____ he could handle his ____(new)____ position.

Then the pitcher ____(threw)____, and Jack heard a ____(crack)____ as the bat hit the ____(ball)____. The ball came sailing toward ____(him)____. He followed it with ____(his)____ eyes, trying to judge ____(where)____ to play it. But the ____(ball)____ had been hit too ____(hard)____ and it was going over ____(his)____ head.

He backed up ____(quickly)____ without thinking of the ____(steep)____ drop behind him. As ____(he)____ lost his balance, Jack ____(fell)____ down the slope. He ____(jumped)____ up instantly and scrambled ____(after)____ the ball, which had ____(fallen)____ among the trash. Tin ____(cans)____ and paper were flying ____(as)____ he grabbed for it. ____(He)____ got his hands on the ____(ball)____, straightened up, and stepped ____(right)____ into a bucket.

He ____(tried)____ to shake it loose but the ____(bucket)____ would not come off ____(his)____ foot and there was ____(no)____ time to pull it ____(off)____. He had to get the ____(ball)____ back, or the run ____(would)____ score. But from where ____(he)____ was he couldn't see ____(anyone)____ to throw it to.

____(Jack)____ stumbled up the hill, ____(falling)____ as he went. It ____(was)____ awfully hard to run with a ____(bucket)____ on his foot. As ____(he)____ reached the top of the ____(hill)____, he threw the ball to ____(Tom)____, who had come over from ____(center)____ to cover the play. ____(He)____ relayed the ball to the ____(shortstop)____, who threw it home. The ____(play)____ was close but the ____(runner)____ was out!

Adapted from
"The Trouble with Francis," Ventures Book 4,
W. J. Gage Limited, Toronto, 1968, 63-66.

APPENDIX B

DIFFICULTY LEVELS OF THE CLOZE TESTS

Comparison of the Difficulty Levels of the Four Cloze Tests

	Structural Cloze		Lexical Cloze	
	Pre-test	Post-test	Pre-test	Post-test
Readability Grade Level*	4.56	4.51	4.54	4.51
Total number of words	254	254	255	256
Number of Sentences	20	19	18	19
Average Sentence Length	12.70	13.36	14.16	13.47
Number of T-units	26	24	23	26
Average T-unit Length	9.76	10.58	11.08	9.84
Golub's Syntactic Density Score (Grade Level)	3	3	3	3

Comparison of Lexical Deletions for the Four Cloze Tests

	Structural Cloze		Lexical Cloze	
	Pre-test	Post-test	Pre-test	Post-test
Total number of deletions	50	50	48	47
Nouns (and pronouns)	15	14	22	24
Verbs (including auxilliaries)	7	8	12	10
Adjectives	8	6	9	6
Adverbs	2	2	5	7

*Readability Grade Level computed according to the Dale-Chall (1948) Formula and Williams (1972) conversion scores.

Golub's Syntactic Density Score

	Description	Loading Frequency L x F
	Total number of words Total number of T-units	
1.	Words/T-unit	.95 x _____
2.	Subordinate clauses/T-unit	.90 x _____
3.	Main clause word length (mean)	.20 x _____
4.	Subordinate clause word length (mean)	.50 x _____
5.	Number of Modals (will, shall, can, may, must, would . . .)	.65 x _____
6.	Number of Be and Have forms in the auxilliary	.40 x _____
7.	Number of prepositional phrases	.75 x _____
8.	Number of possessive nouns and pronouns	.70 x _____
9.	Number of adverbs of time (when, then, once, while . . .)	.60 x _____
10.	Number of gerunds, participles, and absolute phrases (unbound modifiers)	.85 x _____

Total . . . . . _____

SDS: S.D. Score (Total/No. of T-units) . . . . . _____

Grade-level Conversion . . . . . _____

Grade-level Conversion Table:

SDS	.5	1.3	2.1	2.9	3.7	4.5	5.3	6.1	6.9	7.7	8.5
Grade Level	1	2	3	4	5	6	7	8	9	10	11

The syntactic density grade level as computed for the four cloze tests was grade 3.

APPENDIX C

SENTENCES USED FOR INSTRUCTION

Sentences used to Instruct the Experimental Treatment Groups

Sentences were selected from the following basal readers:

Backpacks and Bumblebees. Language Development Reading Program, Thomas Nelson & Sons (Canada) Limited, 1977. (BB)

Rowboats & Rollerskates, Language Development Reading Program, Thomas Nelson & Sons (Canada) Limited, 1975. (RR)

Driftwood & Dandelions, Language Development Reading Program, Thomas Nelson & Sons (Canada) Limited, 1970. (DD)

Starting Points in Reading a, Ginn and Company, Canada, 1973. (SPR)

Ventures, Book 4, W. J. Gage Limited, Toronto, 1968. (VEN)

The sentences which have been selected are representative of the frequently used structures chosen by the investigator for instructional purposes in the present study. However, they do not represent the most complex structures found in these readers, as shown by the following examples:

> They raced off, chasing each other up the path that wound between the painted frame houses on the fringe of the village, then clambered from ledge to ledge of rusted brown and purple rock like mountain goats who thrive on heights (DD, p. 18).

> There he slept all day, coiled like a Catherine wheel on Ben's settee, while down below him trucks snorted and roared, men shouted and laughed, and the big, brass scales clanged and rattled and bumped under their loads of marrows and beans (SPR, p. 85).

Lessons 1 and 2

Conjoined Sentences

Conjunctions used: and, but, because

1. We'll land but remember to stay together. (VEN, p. 103)

   We'll land.
   Remember to stay together. (but)

2. Take my skin and use it to make a fine tent. (DD, p. 78)

   Take my skin.
   Use it to make a fine tent. (and)

3. There was a lot of work to do but they let us go anyway. (BB, p. 7)

   There was a lot of work to do.
   They let us go anyway. (but)

4. It began to rain and the wind pushed the waves higher up the beach. (RR, p. 68)

   It began to rain.
   The wind pushed the waves higher up the beach. (and)

5. They don't work nearly as hard as bumblebees because they don't store honey for the winter. (BB, p. 34)

   They don't work nearly as hard as bumblebees.
   They don't store honey for the winter. (because)

Conjoined Sentences and Deletion of Common Elements

1. Harry stood up and gazed at his carving. (RR, p. 171)

   Harry stood up.
   Harry gazed at his carving. (and)

2. He clenched his fists and shook his head. (SPR, p. 65)

   He clenched his fists.
   He shook his head. (and)

3. The men put some food in a boat and rowed ashore. (VEN, p. 103)

   The men put some food in a boat.
   The men rowed ashore. (and)

4. He stood on the bag and watched the coach for the signal. (VEN, p. 59)

   He stood on the bag.
   He watched the coach for the signal. (and)

5. Clothes had been taken out of boxes and scattered about. (SPR, p. 39)

   Clothes had been taken out of boxes.
   Clothes had been scattered about. (and)

Lessons 3 and 4

Left Embedded Adverbial Clauses

1. As I pedalled along I passed an apple orchard. (BB, p. 7)

   I passed an apple orchard.
   I pedalled along. (as)

2. While we were gone Wilma hadn't moved. (BB, p. 8)

   Wilma hadn't moved.
   We were gone. (while)

3. Before she could say anything, we heard noises somewhere down the beach. (BB, p. 14)

   We heard noises somewhere down the beach.
   She could say anything. (before)

4. As David got warmer inside the blanket, he began to feel sleepy. (BB, p. 139)

   David began to feel sleepy.
   He got warmer inside the blanket. (as)

5. When the basement door closed, Betsy ran over to the clock. (DD, p. 128)

   Betsy ran over to the clock.
   The basement door closed. (when)

6. After helping her Dad make beds, Pam went down for her roller skates. (RR, p. 74)

   Pam went down for her roller skates.
   Pam helped her Dad make beds. (after)

7. When his work was done, he would buy a few things for his family. (VEN, p. 35)

   He would buy a few things for his family.
   His work was done. (when)

8. While everyone was resting on the beach a bright orange butterfly flew to Andy. (RR, p. 163)

   A bright orange butterfly flew to Andy.
   Everyone was resting on the beach. (while)

9. As they neared the first turn, Rollie and Jim were slightly ahead. (BB, p. 63)

   Rollie and Jim were slightly ahead.
   Rollie and Jim neared the first turn. (as)

*10. After Nokomis had removed all the corn, she placed the bare cobs and husks in an old box . . . . (RR, p. 49)

   Nokomis placed the bare cobs and husks in an old box.
   Nokomis had removed all the corn. (after)

Lessons 5 and 6

Center Embedded Clauses

1. A man who used to play Canadian football lived in our town. (BB, p. 53)

   A man lived in our town.
   The man used to play Canadian football. (who)

* final phrase deleted

2. The storm, which had been getting worse all afternoon, suddenly roared with thunder. (DD, p. 132)

   The storm suddenly roared with anger.
   The storm had been getting worse all afternoon. (which)

3. A tall tree which had been struck by lightning lay across the road. (VEN, p. 388)

   A tall tree lay across the road.
   The tree had been struck by lightning. (which)

4. Of all who were aboard the vessel, only King Richard survived. (SPR, p. 69)

   Of all, only King Richard survived.
   All were aboard the vessel. (who)

*5. . . . The Board that controls the market held an Extraordinary General Meeting with Ben. (SPR, p. 86)

   The Board held an Extraordinary Meeting with Ben.
   The Board controls the market. (that)

6. The Irishman who was walking behind almost fell on top of the two huge porkers. (SPR, p. 75)

   The Irishman almost fell on top of the two huge porkers.
   The Irishman was walking behind. (who)

7. Will the party who addressed me at bedtime last night speak up. (VEN, p. 371)

   Will the party speak up.
   The party addressed me at bedtime last night. (who)

8. There are men here who are brave enough to explore this new land! (VEN, p. 97)

   There are men here to explore this new land.
   The men are brave enough. (who)

* first clause deleted

Lessons 7 and 8

Right Embedded Clauses

1. There was a silence when he finished speaking. (RR, p. 122)

   There was a silence.
   He finished speaking. (when)

2. I planned to become a teacher when I went to university. (BB, p. 56)

   I planned to become a teacher.
   I went to university. (when)

3. Charlie meant to tell Lindy that he was behind the curtain. (DD, p. 95)

   Charlie meant to tell Lindy.
   Charlie was behind the curtain. (that)

4. He named it the bathysphere, which means "deep-sea ball." (SPR, p. 156)

   He named it the bathysphere.
   Bathysphere means "deep-sea ball." (which)

5. The Nautilus is one of the ships that has mapped our ocean floor. (SPR, p. 157)

   The Nautilus is one of the ships.
   The Nautilus has mapped our ocean floor. (that)

6. Everyone was hoping that the weather would get better. (BB, p. 59)

   Everyone was hoping.
   The weather would get better. (that)

7. Tom smiled to himself as he paid for the pigs. (SPR, p. 74)

   Tom smiled to himself.
   Tom paid for the pigs. (as)

8. There once was a man who had seven sons. (VEN, p. 325)

   There once was a man.
   The man had seven sons. (who)

Lessons 7 and 8

Multiple Embeddings (including conjoined sentences)

1. The road curved downward where the clover field ended and ahead lay thick woods. (VEN, p. 214)

   The road curved downward. (where)
   The clover field ended.
   Ahead lay thick woods. (and)

2. When the snake strikes the victim, the poison goes into the blood stream where it spreads through the body. (SPR, p. 91)

   The snake strikes the victim. (when)
   The poison goes into the blood stream.
   The poison spreads through the body. (where)

3. The nets were old and gray too, but they were strong, and kept carefully mended. (SPR, p. 145)

   The nets were old and gray too. (but)
   The nets were strong.
   The nets were kept carefully mended. (and)

4. They were so busy eating that at first they did not notice four brown rats who had just arrived. (SPR, p. 131)

   They were so busy eating. (that)
   They did not notice four brown rats.
   Four brown rats had just arrived. (who)

5. Mrs. Gray was feeling very happy as she rushed into the wardrobe room where they found her a pretty blue dress. (DD, p. 57)

   Mrs. Gray was feeling very happy. (as)
   Mrs. Gray rushed into the wardrobe room.
   They found her a pretty blue dress. (where)

6. She looked around her, but the underbrush was so thick that she couldn't see anything. (RR, p. 121)

   She looked around her. (but)
   The underbrush was so thick.
   She couldn't see anything. (that)

APPENDIX D

CORRESPONDENCE

Winnipeg, Manitoba

January 15, 1979

Director of Education
St. James-Assiniboia School Divison No. 2
2574 Portage Avenue
Winnipeg, Manitoba
R3J 0H8

Dear Mr. MacIntosh:

This year I am on sabbatical leave from the St. James-Assiniboia School Division to continue work on my M.Ed. degree program. For my thesis I wish to investigate the effect of teaching students to recover the deep structure of sentences as a means of improving reading comprehension at the fourth grade level. Recent developments in psycholinguistics and transformational grammar have prompted studies of the grammatical structure of language and its effect on reading comprehension. Chomsky's theory of transformational grammar provides evidence that sentences are perceived at the surface structure level but that they are comprehended at the deep structure level. Textual materials often contain syntactic structures which students find difficult to understand, particularly at the fourth grade level and beyond. It is for this reason that I have selected this topic and this grade level for study.

I would like permission to conduct both a preliminary pilot study and the main study in five fourth grade classes in St. James-Assiniboia schools during the latter part of February and in March. The pilot study would consist of approximately three half-hour lessons with one class as well as the administration of pre- and post-tests in reading comprehension. The main study would consist of approximately twelve half-hour lessons with each of four classes as well as pre- and post-testing the students' comprehension skills.

As part of my course work in Clinical Diagnosis and Remediation I have been studying and evaluating certain tests. One of these is the Carrow Elicited Language Inventory published in 1974. This test is being used quite widely in St. James-Assiniboia schools, as well as elsewhere, as an instrument for diagnosing expressive language disorders in children. It is a test that appears to have a number of advantages such as short administration time in terms of time spent with the student. However, because of its fairly recent publication there is little literature available on the validity of this test and there is not agreement as to whether this type of test (elicited language imitation) provides an adequate sample of a child's expressive language. Because we feel that this test could be useful in developing a student's profile, my advisor, Dr. V. Froese, University of Manitoba, Elaine Graham, Speech and Hearing

Clinician with Educational Support Services, and I would like your permission to conduct a post hoc study of the accumulated scores of students whom Miss Graham has tested for language disorders. The students would remain anonymous since we would be using test scores only to study correlation between scores on the Carrow Elicited Language Inventory and other language tests to determine whether it predicts children's competence in expressive language.

We believe that information such as this would be useful to clinicians and resource teachers who may wish to use this test in diagnosing expressive language disorders. The reports of these studies would be available to the St. James-Assiniboia School Division. If you require additional information in regard to these requests I would be pleased to meet with you for further discussion at any time convenient to you.

Thank you for your consideration and assistance.

Yours sincerely,

(Mrs.) Inez Striemer

Mr. R. Davis, Superintendent of Elementary Education, granted permission by telephone.

Suggested Letter to Parents:

Dear Parents,

The grade four classes in _____ School have been asked to participate in a reading study conducted by Mrs. Inez Striemer, a St. James-Assiniboia teacher who is completing her master's degree in education. The study is concerned with investigating the effect of instruction in three types of reading skills dealing with sentence structure, as a means of improving students' reading comprehension. Gains in reading comprehension will be measured by two short reading comprehension tests given before lessons begin and again after ten lessons have been completed. Each student will participate in only one group and one instructional method. The reading materials used in the lessons will be taken from readers which the students are using.

We feel that exploring ways in which we can improve reading instruction will be of benefit both to the students and to the teachers. These lessons will be carried out during _____. If you wish further information please call Mr. _____ at _____ School or Mrs. Striemer at 261-7361.

Should you prefer that your child not participate in these lessons, would you kindly fill in the slip at the bottom of the page and return it to the school by _____.

Sincerely,

Principal

I prefer that my child _____ not participate in
(name)
this study.

_____
(Signature of Parent)