PASSAGE DEPENDENT SUMMARY CLOZE: A METHOD TO DETERMINE THE UTILIZATION OF COHESION IN THE PROCESS OF READING COMPREHENSION

by

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Abstract

The investigation represented a first step in the development of a means for measuring comprehension in reading. One concept, that of passage dependency in reading, can be closely linked with the process of comprehension. A measurement device which therefore utilizes passage dependency may be construed to measure comprehension. This study took a story, summarized it and deleted selected words using a modified cloze procedure. The resultant tests became the Passage Dependent Summary Cloze tests (PDSC).

Subjects were 184 grade six students randomly assigned into two groups, experimental and control. The experimental group read a story related to the tests applied while the control group read an unrelated story. These groups were then randomly assigned to one of three different Passage Dependent Summary Cloze tests: 1) a standard 5th word random deletion pattern test; 2) a teacher's intuitive deletion of meaning pattern test and 3) a cohesion deletion test based upon the propositional analysis of Kintsch (1974) and the text analysis of Quillian (1969).

A three way analysis of variance revealed significant differences between the experimental groups performance and the control groups performance for all PDSC tests ($p<.001$), and high ability readers performed significantly better than low ability readers ($p<.001$).

A two way analysis of variance revealed significant differences among the three PDSC tests. Mean percentage differences between experimental and control groups revealed that the cohesion deletion pattern was the most successful in attaining passage dependency.

From the results obtained it would seem that a selective cloze procedure utilizing cohesive elements applied to a summarization of a story can produce a procedure which has the potential to measure comprehension of connected prose.

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Chapter I

Introduction

Purpose of the Study

This study represented a first step in the development of a means for determining comprehension in reading. The present investigation was concerned with an examination of the role of cohesion in written text, and the manner in which the cohesive elements tax the readers' skill in the completion of a passage dependent summary cloze test.

The study proposed to determine if the cohesive elements in a given summary of a story are related to the student's ability to comprehend that story and to measure the student's comprehension. Further, to what extent does the systematic deletion of cohesive ties in the summary relate to the comprehension of the total story?

Background Information

One of the problems in studying reading comprehension is that of finding or developing a measurement instrument that will characterize the comprehension process adequately.

To understand a complex process such as reading comprehension, one requires some means to determine the concepts underlying the text. Recently, a number of theories have developed utilizing propositions as a basis for visually representing the text, such as Kintsch (1974), Meyer (1975) and Frederiksen (1975). The propositional analysis established by Kintsch (1974) and later elaborated (Kintsch and Van Dijk, 1978) can serve as a useful tool in this investigation.

To study text and textual elements adequately, it is necessary to represent the textual meaning formally. According to Kintsch's theory, the meaning of text may be represented by a hierarchy of propositions. Propositions are idea units representing a single idea and are made up of word concepts (relations and arguments).

In the example "The rabbit was tracked by the dog.", the propositions are (TRACK, A: RABBIT, O: DOG), the predicate or relation is TRACK; the first argument is RABBIT which functions in the semantic role of agent (A) and the second argument is DOG which functions in the role of object (O) (See Table 1).

Word concepts are entries in semantic memory and are represented by one or more words in the text or by infer-

ences related to the text. A proposition consists of two or more word concepts where there is a predicate, or relation, and an argument. The relation is a connection between a set of arguments forming a single idea. These relations can be: a) predicates, usually verbs expressing ideas or actions or states; b) modifiers,which change a concept by restriction or limitations by the use of another concept; and c) connectives which relate propositions or facts in the text to each other and may at times be unexpressed in the text. Connectives are important in providing a text with cohesion and thus, are a major focus of this study.

Turner and Greene (1977) have provided an adequate description for achieving propositional analysis. Their work formed a basis for the textual analysis presented in this study.

One of the most influential aspects of text structure, that gives meaning to a passage is the cohesive element. Several recent comprehension models have stressed the relationship between cohesion and comprehension (Frederiksen, 1977; Hindyard and Olson, 1978; Thorndyke, 1977). Kintsch (1979) states that the total number of arguments contained in a text base could effect the coherence of a passage.

The greater the number of different arguments presented, the less coherence. Kintsch, Kozminsky, Strey, McKoon and Keenan (1975) found that the number of word concepts in a passage was significantly related to reading times and recall when the total number of words and propositions in the text was held constant.

Passage dependency has been researched by Tuinman (1973, 1974), and Pyrczak (1972, 1974, 1975). Passage dependency refers to a procedure whereby the ability of a reader to answer questions regarding a particular passage is dependent upon the passage being initially available and encoded in the memory system. Pyrczak (1972) defines passage dependency based upon his technique for determination of reading comprehension, which is that an item is passage dependent to the extent that the pupils are unable to answer questions correctly in the absence of the passage.

Significance of the Study

Comprehension of written text is a basic process related to reading. Much concentration has been spent upon determining exactly what comprehension is and to date there are many opinions as to the nature of this

process. Also, not enough is known about factors which influence the comprehension of written discourse.

In order for someone to obtain meaning from words, sentences or passages, they must be able to utilize many different sources of information. Cues from sentence structure, sentence relation and context are factors inherent in the text. Factors beyond the text include the reader's prior knowledge of the topic and his/her ability to make inferences.

A reader must be able to extract relevant information and assimilate this with his/her prior knowledge in a meaningful way (Inhelder and Piaget, 1958). Once information is assimilated, the reader is in a position to remember the information when necessary.

Two factors that affect a reader's comprehension and retention are first, the factors present in the text, and second, the factors involved in instructional devices. Factors present in the text are the items dealt with during the present investigation. Instructional devices were not included.

Factors involved in text include: grammatical structures, discourse structures, semantic relations, content and context. The studies addressing these topics are

still in their infancy but much progress has been made in the past decade with studies such as those of Kintsch (1974), Meyer (1975), and Van Dijk (1977).

The present study has particular value in two distinct areas: 1) the conscious utilization of cohesion in text structure by writers and teachers which could lead to, 2) the development of an assessment device that might tap the structural elements responsible for aiding a child to comprehend written discourse.

This study was based upon various assumptions and has also included several limitations.

Assumptions

The following assumptions were made regarding this study:

1) Reading comprehension is a process that involves very complex component parts such as memory, recall, retrieval and recognition.
2) Reading comprehension always involves knowledge use and inference.
3) Cohesion is a structural element in written discourse which binds sentences together in

a meaningful way. This binding allows the reader to develop coherence in the text, and therefore, can account for a major portion of that text's comprehensibility.

Limitations

1) Text structure is interpreted differently by various readers. The linguistic and non-linguistic elements, the knowledge, expectations and purposes of the reader, interact to determine the interpretation.
2) Due to the necessity to use intact classes in the experimental sample, individual random sampling was not possible. Random assignment of the individual's with classes and random assignment of control and treatment conditions did take place.
3) The number of students in each sub-group was relatively small, and the number was not equal.

Summary

The purpose of this study was to investigate the ability of students to comprehend a specific story. The study attempted to determine to what extent deleted cohesive ties related to a student's comprehension of a story and proposed to develop a measurement device to determine that comprehension.

Cohesion is a structural element within a text that binds propositions into a meaningful discourse. Removal of cohesion from a passage should result in the failure to understand that passage. Kintsch's (1974) theory of propositional analysis formed the basis for the textual analysis presented in this investigation.

Passage dependency refers to a procedure whereby a reader can answer questions related to a passage only after having been exposed to that passage. This dependency upon a passage, therefore, appears to be an indication of comprehension.

Chapter II

Review of Literature

The review of literature presented in this chapter encompasses eight interrelated areas of research: information processing as it relates to memory, comprehension models relevant to this study, schemata, text structure, propositions, cohesion, cloze procedure and passage dependency. The chapter includes a summary of the literature, and an overview of the experimental design relevant to the literature.

Information Processing

Humans have been characterized as processors of information and human memory as an information processing system (Klatzsky, 1975). The memory system has two important characteristics: 1) it can be broken down into a series of stages; 2) the processing at each stage is limited.

Information processing can be visualized as containing various stages. A signal or piece of information about a stimulus enters into the system. The site of reception is called the sensory register because information enters by means of the senses. This information

is held here very briefly. It decays rapidly and ultimately vanishes completely, and therefore, the sensory register is limited by the time of decay.

While information is in the sensory register, it is processed by two functions; pattern recognition and attention. Pattern recognition is a complex process that results from the interaction between the information in the register with previous knowledge. Attention, is a process whereby the stimulus registered is dealt with.

Information that has entered the system and has been recognized and attended to, is then passed on to the next stage - the short term memory (STM). Here the information is held briefly but in a different state than the sensory register due to the process interaction. Decay is also rapid unless rehearsal or repetition is utilized. If rehearsal does not occur the information will be lost. This is a type of forgetting and can occur at any point in the system. Another limitation to this stage is the amount of stimuli that can be held simultaneously: 7 ± 2 items or bits of information (Miller, 1956).

Lastly, information may be sent to the final stage in the system, the long term memory (LTM). This stage

holds all of our knowledge about the world. Unlike the sensory register and STM, LTM is a permanent store. This stage is very complex but appears to be arranged in such a way that retrieval is generally accomplished with relative ease. Information can be accessed very rapidly from long term memory, and this indicates that this stage is highly organized. In Atkinson and Shiffrin's (1968) view, the long term store is "self-addressing". By the term self-addressing they mean that the "contents to be located contain the information necessary to specify the storage locations" (p. 181). They believe that retrieval is a three component activity involving search, recovery and response generation.

Tulving (1972) believes that LTM is best thought of as two entities. He based his ideas on the kinds of information that each long term store can utilize and made a distinction between semantic memory and episodic memory. The semantic memory appears to hold all the information we need in order to use language, not only words and symbols, meaning and referents, but also the manipulation rules to access them. Episodic memory holds information pertaining to affairs of present life or time (Tulving, 1972).

Semantic and episodic memory also differ in their susceptibility to forgetting. Episodic memory is in a constant state of change, and information there is often changed or made unretrievable. Semantic memory is more stable, and information is more likely to stay.

Several models of semantic memory have been postulated. These include network, set-theoretic and semantic feature models. For the purpose of this study consideration included two network models; Quillian's (1969) and Anderson and Bower's (1973), the set model of Meyer (1970) and the semantic feature model of Smith, Shoben and Rips (1973).

A consideration of Quillian's Teachable Language Comprehender (TLC), (Quillian, 1969; Collins and Quillian, 1969) touches upon the area of comprehension. The TLC is made up of three types of structures; units, properties and pointers. Units correspond to objects, events or things. Properties tell us about units, pointers associate units and properties inside the long term memory network and tend to define them. Quillian's model depicts a huge network of associated concepts. The pattern of interconnections give meaning.

Like Quillian's model the human associative memory (HAM) model of Anderson and Bower (1973) depicts a vast network. The basic component of this model, however, is the proposition. A proposition in this model can represent both linguistic and non-linguistic information. A proposition is a small set of associations and locations that are made up binarily and can combine two concepts. It is composed of a context plus a fact, although the context may be absent. The context in turn is made up of a location and time. The fact, is a subject and predicate. The predicate is a relation and an object. As can be seen, things are broken down in a binary fashion until no further division can occur. Thus, the point of termination is known as the terminal node and is the basic concept of long term memory. Diagrammatically a proposition depicts a memory of trees anchored at the node that serve to associate different locations.

The set-theoretic model (Meyer, 1970) assumes that semantic categories are in long term memory as sets or as groups of information. Meyer used this model to explain the time it took subjects to verify sentences with subject and predicate. Meyer's model contains a two stage approach. First, the person looks through all examples of a particular item that overlap or have something in common. If the

search is successful or a match is found the process ends. If no match is found the outcome of this first stage is negative. Should this occur, a second stage is initiated whereby the attributes of the item are further matched until either a match is found, thereby verification occurs or a negative response is given.

The Smith, Shoben and Rips (1973) derivation of this model is the semantic feature approach. It has the advantage of explaining the relatedness discussed above. This model assumes that within long term memory there appears a semantic category in the form of features. These features are broad and are essential to defining the category. These are arranged in a list of descending importance. The more important features are called defining features, the less important are called characteristic features.

This idea, that semantic features exist to combine and produce meaning is not new (for example, Katz and Fodor, 1963; Miller, 1972; Osgood, 1952), but the model of Smith, Shoben and Rips is unique in that it makes assumptions that are brought to bear on the data of semantic memory research. This model can account for much of that data.

The model assumes that each concept in long term memory is represented by a list of features that fall along the continuum of importance. Verification of a sentence progresses through two stages. The first stage starts by retrieval of an item from LTM that includes both defining and characteristic feature lists. Matching occurs and if successful, a true connotation is attached, if neither a true nor false connotation is found then the second stage is initiated whereby only the defining features are used. If a match now occurs, a positive response is solicited. This match is like a second checking process.

The three models discussed above attempt to explain the processes involved in semantic memory. The models differ fundamentally as each tries to explain different concepts. The set model and semantic feature model are designed to deal with very specific experimental information whereas the network models are capable of dealing with a broader context. Because of this scope the network models are capable of dealing with both semantic and episodic memory (Tulving, 1972). They were also more directly influential to this thesis particularly the TLC model of Quillian (1969).

One of the general processes associated with LTM is the process of remembering which includes three occurrences, encoding, storage and retrieval. After items have been encoded they are put away in storage (memory) where they remain until needed or retrieved.

The term encoding is often used to embrace both sensory registration or short term memory. The terms storage and retrieval are most often used to refer to long term memory. A discussion of comprehension should make reference to long term memory processes, like those made by Quillian's TLC model and Anderson and Bower's HAM model.

To summarize, memory process contain three identifiable stages, sensory register, short term memory and long term memory. Information entering the system is attended to and passed on through the stages or seems to decay and is lost. Once the information reaches the long term memory it is permanently stored in either the semantic or episodic memory. Retrieval initiates a process described in the chapter by several models, network, set-theoretic and semantic feature.

Comprehension

In Quillian's model, comprehension is accomplished in a process called the intersection search. If in a sentence certain concepts are stated, a search process is initiated in long term memory at the location of each concept. The search spreads outward by means of pointers or paths until it reaches a new concept which it marks. During this search process the possibility of touching upon previously marked concepts occurs. At this point an intersection is formed. Following the pathways the two concepts determine a relationship. If this relationship is compatible with the incoming information, comprehension occurs. In figure 1, a depiction of the concept "climate" diagramatically depicts the TLC process.

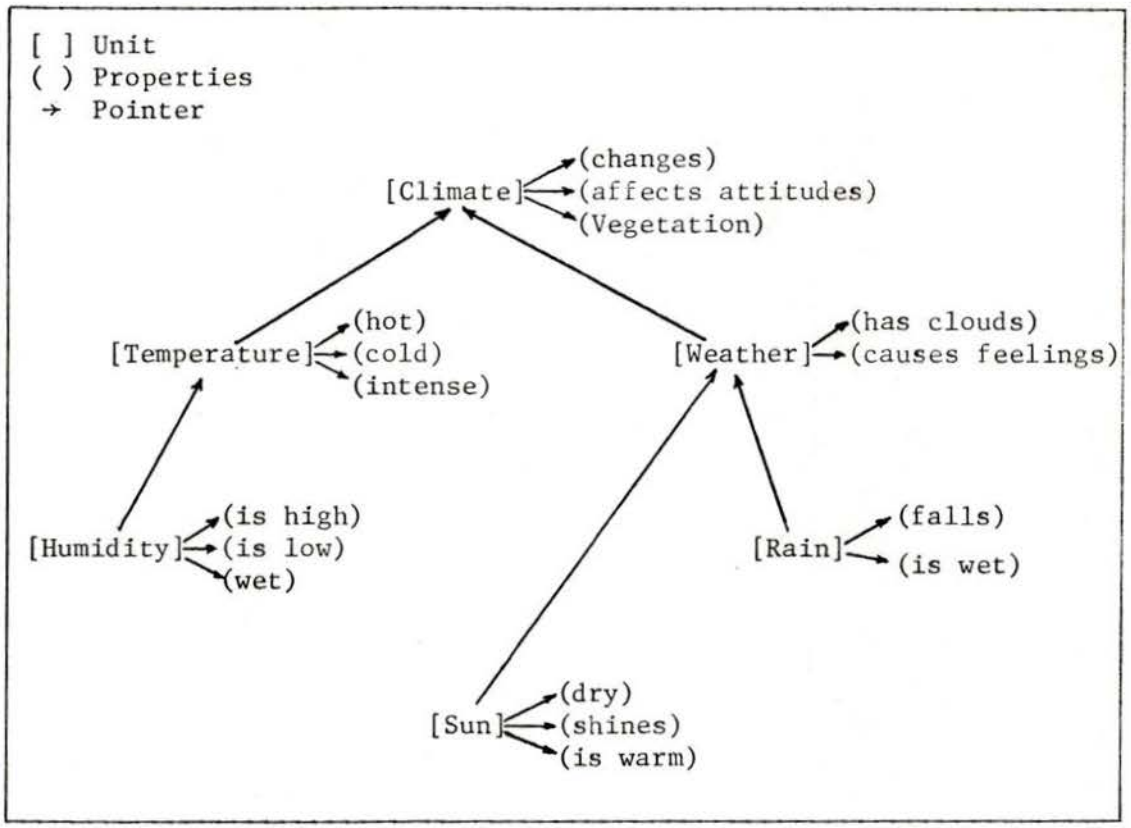

Figure 1 - Hypothetical memory structure for the category "climate" as depicted by the Teachable Language Comprehender after Collins and Quillian (1969).

The HAM process that corresponds to Quillian's intersection search is called a match process which is designed to match incoming information with memory. In the first stage information is encoded in the form of propositions. The next stage is then to match these propositions to those contained in long term memory. The resultant search through the network allows the connection of concepts to

occur. Once this connection is completed comprehension takes place.

If the process is applied to a passage which contains a missing word the omission can be explained. The process would attempt to match the blank with relevant information in memory. If a logical filler is found the blank could be filled in and comprehension would occur. This is a rather simple example as the process is much more complex, but the basic principle remains.

The match process provides the basic mechanism for relating current experiences to existing knowledge, thus playing a major role in search and retrieval.

Comprehension models by Schank (1972, 1975), Kintsch (1974, 1976), Norman and Rumelhart (1975), Rumelhart, Lindsay and Norman (1972), Frederiksen (1975), Anderson (1976) and Miller and Johnson-Laird (1976) have developed from the basic model of Quillian (1969) and Anderson and Bower (1973). These models all use the same basic concept, already mentioned, but have approached it from slightly different perspectives.

The largest criticism of these models is the extreme amount of detail they include. The detail is often over-

whelming and changes with their structure occur so rapidly in the experimental venue that rejection of the theories can be easily justified by those taking exception to them.

Global theories like the above will probably never be confirmed directly by experimental procedures. These models are still in their early stages of development. Information processing, however, provides a framework of assumptions, concepts and language that enable one to test hypotheses regarding comprehension. Haber's (1969) justification helps explain the use of these theories.

> "Information-processing analysis attempts to look for correlations between contents of the stimulus and contents of the responses measured at various times after the stimulation begins. By examining these correlations some notions can be gained by the properties of the flow of information in the nervous system, especially regarding the content of that information at any given point . . . . What is assumed is that if the appropriate operations could be devised, it should be possible to sample and examine the contents of stimulation at every point in time, and at every level in the nervous system (Haber, 1969, p. 2)."

Information processing has given us a conceptualization of what may happen within the human memory system. The research of Tulving (1972) has indicated the

existance of two entities within LTM. The semantic memory, being the more stable of the two, has given rise to postulations regarding the comprehension process. Quillian (1969) and Anderson and Bower (1973) have described two processes that relate to comprehension. Although the HAM process of Anderson and Bower is an important concept, the theory propounded by Quillian can be more readily adapted to the purpose of this investigation. If Quillian's theory is to be tied to the total concept of test development it is important to understand certain basic elements upon which information processing depends. One such element is schema.

Schemata

Schemata are the fundamental elements upon which information processing depends. They are similar to the propositions of the HAM model and enable us to understand more fully the processes of cognition. Memory Schemata is a term usually credited to Bartlett (1932) and Piaget (1958). It is a structured cluster of knowledge that represents a particular concept (Minsky, 1975; Bobrow and Norman, 1975; and Rumelhart and Ortony, 1977).

For example, suppose we had a schema for BOOK. The schema would contain a certain amount of schemata each representing a different part of the book. There would be a sub-schema representing COVER, one for PAGES, one for PRINT and so on. A total representation would form the concept. According to schema theories all knowledge is organized into units called schemata. A schema is a data structure representing our knowledge about a concept, Rumelhart refers to a schema as a network of interrelations (Rumelhart, 1980).

Readers use previously learned schemata to aid comprehension and encoding of simple narrative stories in memory (Kintsch and Van Dijk, 1975, 1978; Rumelhart, 1975, 1977; Kintsch, 1977; Mandler and Johnson, 1977; Thorndyke, 1977, 1978; Anderson, 1978; Mandler, 1978; and Stein and Glenn, 1979). Text comprehension, encoding, and memory retrieval rely heavily upon the activation and use of well learned memory schemata.

There are two modes of schema activation, first those that refer to input process and are said to be conceptually driven, and second, those referring to output function or data driven (Bobrow and Norman, 1975). Input processing describes the activation of memory sche-

mata to guide incoming information. This activation of memory schemata in turn activates subschemata, the total action being able to account for some portion of the input (Stein and Nezworski, 1978; Minsky, 1975; Rumelhart and Ortony, 1977). The output mode is data driven where the subschemata activate the schema of which it is a part. Simplistically, schema theory represents concept-driven and data driven approaches to processing (Rumelhart, 1980). These data driven or output functions also influence recall of information from memory (Mandler and Johnson, 1977; Rumelhart, 1978; Thorndyke, 1977, 1978; Kintsch and Green, 1978; Mandler, 1978) and summarization of text from memory (Rumelhart, 1975, 1977; Kintsch et al, 1977; Kintsch and Green, 1978).

Schemata have certain properties or functions in cognition. They are able to facilitate concept abstraction, where a grammar specifies both the concepts within the schema and the rules for combining or matching them (Rumelhart, 1975, 1977; Mandler and Johnson, 1977; Thorndyke, 1977; Stein and Glenn, 1978). As well they develop a network of related properties or event sequences (Rumelhart and Ortony, 1977; Schank and Abelson, 1977).

Schemata are able to be developed into hierarchial organization, instantiation and prediction. When appropriate schemata are utilized and matching has occurred, understanding can take place. As in previous section, within memory, a search takes place to find a correct matching schema. This is not a random search but is guided by schemata that form the layout of the memory or the location of scan paths (Williams, 1977). Whenever a concept initiates a search for data and fails to locate a match, the process is suspended and the schemata are reallocated to more promising schemata. When enough matches have occurred that are relevant to the input, a correct response is given and comprehension occurs.

This schema theoretical approach provides a convincing framework to form a reasonable theory of information processing and hence comprehension. The theory also seems compatible with the TLC process developed by Quillian (1969).

Text Structure

Recent research in prose memory has seen the development of increasingly formal accounts of text structure.

This development has provided an avenue for determining the importance of text elements.

Differences between the importance of the text and the recall of text have been successfully demonstrated using structural analysis of Meyer and McConkie (1973), Kintsch (1972, 1974), Meyer (1975).

Frederiksen's (1975) model utilizes a structure similar to Fillmore's (1968) case grammar. He has developed stative, case and attributive relations into a semantic network. Propositions are nodes connected by logical, causal and algebraic means. The first two are represented by relations such as conjunction, disjunction, implication and material. The algebraic relations utilize order proximity, time and location. His use of inference permits him to represent long term memory and comprehension processes realistically.

Meyer (1975) has developed a model that is hierarchial rather than like Frederiksen's network. She has emphasised the role or relationship between the verb (predicate) and other words (arguments) in a sentence. In a very complex, well developed hierarchial representation, she has shown text by its organization. Proposi-

tions are identified as to their importance. Every idea is included and relationships are indicated by branches connecting levels. Her representation can be used to determine recall. Reder (1980) however, has pointed out that her theory could have better predicted the organization had she been able to include how the author's intended meaning is transposed into prose and what portion of this intended meaning is retained in LTM.

Kintsch (1974) has used the proposition as his fundamental element of analysis. Every text is represented as an ordered list of propositions. A sentence may contain one or more propositions consisting of a relation (verb and adjectives) and argument (nouns and other). A hierarchial structure is created which appears to organize text in a different manner than either Frederiksen or Meyer. In Kintsch's model, comprehension is assumed to involve the construction of the meaning of a passage from the written text. Meaning is represented by the text base, the structured list of propositions. A proposition consists of a predicate with one or more arguments. A concept is utilized in the language by a word or a phrase.

Kintsch and others have conducted numerous experiments which they have provided for his theory (Kintsch

and Keenan, 1973; Kintsch, McKoon, and Keenan, 1974; Kintsch and Van Dijk, 1975, 1978; Kintsch and Vipond, 1979).

The Kintsch model of comprehension assumes that the comprehension process can be decomposed into component parts, some of which may be manageable while others have not been sufficiently studied as yet (Kintsch and Van Dijk, 1978).

A critical review of the literature suggests that Kintsch's theory is able to provide a framework for test development, therefore, this investigation attempted to produce evidence in support of some of the manageable aspects of the comprehension process, those of recall and the specific structural element of cohesion. A study based upon Kintsch's model must, however, accept the assumptions inherent in the model. Firstly, the model is concerned only with semantic structures characterized in terms of propositions. Secondly, comprehension can only be modelled diagramatically if there is a specific structure whereby the language processes are known. Therefore, the model, and this thesis, are based upon certain conventional text types, in this case stories.

Text structure is a manageable portion of the comprehension process. Text structure can be identified as contributing to the difficulty students have in understanding stories. Several models of comprehension were evaluated and the model of Walter Kintsch became the basis for this study. To further understand the complex development of a testing device, the major unit of analysis discussed by Kintsch (1972) must be investigated. Propositions are the basis for the textual analysis he described.

Propositions

A proposition is a unit of analysis, a simple atomic relation between two or more concepts (Kintsch, 1974; Meyer, 1975) or a syntactic clause (Thorndyke, 1977). The meaning of text is characterized by an underlying configuration of propositions and the relations among these propositions. Formal schemes for representing the structure of prose have been developed (Kintsch, 1974; Meyer, 1975; Thorndyke, 1977). These theories associate a proposition's importance with its level in a hierarchial structure. One aspect of recall protocols is that some propositions are consistently recalled, whereas others are

recalled infrequently (Kintsch, 1974; Meyer, 1975, 1977; Thorndyke, 1977; Mandler and Johnson, 1977). Analysis of recall using propositional analysis has demonstrated a correlation between propositional importance and recall probability (Kintsch, Kozminsky, Streby, McKoon and Keenan, 1975). Propositions high in the hierarchy are recalled better by readers than those that are lower. Subjective importance of a proposition also influences its memorability (Johnson, 1970).

Propositions consist of abstract word concepts. These concepts are the elements in the lexicon of semantic memory and may be represented by one or more words in the surface structure (Kintsch, 1974). The relation is a connection between a set of arguments forming a single idea.

The propositions in a text are generally bound by argument repetition into a cohesive interrelated whole, and represent the meaning of the text (Kintsch, 1974). The binding of the propositions permits the development of understanding.

Cohesion

A coherent story differs from a set of isolated sentences in that it has a unifying context, a recognizable sequence of events and a fixed set of characters or topics (Van Dijk, 1977). The extent to which these conventions are preserved in a text determines how comprehensible the text will be (Kintsch and Van Dijk, 1978). The comprehensibility of a text is a good predictor of how memorable it is, and the relationship between coherence and memorability has been found by many investigators (Kintsch, 1977; Stein and Nezworski, 1978; Mandler, 1978; Stein and Glenn, 1978).

Sentences are assigned meanings and references, not only on the basis of their component parts but also relative to the interpretation of previous sentences. To relate this concept back to cognitive memory or information processing, any language user must relate new incoming information to the information they already possess from the text itself, the context within which the information is held, or previous knowledge. The ability to relate new information to prior knowledge can be interpreted in terms of a coherent propositional network

and this network has been called the leading edge rule (Kintsch and Vipond, 1978). A text base is cohesive if it is connected by argument repetition. As a result, if two propositions are connected by a common argument they can be considered cohesive (Clark, 1976; Haviland and Clark, 1974).

Similarly the model presented by Halliday and Hasan (1976) expresses the continuity that exists between one part of the text and another. Essential to Halliday and Hasan's definition is that the tie be across sentences and enables comprehension to occur. Halliday and Hasan's framework consists of five different types of cohesive ties: reference, substitution, ellipsis, conjunction, and lexical cohesion.

Reference pertains to items which make reference to something else for their interpretation. They can be of a personal nature such as I, we, it or they; demonstrative, such as this, that or which; comparative, generally adjectives and adverbs; exophoric, outside of text like pictures or endophoric from inside of the text such as inferences based upon text related structures.

Substitution refers to the replacement of one item with another and ellipsis is like substitution except the

replacement is with nothing or zero. For example, substitution can be a relation between words or phrases. "Mommy is buying me a doll. Which one?" Ellipsis is something that is left unsaid but understood. For example, "Its hot in here." meaning open the window.

Conjunction relates what is to follow with what had gone on before. Conjunction uses connectors such as and, furthermore, but, therefore and next.

Finally, lexical cohesion involves the vocabulary use that is related in some way to previous items. A selection of vocabulary could be for example, "There's a boy climbing that tree." to "The boy's going to fall.", whereby a selection of nouns has taken place.

To summarize, cohesion aids comprehension. Two different viewpoints were presented, one from the psychological input of Kintsch, the other from the linguistic input of Halliday and Hasan. These theories relate to recallability of the text, and the cohesion theory of Kintsch forms the basis for the development of a device to determine understanding within the framework of this investigation.

Recall

Early research on prose recall indicated that certain portions of the text could be recalled better than other portions. It appeared that the most important sections of the text, those most closely associated with the theme were recalled by more people. Newman (1939) found that what he called essential information was recalled better than non-essential, and considerable forgetting occurred of non-essential material.

More recent studies have shown that there is a relationship between the importance of the information and the recallability of it (Brown and Smiley, 1977; Goetz, 1979). If within a text there is a high degree of cohesion it facilitates the representation of the text in memory and is far easier to retrieve and relate to what is known, thus instituting greater understanding (Anderson and Bower, 1973; Kintsch, 1972, 1974).

Cloze

Measuring comprehension is not an easy task. As has been shown previously, comprehension is a complex process. Because of this complexity, measurement can only deal with

the content of the stimulus and the content of the response (Haber, 1969).

The simplest measure of comprehension is merely to ask the reader if he/she understand or how well he/she understands (Carroll, 1972). Validity of such judgements is highly questionable however. Carroll points out that reports of truth or falsity of a statement may be based upon the reader's previous knowledge rather than comprehension. Perhaps the use of following directions, as in most intelligence tests, could be a valid procedure since we seem to be constantly having to comprehend and follow instructions.

Comprehension, not unlike memory processing, involves several stages, among which encoding, search, recovery and response generation are included. How then can these processes be determined? Tuinman (1972) in a study to determine a procedure whereby retrieval could be assessed, utilized the general memory search model of Atkinson and Shiffrin (1968). In this paper he characterized the cloze procedure as a model of search activity, recovery and

response generation. Another study relating cloze to a search procedure was made by Kaplan, Carvellas and Metlay (1971). In this study they found evidence that cloze closely matches category constrained search tasks. Over the past several years cloze procedure has been extremely well explored. A particular form of this technique emerged long ago when Ebbinghaus (1885) was investigating the properties of memory. Ebbinghaus, however, did not produce the present theory, and it was not until Wilson Taylor (1953) likened the ability of a reader to complete a sentence, which has missing parts, to the gestalt concept of clozure, that cloze became a plausible device. Two basic concepts in this theory are information and redundancy.

Cloze theory fits into previously mentioned information processing theory and a conceptualization of the theory of comprehension allows a better understanding of the construct validity of the cloze procedure as a measure of information processing.

In taking a cloze test an individual reacts to information from several sources in making choices among words to be considered for filling in gaps within a text

(Rankin, 1978). As in the TLC process the blank instigates a search in an attempt to match the blank with relevant information in memory. All aspects of the memory system are instituted in order to fill in this missing information.

Coleman and Miller (1968) experimented with the cloze to measure a reader's information gain. They were interested in measuring how much new information a reader gained from a passage. They discovered, however, that the regular cloze procedure (5th word deletion pattern) was not measuring information gain but something the subjects already knew. In further testing situations a determination that selective deletion strategies did in fact measure information gain arose. By determining the number of kernals per passage and deleting these kernals they were able to obtain significant correlations between kernals and information gain (Coleman and Miller, 1968, page 384). These elements were the most efficient ones they discovered, in the determination of information gain. As well, completing a sentence when only a subject or predicate is deleted comes closer than any other method they tested to tapping comprehension of material and becomes

similar to the task of answering questions.

This section has dealt with the subject of the cloze testing procedure. The cloze mode of deletion and other selective deletion schemes, which allows for the determination of textual elements necessary for comprehension, were utilized within the experimental design of this study. Passage dependency and cloze procedure become integral partners within the scope of this study. To further understand the relationship between them a discussion of passage dependency appears necessary.

Passage Dependency

Tests of reading comprehension purport to measure how well a student understands what he is reading. The devices used to ascertain the degree of this understanding are based upon the tacit assumption that a direct relationship exists between reading a passage and answering questions about it (Tuinman, 1973, 1974). A task is passage dependent to the extent that it is necessary for a person to have read a particular passage in order to perform the task that is constructed with the most items with the highest degree of passage

dependency could offer the largest guarantee against invalidity, this is due to the students responding to items without prior reading of the passage on which the item is based. It is extremely difficult to construct highly passage dependent items and several of the published standardized tests of comprehension do not provide for this dependency (Tuinman, 1973, 1974).

Related research in passage dependency has clearly indicated that a large percentage of items can be answered on existing standardized reading comprehension sub-tests without access to the passage on which the questions were based (Tuinman, 1972). He has shown that there was a high correlation between answering such questions on these sub-tests with the passage and answering them without the passage. Tuinman has made it quite clear that 1) students produce responses that are not under the influence of the passage, and 2) that existing tests contain many items which support rather than deter correct responses. In one study, Tuinman tested five standardized comprehension sub-tests for passage dependency and none of the tests approached the passage depen-

dent optimal limits of correct responses that he determined to be adequate. Tuinman's study dealt with five standardized tests, the Nelson Reading test, California Achievement test, SRA, Metropolitan Achievement test and the Iowa Test of Basic Skills. Results showed that of the tests, three allowed a student who does not have access to a passage to obtain a score as high as 70 per cent of what a student with the passage would obtain. The remaining tests were less inadequate, but only slightly as students without access to the passage obtained scores as high as 61 percent of what students with the passage obtained. Tuinman's study is not unique, as similar results have been reported by Weaver, Bickley and Ford (1969), Mitchell (1967) and Preston (1964). Passage dependency studies indicate that reading a passage sometimes adds little information essential to answering questions about them, however, the measurement of comprehension must clearly be dependent upon the passage. Indications are that a test should be devised that will in fact be passage dependent.

Summary - Toward the Measurement of Comprehension

Chapter II has presented a review of research dealing with the development of information processing approaches to memory, comprehension, models containing schema use and propositional viewpoints, cohesion, cloze procedure and passage dependency. These areas are directed toward the development of a means of measuring comprehension.

Memory processing sets the stage for the input of information and for the comprehension of that input. The comprehension process operates within semantic memory and permits input to assimilate with prior knowledge thus enabling comprehension to take place. Comprehension is, however, a complex process containing many facets. The measurement of this complexity has lead to many difficult problems, several as yet unsolved at this time. It seems clear, however, that a measurement of comprehension must be dependent upon a particular type of information, and in the case of this investigation, a short story. If a student is unable to answer questions about a story without reading it (passage out), yet able to answer those questions after reading the story (passage in), an indication of comprehension would have been attained. The rela-

tionship between passage dependency and comprehension measurement has been demonstrated by Tuinman (1973) and Pyrczak (1972). Therefore, passage dependency seems to be a necessary characteristic of a comprehension measurement device.

Cloze procedure appears to incorporate some of the complexity involved in the comprehension process, and seems to measure some aspects related to understanding (Rankin, 1978). Regular cloze tests incorporate a 5th Word deletion strategy whereby a specific passage is taken and every 5th word is eliminated throughout the selection. Selective cloze tests are handled in a similar fashion but the deletions are made to specific structural elements of the sentences within the passage.

One of the fundamental structral aspects of text involved in comprehension is cohesion (Kintsch, 1974; Halliday and Hasan, 1976). Cohesion unites a passage or a story into an understandable unit.

If an existing short story were summarized to a length adequate for the development of a test and cloze deletions were made of the cohesive elements, one should produce an instrument that measures comprehension.

This investigation developed three separate deletion pattern tests referred to as passage dependent sum-

mary cloze (PDSC). The specific patterns are discussed in the following chapter.

Chapter III

Experimental Design and Procedure

Introduction

The study of prose comprehension and retention has been particularly extensive in recent years. Cognitive psychologists have finally re-entered this sphere overcoming the difficulties inherent in studying larger units than the sentence. They are now joining other investigators from the field of education in an attempt to understand comprehension.

The growth of this interest in the study of prose is due to several factors: practical applications of experimentation, better research and theory development related to reading, and new theories in the field of linguistics.

One of the problems in studying prose comprehension is to delimit the complexities associated with larger units of prose, such as the paragraph, story or chapter. To date the investigators seem to be focusing upon only two or three aspects of the units, such as structure, how the content affects recall, how orienting tasks

p. 43?

affect comprehension or how the reader's knowledge influences his/her understanding of text. The results of this research indicate the need for a better understanding of text structures and the construction of prose passages.

There is far less known about factors that influence comprehension of sentences and longer passages of discourse in reading than is known about factors that influence recognition of individual words. This limitation is due to two primary reasons; it is harder to define and segment into units the information contained in a passage and second there has been little progress toward a theory of comprehension.

This study examined the effect of student's previously attained information from reading a story, based upon the success or failure of a sample of grade six students to complete the cloze test.

The independent variables were Sex, Treatment and Reading Ability. The dependent variable was the performance students attained on the series of three cloze tests, having read a story (passage in) on which the cloze test was based and on the performance of similar students who had not read the story (passage out)

on which the cloze test was based. Figure 2 shows the model upon which the investigation was based.

Applied Cloze Test (PDSC)	Passage In (Story Read)	Passage Out (Story Not Read)	Treatment or Trial
1. Random deletion	mean percent	mean percent	1
2. Teacher deletion	mean percent	mean percent	2
3. Cohesion deletion	mean percent	mean percent	3

Figure 2. Cloze test patterns or trials based upon passage in and passage out conditions.

Hypotheses

The following hypotheses have been developed. These hypotheses were tested at the .05 level of significance.

Hypothesis #1

The mean percentage scores of the students who had read the relevant story will be greater than the scores of students who had not read the story measured on a Passage Dependent Summary Cloze Test.

$$H_1 = \mu_1 > \mu_2$$

Hypothesis #2

The mean percentage scores of the high ability readers will be greater than those of the low ability readers.

$$H_2 = \mu_1 > \mu_2$$

Hypothesis #3

There will be differences among the student's percentage mean scores on the three trials; 5th word pattern, teacher intuitive pattern, and cohesion pattern under passage in conditions in the following order: The cohesion pattern will receive greater mean scores than the teacher pattern or the every 5th word pattern.

$$H_3: \mu_3 > \mu_2 > \mu_1$$

Hypothesis #4

The difference between mean percentage scores in passage in and passage out conditions will be greater

for the cohesive deletion condition than for the every 5th word and teacher deletion.

Sub Hypothesis 4a)

$$H_4: \quad \mu_3 > \mu_2 > \mu_1$$

The students performance on the cohesive deletion will indicate a greater mean percentage score difference between passage in and passage out conditions (passage dependency) than the 5th word random deletion.

$$H_{4a}: \quad \mu_3 > \mu_1$$

Sub Hypothesis 4b)

The student's performance on the cohesive deletion will indicate a greater mean percent score difference between passage in and passage out conditions (passage dependency) than the teacher intuitive deletion.

$$H_{4b}: \quad \mu_3 > \mu_2$$

Definitions

The following terms are used throughout this study:

1) *Cloze procedure* - a method for systematically deleting words from a prose selection and then evaluating the success a reader has in accurately supplying the words deleted.
2) *Cohesion* - a set of linguistic ties that bind a text into a coherent whole; a type of redundancy which exists among the various sets of semantic resources which link one proposition with another.
3) *Passage dependency* - the quality of a task whereby understanding of a passage and answering questions based upon it depends upon having previously read the passage.
4) *Passage In Condition* - an experimental condition whereby the subjects in possession of a test related story of passage had read the story.
5) *Passage Out Condition* - an experimental condition wherein the subjects had not read the story or passage.
6) *Propositions* - a specific semantic representation of an idea or concept found within a sentence, paragraph or passage.

Subjects

One hundred and eighty-four grade six students representing seven classes from a school located in the Greater Victoria area of British Columbia were used in the investigation. These students were designated as to their reading ability according to the previously administered Canadian Test of Basic Skills (King et al, 1976) reading comprehension. High ability readers were students whose scores were above the school's grade six group median. Low ability readers were those who scored below the same median for the total sample.

Procedure

The seven classes were divided into two sections containing equal representation of reading ability and designated as control (group A) and experimental (group B). The control group was further designated passage out and received a story to read that was unrelated to the applied tests (The Storyteller by Saki). The experimental group was designated passage in and received a story to read

that was directly related to the applied tests (All Summer In A Day by Ray Bradbury). The students were randomly assigned to passage in and passage out conditions using the table of random numbers. Each class was used only once, no repeated visits were made. All students were numbered and classified as to their reading ability. The students were randomly assigned to one of the three Treatments with as equal representation of high and low ability readers within each Treatment as possible. Each Treatment was labelled with the name of the student and as experimental or control.

Upon entering the classroom the students were introduced to the researcher who then proceeded to explain the testing procedure. Instructions were identical for each class and appear in Appendix B4.

Testing Instruments

Passage Dependent Summary Cloze procedure is a device used in this study to measure comprehension. A story was selected with a readability level of grade 7.1 on the Fry Scale. The story "All Summer In A Day" by Ray Bradbury (Scott, 1968) was then reduced to a length of 250 words from the original 1939 words. Initial summarization was carried out by five graduate students in the language arts section, Faculty of Education, University of Victoria. Instructions given to these graduate students were: (1) to summarize the story to a length of 250 words; (2) use the author's words and; (3) retain the gist of the story. These instructions resulted in five summaries. Three were virtually identical in structure and content; one was eliminated as the summarization contained one of the graudate students own terms rather than the authors; and the last summary, although considered in the creation of the final synthesis was not as useful as it was in point form rather than narration. These summaries were combined so that the single summary contained the gist of the original five (See Appendix A).

The final summary was created by selecting complete sentences from each of the graduate student's summaries so as to form a single passage that contained the gist of the story. The participating graduate students were shown the final copy to determine if the summary was an accurate representation of their input and the story content. All five students agreed that the synthesis represented a fair summary of their understanding of the story. The initial summary cloze test (a 5th word deletion) was piloted to determine if the passage dependent criteria would work (See Appendices C and D).

It was found that the length of 250 words was too unwieldly and that the number of propositions contained within the summary was too large to allow for deletion experimentation. As a result, the summary was further summarized (See Appendix B) again to retain the gist. The summarization was accomplished by eliminating many of the descriptive sentences, phrases and words from the first summary. The object was to produce a summary of 125 words that still contained the gist of the story and the author's words. This 125 word summary was then converted into a propositional text base (See Table 1).

The propositional procedure has been justified in Kintsch (1974) and conceptualized into a working analysis by Turner and Greene (1977).

Table 1

Proposition List for the Summary of the short story "All Summer In A Day" based upon the work of Kintsch (1974), and Turner and Greene (1977).

1. Falling, O: Rain, G: Venus
2. Time: 1, Seven, Years
3. Neg: Remember, Children
4. See, A: 3, O: Sun
5. Time: Soon
6. Weather: A: Shine, O: Sun
7. Qualify: 5, an Hour
8. Loc: From, Earth, Margot
9. Qualify: Dislike, 8, A: Children
10. See: A: 8, O: Sun
11. Time: Arrive, Day
12. Qualify, 11, Shine, Sun
13. Tease, A: Children, O: Margot
14. Resist, A: $, they O: She
15. Pushed, S: Into, G: Closet
16. Locked, A: Door, O: $
17. Time: Sun, Came
18. Rush: A: Children, O: Outside, G: Play
19. Feel: G: Glorious, O: $
20. Time: Soon, 19, End
21. Fell, A: Rain, S: Once More
22. Run, A: Children, O: Inside
23. Sudden, A: they Remember, O: Margot
24. Slow, A: Open, O: Door
25. Let, A: Out, O: Her
26. Result: Out, Margot

NOTE: Symbols contained within the propositions follow.

- A: Agent - animate instigator of the state or action identified by the verb.
- O: Object - object of an action which undergoes change or movement.
- S: Source - action identified by verb.
- G: Goal - result of action identified by verb.
- $: Inference

The propositional analysis technique is an extremely robust procedure as it allows for a wide degree of flexibility in the construction of the propositions and their positions in the text base. Figure 3 illustrates the cohesion graph developed from the text base. It shows the argument repetition and the connection that make the passage cohesive.

Kintsch and Van Dijk (1978) developed a cohesion graph based upon argument repetition. They used especially constructed examples where the propositions were connected by lines indicating shared referents. The model was designed to explain how text is processed by the reader. Unlike the Kintsch model, the cohesion graph developed for this study utilized more than argument repetition. Using constructs elucidated by Quillian units and properties were identified within each proposition. The connections between the propositions acted much as pointers from concept to concept. The connections on lines indicated the propositional flow of the story. These connections represent the concept repetition or idea repetition of the story.

The 125 word summary, a result of a condensation of the initial 250 word summary now became the text base (See Appendix B). Deletion patterns were then applied to this revised summary.

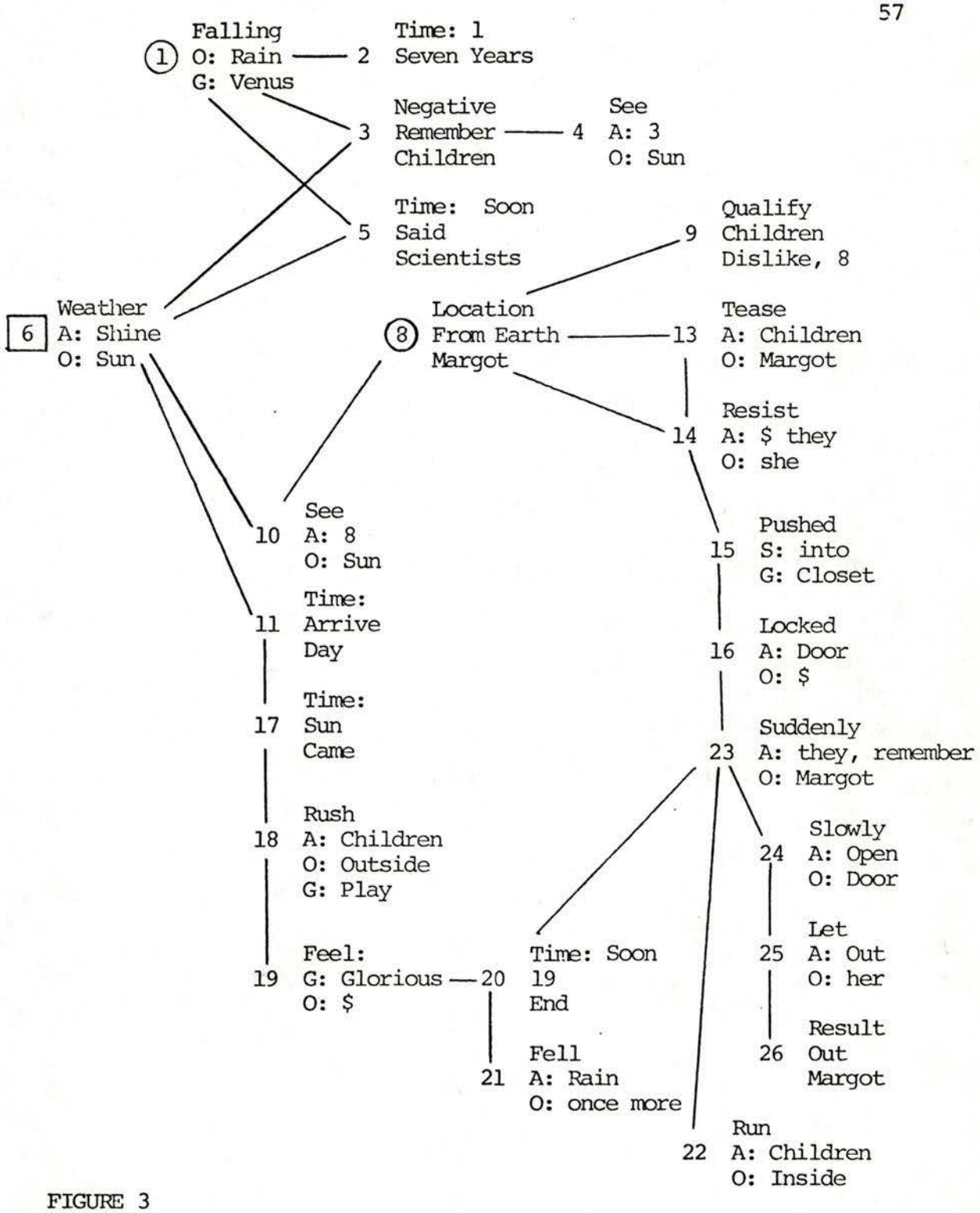

FIGURE 3

An example of a Cohesion Graph based upon the work of Kintsch (1972) and incorporating the propositional analysis that appears in Table 1.

The PDSC Test

Three different deletion patterns in a cloze test situation were utilized. The deletion strategies employed were every 5th word, teacher intuitive deletion of meaning and a cohesive deletion based upon the graph in Figure 3.

The PDSC test differs from a standard cloze test in that the summary on which deletions are made contains the gist of the entire story. The standard cloze test is generally applied to a 250 word sample section of the original story and does not usually contain the total idea expressed by the author. By summarizing the story, and applying specific selected deletion patterns a method for the determination of comprehension may be attained. The deletion patterns if successfully applied to the summary would make successful completion the test dependent upon the reader having read and understood the story. The passage dependency created by the deletion patterns was the central concept or the major emphasis of this study.

Every 5th Word Deletion

Trial I was developed from the summary passage using the 5th word deletion criteria. Deletions occurred every 5th word to a total of 24 deletions (Appendix B1). Table 2 illustrates the exact replacement word and the acceptable alternatives to that word. Acceptable alternatives were selected based upon the fact that a summary of the story was used and certain words appearing in the story might not appear in the summary. If the alternatives contained similar concept loads to the actual replacements, they were considered to be acceptable.

Table 2

Omitted Words and Accepted Replacements
for Every 5th Word Deletion

Bank No.	Exact	Replacement
1	falling	pouring; pounding
2	Venus	
3	not	never; hardly
4	sun	sunshine
5	scientists	
6	shine	
7	was	came
8	other	Venus
9	she	
10	finally	soon
11	day	
12	and	then
13	pushed	put; threw; shoved
14	and	
15	the	
16	all	
17	to	
18	glorious	terrific, great, joyous, wonderful
19	to	
20	rain	
21	children	
22	suddenly	then
23	opened	unlocked
24	her	Margot

Replacement words were decided upon on the basis of how well they would fit into the meaning of the story. Since the study was of comprehension any word that would convey the meaning of the story in a close approximation was judged to be acceptable.

Trial II Teacher Intuitive Deletion

Trial II was developed in an attempt to determine if a classroom teacher could intuitively produce a test that would be passage dependent and related to the semantic content of the story. The summary was given to a junior high school teacher with the instructions to delete twenty-four words that removed the heaviest concept load from the passage. No further instructions were given (Appendix B2). Table 3 illustrates the deleted words and the acceptable replacements.

Table 3

Omitted Words and Accepted Replacements
Teacher Intuitive Deletion

Number	Word	Replacement
1	rain	
2	falling	pouring, pounding
3	remember	
4	sun	sunshine
5	scientists	
6	it	
7	shine	
8	Earth	
9	disliked	envied
10	sun	
11	arrived	came
12	day	
13	teased	
14	resisted	
15	pushed	put, threw, shoved
16	closet	
17	locked	
18	sun	
19	play	
20	feeling	
21	rain	
22	remembered	
23	opened	unlocked
24	door	closet

Trial III Cohesive Deletion - Units and Properties

Trial III was a deletion of selected cohesive ties based upon the propositional analysis of Kintsch (1974, 1978) and the use of the units and properties of Quillian (1969). The propositional analysis of the summary passage appears in Table 1 and the resulting cohesion graph in Table 2. Each proposition was analysed and the units and properties contained within were identified. These elements were then placed into the cohesion graph to determine which ones would be deleted. Systematic deletion of these cohesive elements and the degree of successful replacement could indicate their importance to a reader's comprehension of the passage. The process of deletion followed several stages:

1) The summary was broken down into twenty-six propositions (Kintsch, 1974; Turner and Greene, 1977).
2) Within each proposition, units, properties and pointers were identified (Quillian, 1969).
3) The units and properties were then identified within the cohesion graph, Table 2.

4) Single words identified as units and properties were then deleted. An attempt was made to retain at least three words between the deletions (MacGinitie, 1961). In two cases this requirement could not be adhered to, as some sentences contained too many cue words.

5) A total of twenty-two deletions were made which was a variation from the previous two trials. Deletion of all units and properties would eliminate any question of success in replacement of the missing words regardless of prior knowledge. As a result the researcher made the deletions in such a manner as to guarantee at least minimal success during passage out conditions and good success during passage in conditions. Success was felt to be an important criteria to minimize student frustration. It is important in the deletion strategy to allow for high success based upon the student having previously read

the story. Therefore, deletion were made as follows:

a) Proposition 1 contained three major cohesive ties, units of rain and venus and property, falling. Due to their importance to the story and their argument repetition, they were all deleted.

b) Proposition 2 was left intact as its only tie was to proposition one.

c) Proposition 3 contained one unit children and one property remember, with cohesive ties to proposition 1 and 6, both were deleted.

d) Proposition 4 contained a major cohesive unit, sun and this word was deleted. The property, seeing, was not deleted due to its physical closeness to previously deleted words.

e) Proposition 5 was left intact but proposition 6 contained the major cohesive tie, shine and it was deleted.

f) Proposition 7 was left intact. Proposition 8 contained the unit Earth and this word was deleted since it required identification from the passage to insure success.

g) Proposition 9 contained the unit, children, was deleted since it is a major cohesive tie relating to propositions 1, 3, 8, 13, 14, 18, 22, 23 and containing inference to propositions 15, 16, 19, 24, 25. This meant deletions in propositions 14, they; 15, closed; 16, door; 18, children and play; 22, children; 23, they and 24 door.

h) Proposition 10 contains the unit deletion sun with cohesive ties to proposition 6 and 8.

i) Proposition 11 was left intact whereas proposition 12 with cohesive tie to proposition 11 contains the unit, sun deletion, and was removed due to its total cohesiveness to the major theme

of the story. Similarily proposition 17 contained the same deletion.

j) Proposition 20 was left intact since the propositions relating to it contained major cohesive deletions and it didn't affect the summary.

k) Proposition 21 contained the unit rain deletion due to the relationship it had to the theme of the story and the summary.

l) Proposition 26 was entirely inferential and physical deletion was not practical.

The resulting test contained 22 deletions, two fewer than the previous two trials (See Appendix B3). It was decided to leave this trial as such rather than add two more deletions. This was done to maintain the type of deletion strategy employed rather than to simply select two more concept words at random for deletion. Derived scores would produce adequate comparisons for this study. Table 4 illustrates the deleted words and the acceptable replacement words.

Table 4

Omitted Words and Acceptable Replacements
Cohesion Deletion

Number	Word	Replacement
1	rain	
2	falling	pouring, pounding
3	Venus	
4	children	
5	remember	
6	sun	sunshine
7	shine	
8	Earth	
9	children	
10	sun	
11	children	
12	they	
13	closet	
14	door	
15	sun	
16	children	
17	play	
18	rain	
19	children	
20	remembered	
21	they	
22	door	closet

Summary

This chapter provided information about the sample used in this study, the type of textual analysis and the deletion strategies employed with the testing instrument. The pilot study was conducted to test the procedure and testing devices. Three deletion strategies were utilized and explanations of their design were included.

It was hypothesized that a cohesive deletion strategy would produce greater passage dependency than either the 5th word or teacher intuitive deletions. It was further hypothesized that high ability readers would perform significantly better than low ability readers on the PDSC test under all conditions and that passage dependency is a vital condition for the test to contain. Since the cloze technique has been found to be a measure of reading comprehension (Bormuth, 1974; Rankin, 1978) a student's inability to complete such a test would indicate a lack of comprehension for the summary. If, on the other hand, a student has success in completing the test, the indication would be either that there is some level of comprehension occurring or that certain factors are present within the text that allow that student to successfully

complete the task. Since the research evidence indicated that the text structure plays a major role in affecting comprehension the specific semantic element of cohesion was tested. A deletion of cohesive elements and the success with which students complete a test related to the cohesion would indicate comprehension of the task. Results of the deletion strategies appear in the following chapters.

Chapter IV

Results and Discussion

Introduction

This chapter presents the results of the study which attempted to develop a passage dependent cloze procedure. A summary of the performance for the total sample is contained in Table 5, and shows the mean percentage scores by Trial, Treatment and Reading ability.

Since reading research has often reported sex differences and performance at different levels of physical and mental development, it seemed necessary to determine whether there were such differences in this study. Research supports the premise that sex differences on "high level" verbal tasks such as comprehension of difficult written material tend to diverge as the child approaches adolescence (Maccoby and Jacklin, 1974). A general assumption was made, therefore, regarding the performance of boys and girls in that they should perform equally on the trials. A "t" test was applied to the data and the results, described in Table 6 show no significant differences between male and female performance on the PDSC. As a result this variable was not dealt with further.

Table 5

Summary of Performance of Grade Six Students on Three Forms of A Cloze Test

Variable	Mean percentage of correct responses	SD	N/Treatment	N/Reading Ability	Total N
5th Word Deletion	67.71	17.08			60
A. Passage Out (Control)	59.63	18.84	29		
High Ability Readers	68.38	13.43		17	
Low Ability Readers	47.22	18.83		12	
B. Passage In (Treatment)	75.27	10.97	31		
High Ability Readers	82.11	6.38		17	
Low Ability Readers	66.96	9.59		14	
Teacher Intuitive Deletion	39.20	25.42			71
A. Passage Out (Control)	21.41	17.79	36		
High Ability Readers	29.17	17.11		15	
Low Ability Readers	15.87	16.49		21	
B. Passage In (Treatment)	57.50	18.02	35		
High Ability Readers	62.50	12.01		14	
Low Ability Readers	54.17	20.71		21	
Cohesion Deletion	53.77	34.09			53
A. Passage Out (Control)	25.41	19.82	22		
High Ability Readers	31.44	23.38		12	
Low Ability Readers	18.18	11.93		10	
B. Passage In (Treatment)	73.90	27.04	31		
High Ability Readers	88.35	7.23		16	
Low Ability Readers	58.48	31.90		15	
TOTAL	52.69	28.57			184

Table 6

A Comparison of the Mean Percent Scores of Males and Females

Group	Number	Mean	Standard Deviation	Standard Error	t	p
Male	77	48.7	30.1	3.4	1.63	.105
Female	107	55.6	27.2	2.6		

Organization of the Statistical Analysis

The data were analysed by a three way analysis of variance. Post hoc measures using the Scheffé procedure were applied to the analysis.

Frequency distributions for each trial are shown in Appendix E. Descriptive data related to the raw scores are shown in Appendix F.

The four hypotheses are restated below in order to provide a focus for the results of this study. Each hypothesis was tested for significance at the .05 level.

A separate discussion of each hypothesis will be used to explain the results more fully.

Hypothesis #1

The mean percentage scores of the experimental group's performance will be significantly greater than the control group's performance on the passage dependent summary cloze test.

A summary of the data for the three way analysis of variance appears in Table 7. From this table it can be seen that there were significant differences between the

treatment groups performance and the control groups performance for all trials ($p<.001$). The first hypothesis is, therefore, accepted.

Hypothesis #2

The mean percentage scores of the high ability readers will be significantly greater than those of the low ability readers.

From Table 7 it can be seen that there is a significant difference between readers of high ability and those of low ability ($p<.001$). As a result Hypothesis #2 can also be accepted.

Table 7

Analysis of Variance for Treatment, Reading Ability and Trial on the PDSC

Source	DF	MS	F
Main Effect			
Treatment/Control	1	50599.3	170.8 *
Reading Ability	1	12747.1	43.0 *
Trial	2	10108.1	34.1 *
2 Way Interactions			
Treatment/Control Reading Ability	1	8.6	.03
Treatment/Control and Trial	2	3855.4	13.0 *
Reading Ability and Trial	2	556.1	1.9
3 Way Interaction			
Treatment/Reading Ability/Trial	2	296.2	1.9
Error	172		
Total	183		

* $p<.001$

Hypothesis #3

There will be significant differences among the mean percent scores of the three trials; 5th word deletion pattern, teacher intuitive deletion pattern and cohesion deletion pattern under passage in conditions in the following order: H_3: $\mu_3 > \mu_2 > \mu_1$.

The 5th word deletion pattern is represented by μ_1, the teacher intuitive deletion pattern by μ_2 and the cohesion deletion pattern by μ_3.

From Table 7 it can be seen that there is a significant difference between the trials ($p<.001$). Mean percentage scores are shown in Tables 8 and 9 and as can be seen, the 5th word deletion received the highest mean score. As a result, the trials can be ordered according to their mean percentages as follows: first, the 5th word random deletion, second, the cohesion deletion, and finally the teacher intuitive deletion. The ordering of mean percentage scores meant that Hypothesis #3 could not be accepted, since $\mu_1 > \mu_2, \mu_3$.

Table 8

Mean Percentage PDSC Scores for Passage In and Passage Out Conditions for each Trial

	Passage In	Passage Out
5th Word	75.3 (31)	59.6 (29)
Teacher Intuitive	57.5 (35)	21.41 * (36)
Cohesion	73.9 (31)	25.4 * (22)

Significant differences between passage in and passage out conditions *p<.001

Sub Hypothesis 3a

The mean percentage score of passage in conditions for the teacher intuitive deletion pattern will be significantly greater than the mean percentage score for the 5th word deletion pattern.

$$H_{3a}: \mu_2 > \mu_1$$

Tables 8 and 9 indicate the percentage scores for each trial and each condition. As a result of these scores Sub Hypothesis 3a was not accepted as the mean percentage score for the 5th word deletion pattern was significantly greater than the teacher deletion pattern ($p<.02$).

Sub Hypothesis 3b

The mean percentage score of passage in conditions for the cohesion deletion pattern will be significantly greater than the mean percentage score for the 5th word deletion pattern.

$$H_{3b}: \mu_3 > \mu_1$$

In Table 8 and Table 9 the mean percentage score for the cohesion deletion was almost equal to but not greater than the mean percentage score for the 5th word deletion. Therefore, H3b was also not accepted.

Sub Hypothesis 3c

The mean percentage score of passage in conditions for the cohesion deletion pattern will be significantly greater than the mean percentage score for the teacher deletion.

$$H_{3c}: \quad \mu_3 > \mu_2$$

The Scheffé procedure indicated that the mean percentage score for the cohesion deletion was significantly greater than for the teacher deletion ($p<.05$). Therefore, the hypothesis can be accepted.

Hypothesis #4

Hypothesis #4 was developed as two sub-hypotheses that related to the cohesion deletion pattern.

Sub Hypothesis 4a

It was hypothesised that the cohesion deletion would indicate a greater mean difference score between passage in and passage out conditions (passage dependency) than the 5th word deletion.

Mean difference scores were determined by subtracting the mean percentage scores for passage in and passage out conditions.

$$H_{4a}: \quad \mu_3 > \mu_1$$

The scores were analysed utilizing the Scheffé procedure resulting in the acceptance of the hypothesis as the difference between the cohesion pattern and the 5th word pattern was significant ($p<.05$). The mean difference score between the cohesion deletion and the 5th word deletion appear in Table 10.

Sub Hypothesis 4b

The cohesion deletion pattern would indicate a greater mean difference score between passage in and passage out conditions (passage dependency) than the teacher intuitive deletion pattern.

$$H_{4b}: \quad \mu_3 > \mu_2$$

The scores were also analysed utilizing the Scheffé procedure and resulted in the acceptance of hypothesis 4b as the difference between the trials was significant ($p<.05$).

Table 9

Mean Percent PDSC Scores For
Passage In and Passage Out Conditions
For Each Trial and High and Low Ability
Readers

Trial	High Ability		Low Ability	
	Passage In	Passage Out	Passage In	Passage Out
5th Word	82.1 (17)	68.4 (17)	67.0 (14)	47.2 (12)
Teacher Intuitive	62.5 (14)	29.2* (15)	54.2 (21)	15.9** (21)
Cohesion	88.4 (16)	31.4** (12)	58.5 (15)	18.2* (10)

Significant *p<.01
**p<.001

NOTE: (x) represents the number of students in each measurement situation.

Table 10

Mean Percent PDSC Over Trials, Reading Ability
Passage In and Passage Out Conditions and Mean Difference
Between Passage In and Passage Out Conditions

	High Readers			Low Readers		
	Passage In	Passage Out	Mean Difference	Passage In	Passage Out	Mean Difference
Trial 1	82.1	68.4	13.7	67.0	47.2	19.8
Trial 2	62.5	29.2	33.3*	54.2	15.9	38.3**
Trial 3	88.4	31.4	57**	58.5	18.2	40.3*

Significant *p<.01
**p<.001

NOTE: Mean differences refers to the difference in the mean percentage scores between passage in and passage out conditions.

Analysis

As can be seen, Table 10 shows the mean percent difference scores for each trial. The mean percent difference indicates the passage dependency in this study. The percentage yielded by the PDSC can be indicative of how well the passage has been comprehended by the reader. Percentage scores between passage in and passage out conditions are consistant with those found in similar studies by Bormuth (1968, 1974) where he reported that less than 44% correct responses indicated frustration level, 44-57% the instruction level and more than 57% the independent level of reading. Results obtained by the PDSC tests appear to indicate similar results. Table 9 and 10 indicate the percent scores for each trial during passage dependent situations. Significant differences appear in Table 9 and indicate passage dependent conditions for Trial 2 (teacher) $p<.001$ and Trial 3 (cohesion) $p<.001$. The mean percentage difference between each trial rank them as to their passage dependency. This ranking can be readily observed in Table 10 where the mean percent difference for the trials were ranked as follows: Trial 1 lowest, Trial 2 middle and Trial 3 highest.

Summary

In summary, the results showed that:

1. There was no significant difference between the performance of males and females on the PDSC tests.
2. There was a significant difference in the performance of treatment and control groups. The treatment group performed significantly better ($p<.001$).
3. There was a significant difference between the performance of High Ability readers and Low Ability readers ($p<.001$).
4. There were significant differences between the mean percent scores for each test trial during passage in conditions. The mean percent score for 5th word deletion Trial was significantly greater than that of the teacher intuitive deletion Trial $p<.02$. The cohesion deletion Trial's mean percent score was significantly greater than the teacher intuitive deletion Trial $p<.05$. There was no significant difference between the

5th word deletion and the cohesion deletion for passage in conditions.

5. There were significant differences in the mean percent scores between the three trials $p<.001$. The Trials were ranked from lowest mean difference score to highest with the 5th word deletion being the lowest and the cohesion deletion the highest indicating the greatest passage dependency.

Chapter V

Conclusions

Post Hoc Analysis and Discussion

While the findings relating to the hypotheses provide mixed support for the use of a PDSC as a means of measuring comprehension a re-analysis of the data does provide some interesting insights.

Ideally for complete passage dependency, passage in conditions should have mean percentages of 100 and passage out conditions of 0. One hundred percent would imply no individual differences in comprehension. Zero percent would imply no redundancy within the summary. However, common sense indicates that such results are impossible to achieve. If less rigorous criteria are set and applied to the test results of this study an interesting pattern develops. In establishing a criteria for the study it was assumed that non-readers of the story could derive at least a 20% score based upon the contextual information provided by the summary passage. It is further assumed that a 80% score can be attained by the subject readers of the story. The differential percentage would, therefore, be 60%. The selection of those figures was made arbitrarily by the researcher and are

subject to modification.

As can be seen in Table 10, the only test that approached the differential criterion was the cohesion pattern and only for high ability readers. Low ability readers, however, also scored significantly greater on the cohesion pattern than on the other patterns, indicating that the element of cohesion still provides for meaning regardless of reading ability, but to a lesser degree. The 5th word pattern provided the least significant mean percentage difference. The non-significant difference observed between passage in and passage out conditions for the 5th word deletion pattern suggests that the 125 word summary was short enough to allow considerable variation in results and would, therefore, produce inconclusive results. It could also be presumed that with a 5th word deletion there is sufficient information left in the mutilated summary for non-readers of the story to reconstruct to essentially the same degree as readers who have read the story on which the summary was based.

The teacher intuitive deletion, provided a small amount of passage dependency but not sufficient to meet

the criterion of acceptability established for the investigation. The percentages were lower than any of the other trials, yet the different scores were consistant with the other deletion patterns. The low percent scores observed in the teacher trial could be interpreted to mean that the deletions were too difficult for the students to handle. The difficulty is corroborated by the fact that the pattern contained the lowest mean percentage under all conditions (Table 9). There did appear to be significant differences, however, between passage in and passage out conditions ($p<.001$). These indications suggest that teachers may be sensitive to important meaning bearing structure in connected text. However, further research with a wider sample of teachers would need to be done before any firm conclusions could be drawn.

The use of propositional analysis is an excellent research tool but due to the complexity of the analysis will probably be restricted to researchers rather than practitioners. The Kintsch model of propositional analysis seems to be readily applicable to summary stories as has been demonstrated. While the guide for accomplishing this kind of analysis by Turner and Greene

(1977) made the task simpler, the time required to do the analysis is not generally available to the average teacher.

Units, pointers and properties (Quillian, 1969) provide a sound structural base for textual analysis. However, pointers are often inferential in nature and systematic deletion of them is often difficult. Units and properties are far more compatible due to their syntactic nature. These elements can be mechanically deleted and do relate to the propositional analysis.

Cohesion provides the unifying bond that holds text together. Total deletion of all cohesive elements would entirely destroy the meaning of any passage and thus render its reconstruction impossible under any circumstance.

The cohesive elements appear to be very influential in the development of student comprehension; however, further research is required before any definite statement could be made.

From the results obtained in this study it would seem that the cloze procedure has the potential for measuring comprehension of connected prose. However, the deletion patterns should be selective rather than every 5th word.

An important variable not addressed in this study is the nature of the summary passage. The present work used a single summary of a fairly factual type. Future research needs to look at a more inferential summary.

A passage dependent summary cloze procedure based upon an inferential summary of the story used in this study has been experimented with at the University of Victoria. Results are encouraging as percentages of approximately 3% have been attained for passage out conditions and percentages of approximately 90% have been attained for passage in conditions. Further research should continue in this regard.

Summary of Discussion

A summary of the conclusions reached on the basis of this study indicate that comprehension measurement relates to the cohesion of the text. Passage dependency appears to reflect comprehension. Students who had read the story scored higher on the PDSC test developed for that story than those who had not read the story. Indications are that a test can be devised on the same basis as the PDSC that could measure reading comprehension.

The most effective PDSC test in this investigation was the cohesion deletion based upon the research of Kintsch (1974) and Quillian (1969). The 5th word random deletion produced the highest percentage scores indicating the sample students had greatest success with this test. The teacher intuitive deletion produced the lowest percentage scores. Perhaps the reason was due to the teacher eliminating too many of the necessary semantic ingredients that made the story coherent. The resulting deletion pattern was too difficult and did not provide enough clues to the story; as a result the students scored significantly lower on this trial.

Suggestions for Further Study

1. Summaries of a passage might contain inferential material rather than factual condensation. The strategy might be difficult but the results would indicate whether the student has or has not grasped the story concepts, if percentage scores for passage dependency approach 100%.
2. Further research should consider other types of deletion patterns made with the cloze test. These deletion patterns could employ other cohesive elements as suggested by Halliday and Hassan (1976).
3. Further manipulation of forms of the PDSC test might deal with the nature of the summary rather than the method of deletion. Concentration on deletion procedures, although important, can only be as effective as the material on which the deletions are made.
4. An interesting study that could result from the information obtained might center around the responses made by the students. Why did certain words appear that were semantically correct yet unrelated to the passage? How was the cloze blank interpreted by the

students and what words did they use? These questions could raise interesting issues related to reading comprehension.

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APPENDIX A

Initial Summary Based Upon All Summer in a Day written by Ray Bradbury and reproduced in Sense and Feeling, Copp Clark, 1968

It had been raining for seven years on Venus, as a class of nine year olds stood looking out at the deluge. Having been born here they could hardly remember seeing the sun yet soon, as the scientists had predicted, the sun should briefly shine.

A pale girl, Margot stood apart from the others. She seemed not to belong and seldom joined in the activities. Margot had come from Earth five years previously and remembered seeing the sun. She would not play with the others and would only sing if the songs were of the summer and the sun. She also wrote strange poems about flowers blooming and these differences made the others dislike, even distrust her.

The promised day arrived when the rain would stop and the sun would shine for just a few hours. The children taunted Margot relentlessly that the sun was not going to come out and when she protested they seized her, bundled her roughly into a closet, and locked the door. Despite her screams and struggles, as the teacher arrived

all of the children rushed toward the outside. Sunshine transformed the world into a new and perfect playground and the children revelled in the freedom denied previously by the rain. Suddenly one of the girls wailed as a drop of rain fell on her hand. The sun was rapidly fading. They ran back to the classroom as the rain fell once more. Then they remembered Margot. Slowly they placed the key in the lock and opened the door.

APPENDIX B

Revised Summary

The rain had been falling for seven years on Venus. The children there could not remember ever seeing the sun. Very soon, however, the scientists said that it would shine for an hour.

Margot was from Earth and the other children disliked her because she had seen the sun. Finally the day arrived. That day the children teased Margot and when she resisted they pushed her into a closet and locked the door.

Finally, the sun came out and all the children rushed outside to play. It was a glorious feeling but soon came to an end as the rain fell once more. The children ran back inside and suddenly remembered Margot. Slowly they opened the door and let her out.

Appendix B1

PDSC test - Trial No. I

5th Word Random Deletion

Fill in each blank space with a word. Only one word goes in each space.

The rain had been ___falling___ for seven years on ___Venus___. The children there could ___not___ remember ever seeing the ___sun___. Very soon, however, the ___scientists___ said that it would ___shine___ for an hour.

Margot ___was___ from Earth and the ___other___ children disliked her because ___she___ had seen the sun. ___Finally___, the day arrived. That ___day___ the children teased Margot ___and___ when she resisted they ___pushed___ her into a closet ___and___ locked the door.

Finally, ___the___ sun came out and ___all___ the children rushed outside ___to___ play. It was a ___glorious___ feeling but soon came ___to___ an end as the ___rain___ started once again. The ___children___

ran back inside and __suddenly__ remembered Margot.
Slowly they __opened__ the door and let
__her__ out.

Appendix B2

PDSC test - Trial No. II

Teacher Intuitive Deletion

Fill in the blank space with a word. Only one word goes in each space.

The ___rain___ had been ___falling___ for seven years on Venus. The children there could not ___remember___ ever seeing the ___sun___. Very soon, however, the ___scientists___ said that ___it___ would ___shine___ for an hour.

Margot was from ___Earth___ and the other children ___disliked___ her because she had seen the ___sun___. Finally the day ___arrived___. That ___day___ the children ___teased___ Margot and when she ___resisted___ they ___pushed___ her into a ___closet___ and ___locked___ the door.

Finally, the ___sun___ came out and all the children rushed outside to ___play___. It was a glorious ___feeling___ but soon came to an end as the ___rain___ started once again. The children ran back inside and suddenly ___remembered___ Margot. Slowly they ___opened___ the ___door___ and let her out.

Appendix B3

PDSC test - Trial No. III

Cohesion Deletion

Fill in the blank space with a word. Only one word goes in each space.

The ___rain___ had been ___falling___ for seven years on ___Venus___. The ___children___ there could not ___remember___ ever seeing the ___sun___. Very soon, however, the scientists said that it would ___shine___ for an hour.

Margot was from ___Earth___ and the other ___children___ disliked her because she had seen the ___sun___. Finally the day arrived. That day the ___children___ teased Margot and when she resisted ___they___ pushed her into a ___closet___ and locked the ___door___.

Finally, the ___sun___ came out and all the ___children___ rushed outside to ___play___. It was a glorious feeling but soon came to an end as the ___rain___ started once again. The ___children___ ran back inside and suddenly ___remembered___ Margot. Slowly ___they___ opened the ___door___ and let her out.

APPENDIX B4

Directions given to the Students During the Experiment Procedure

Listen to the instructions carefully. Don't do anything until you are told to. I'm going to hand out a short story to each of you. Read it carefully. I will not be able to answer any questions while you are reading so do your best. You will have 20 minutes to read it, then I will give you a fill in the blank test. Do not mark the booklets as they will have to be used again. Are there any questions?

Start.

Time

I will now hand out the test.

Now fill in the spaces with the best possible word you can. Only one word fits into each space. Take your time but work steadily. When you have finished turn your paper over and sit quietly until time is up.

Time

Pass the test to the front. Please check to see if your name is at the top.

Conclusion

What you have done is complete a cloze test related to one of the stories that some of you read. I'm sure you will have recognized that. I will give Mr./Mrs. _____ _____ your scores when I have marked them. Here are the answers. (class involvement)

General discussion followed and then they were all thanked for their cooperation.

APPENDIX C

The Pilot Study

A pilot study was conducted with a grade seven class in the Victoria School District during the month of December. The purpose of the study was to test the Passage dependent procedure utilizing noun and verb deletions of 40% of the total number of nouns and 40% of the total number of verbs. A second purpose of the study was to examine the appropriateness of the passage to be used and look at the appropriateness of an alternative passage. If for any reason a problem arises with passage A such as the students having previously read the passage, an alternate story would be required, passage B was made available.

Data were collected from 29 students for this study. Three measurements were obtained from each PDSC form and converted to percent scores.

a) exact word replacements for each student.

b) exact word replacements for each blank.

c) the mean percentage of exact replacements per passage.

From these measures a comparison of means were derived between "passage out" and "passage in" conditions. A comparative percentage for each student's performance under each condition was obtained.

By chance, the students in the pilot study had read the passage in class three months prior to the test application. As a result the passage was not given to them and only the test was applied. Analysis of the results produced a mean percentage of correct responses of 31.45%. See Appendix D for replacement percentages.

Within the test it was found that some words were more predictable than others but no conclusions were drawn. The test appeared to have some ability to predict the utilization of textual elements.

Passage B was then distributed to fifteen of the members of the same class used previously. The remaining students were given a like task to occupy their time. The selection of the treatment group was made by the teacher who selected rows which, unfortunately, contained all of the slow readers in the class. Future care was taken by the researcher in the random assignment within the classes. A passage dependent cloze test was made for this passage with deletions of 40% noun and verb similar

to passage A (Appendix D1).

Mean percentages were 9.85% passage in and 9.31% passage out. These means resulted in part from the selection criteria and also from the deletion strategy which was too difficult for those students.

Procedures seemed to be generally satisfactory but more care must be exhibited with regard to randomization, deletion strategies and lexical content.

Propositional analysis can be applied to future PDSC test summaries. This requires simpler vocabulary and shorter summary length due to the complexity of the procedure. As a result the initial 250 word summary was reduced to approximately 125 words. The reduction results in 46-50 propositions per test, a more than sufficient amount for recallability (Kintsch et al, 1975). See Appendix B for the summary passage.

APPENDIX C 1 #A

Pilot Study - 40% Noun and Verb Deletion

Fill in each blank space with a word. Only one word goes in each space.

PDSC FORM A

It had been raining for seven years on Venus, as a class of nine year olds stood looking out at the deluge. Having been _____ here they could hardly _____ seeing the _____ yet soon, as the scientists had predicted, the _____ should briefly _____.

A _____ girl, Margot, stood _____ from the others. She seemed not to _____ and seldom _____ in the _____. Margot had come from _____ five years previously and _____ seeing the _____. She would not _____ with the _____ and the _____. She also wrote strange _____ about flowers _____ and these _____ made the others _____, even _____ her.

The promised _____ arrived when the rain

would _____ and the _____ would _____ for just a few hours. The children _____ Margot _____ that the _____ was not going to come out and when she _____ they seized her, bundled her roughly into a _____ and _____ the _____. Despite her _____ and struggles, as the _____ arrived all of the children _____ toward the _____. Sunshine _____ the world into a new and perfect _____ and the children _____ in the freedom denied _____ by the _____. Suddenly one of the girls _____ as a _____ of _____ fell on her hand. The _____ was rapidly fading. They ran back to the _____ as the _____ fell once more. Then they _____ Margot. Slowly they placed the key in the lock and opened the door.

APPENDIX C2 #B

Pilot Study - Meaning Deletion

Fill in each blank space with a word. Only one word goes in each space.

PDSC FORM B

Luke and Eric 6 B 12 were inhabitants of the underground city of Surreal. They _____ by moving _____ to an area of the city where _____ seldom went and _____ in a long white _____ for the express _____ to pass by. The underground _____ was well _____ against the outside world by an _____ system and just one main _____ led to that _____.

Luke had always been _____ with what lay _____ and was _____ by the _____ and electric eye that _____ it. After a recent _____, Luke discovered a _____ in the _____ near the gate. Although the leaders of the _____ did not forsee any further _____ they issued _____ an emergency _____ containing

a gas _____ and ray _____. It was this emergency _____ that Luke and Eric were _____ as they approached the _____ in the _____.

Luke had been travelling this way _____ since he had discovered the _____ and had finally _____ his _____ friend Eric into _____ him. He _____ Eric _____ a solemn _____ never to reveal the _____ of the _____ to anyone. Breaking this _____ would lead to _____ by a _____ manner. Eric was _____ of the outside because of the things he had heard, but Luke was _____ to _____ the _____ that awaited. _____ suddenly _____ that what they were doing would actually cause them to _____ a _____ death, but Luke convinced him that they would be alright. Then they prepared to go through.

APPENDIX D #A

Pilot Study PDSC passage A

Correct Word Replacements and Percent Answered

Fill in each blank space with a word. Only one word goes in each space.

PDSC FORM A

N = 29 $\bar{x}$ = 31.45

It had been raining for seven years on Venus, as a class of nine year olds stood looking out at the deluge. Having been born 10.34 here they could hardly remember 10.34 seeing the sun 75.86 yet soon, as the scientists has predicted, the sun 86.2 would briefly shine 34.48 .

A pale 0 girl, Margot, stood apart 34.48 from the others. She seemed not to belong 0 and seld joined 3.45 in the activities 0 . Margot had come from Earth 82.76 five years previously and remembered 13.8 seeing the sun 89.7 . She would not play 48.28 with the others 65.51 and would only sing if the songs 20.69 were of the summer 0 and the sun 13.8 . She also wrote strange poems 72.41 about flowers blooming 24.14

and these differences 0 made the others dislike 0 , even distrust 0 her.

The promised day 3.45 arrived when the rain would stop 82.76 and the sun 65.51 would shine 31.03 for just a few hours. The children taunted 0 Margot relentlessly 0 that the sun 75.86 was not going to come out and when she protested 0 they seized her, bundled her roughly into a closet 82.76 and locked 72.41 the door 65.51 . Despite her screams 31.03 and struggles, as the teacher 27.59 arrived all of the children rushed 0 toward the outside 0 . Sunshine transformed 0 the world into a new and perfect playground 0 and the children revelled 0 in the freedom denied previously 0 by the rain 17.24 . Suddenly one of the girls wailed 0 as a drop 65.51 of rain 65.51 fell on her hand. The sun 79.31 was rapidly fading. They ran back to the classroom 6.9 as the rain 72.41 fell once more. Then they remembered 65.51 Margot. Slowly they placed the key in the lock and opened the door.

Replacement percentages - Passage Out.

APPENDIX D1 #B

Pilot Study - passage B

Correct Word Replacement and Percent Answered

Passage In

N = 14 $\bar{x}$ = 9.85

Fill in each blank space with a word. Only one word goes in each space.

PDSC FORM B

Luke and Eric 6 B 12 were inhabitants of the underground city of Surreal. They travelled 0 by moving sidewalk 0 to an area of the city where people 14.28 seldom went and waited 7.14 in a long white tunnel 21.42 for the express trains 57.14 to pass by. The underground city 35.71 was well protected 14.28 against the outside world by an alarm 0 system and just one main gateway 0 led to that area 0 .

Luke had always been intrigued 0 with what lay outside 0 and was fascinated 7.14 by the gate 7.14 and electric eye that protected 0 it. After a recent earthquake 21.42, Luke discovered a split 0 in the wall 0 near the gate. Although the leaders of the city 21.42 did not

forsee any furtner quakes 7.14 they issued everyone 0 an emergency kit 21.42 containing a gas mask 21.42 and ray helmet 0 . It was this emergency kit 21.42 that Luke and Eric were wearing 0 as they approached the crack 7.14 in the wall 7.14 .

Luke had been travelling this way daily 0 since he had discovered the crack 7.14 and had finally talked 14.28 his reluctant 0 friend Eric into joining 7.14 him. He made 0 Eric swear 0 a solemn oath 7.14 never to reveal the secret 50 of the opening 0 to anyone. Breaking this oath 7.14 would lead to death 28.57 by a horrible 14.28 manner. Eric was frightened 7.14 of the outside because of the things he had heard, but Luke was determined 0 to explore 0 the mysteries 0 that awaited. Eric 7.14 suddenly realized 0 that what they were doing would actually cause them to die 21.42 a horrible 28.57 death, but Luke convinced him that they would be alright. Then they prepared to go through.

Replacement percentages - Passage In.

APPENDIX D2 #B

Pilot Study - passage B

Correct Percent Answered - Passage Out

N = 15 $\bar{x}$ = 9.31

Fill in each blank space with a word. Only one word goes in each space.

PDSC FORM B

Luke and Eric 6 B 12 were inhabitants of the underground city of Surreal. They 6.6 by moving 0 to an area of the city where 33.3 seldom went and 13.3 in a long white 20 for the express 40 to pass by. The underground 46.6 was well 33.3 against the outside world by an 13.3 system and just one main 0 led to that 6.6.

Luke had always been 0 with what lay 6.6 and was 0 by the 6.6 and electric eye that 6.6 it. After a recent 0, Luke discovered a 0 in the 6.6 near the gate. Although the leaders of the 26.6 did not forsee any further 0 they issued 0 an emergency 6.6 containing a gas 13.3 and ray 0. It was this emergency 0 that Luke and Eric were 0 as they approached the 0 in the 0.

Luke had been travelling this way ___0___ since he had discovered the ___6.6___ and had finally ___6.6___ his ___0___ friend Eric into ___0___ him. He ___13.3___ Eric ___6.6___ a solemn ___26.6___ never to reveal the ___40___ of the ___0___ to anyone. Breaking this ___6.6___ would lead to ___13.3___ by a ___0___ manner. Eric was ___13.3___ of the outside because of the things he had heard, but Luke was ___0___ to ___0___ the ___0___ that awaited. ___20___ suddenly ___0___ that what they were doing would actually cause them to ___20___ a ___6.6___ death, but Luke convinced him that they would be alright. Then they prepared to go through.

Replacement percentages - Passage Out.

APPENDIX E
Frequency Distributions for each Trial

Frequency Distribution for Trial 1
Trial 1

Category Label	Code	Absolute Freq	Relative Freq (PCT)	Adjusted Freq (PCT)	Cum Freq (PCT)
	12.50	1	1.7	1.7	1.7
	29.17	1	1.7	1.7	3.3
	33.33	2	3.3	3.3	6.7
	37.50	1	1.7	1.7	8.3
	41.67	2	3.3	3.3	11.7
	45.83	1	1.7	1.7	13.3
	50.00	3	5.0	5.0	18.3
	54.17	2	3.3	3.3	21.7
	58.33	2	3.3	3.3	25.0
	62.50	4	6.7	6.7	31.7
	66.67	7	11.7	11.7	43.3
	70.83	6	10.0	10.0	53.3
	75.00	7	11.7	11.7	65.0
	79.17	11	18.3	18.3	83.3
	83.33	4	6.7	6.7	90.0
	87.50	3	5.0	5.0	95.0
	91.67	2	3.3	3.3	98.3
	95.83	1	1.7	1.7	100.0
	TOTAL	60	100.0	100.0	

MEAN	67.708	STD ERR	2.205	MEDIAN	71.528
MODE	79.167	STD DEV	17.079	VARIANCE	291.681
KURTOSIS	0.997	SKEWNESS	-1.043	RANGE	83.333
MINIMUM	12.500	MAXIMUM	95.833		

VALID CASES 60 MISSING CASES 0

Frequency Distribution Trial 2

Category Label	Code	Absolute Freq	Relative Freq (PCT)	Adjusted Freq (PCT)	Cum Freq (PCT)
	0.0	3	4.2	4.2	4.2
	4.17	5	7.0	7.0	11.3
	8.33	4	5.6	5.6	16.9
	12.50	4	5.6	5.6	22.5
	16.67	7	9.9	9.9	32.4
	20.83	4	5.6	5.6	38.0
	29.17	1	1.4	1.4	39.4
	33.33	2	2.8	2.8	42.3
	37.50	4	5.6	5.6	47.9
	41.67	5	7.0	7.0	54.9
	45.83	2	2.8	2.8	57.7
	50.00	4	5.6	5.6	63.4
	54.17	2	2.8	2.8	66.2
	58.33	6	8.5	8.5	74.6
	62.50	6	8.5	8.5	83.1
	66.67	2	2.8	2.8	85.9
	70.83	4	5.6	5.6	91.5
	75.00	3	4.2	4.2	95.8
	79.17	2	2.8	2.8	98.6
	100.00	1	1.4	1.4	100.0
	TOTAL	71	100.0	100.0	

MEAN	39.202	STD ERR	3.017	MEDIAN	40.833
MODE	16.667	STD DEV	25.419	VARIANCE	646.119
KURTOSIS	-1.115	STEWNESS	0.083	RANGE	100.000
MINIMUM	0.0	MAXIMUM	100.000		
VALID CASES	71	MISSING CASES	0		

Frequency Distribution Trial 3

Category Label	Code	Absolute Freq	Relative Freq (PCT)	Adjusted Freq (PCT)	Cum Freq (PCT)
	0.0	1	1.9	1.9	1.9
	4.55	3	5.7	5.7	7.5
	9.09	3	5.7	5.7	13.2
	13.64	4	7.5	7.5	20.8
	18.18	2	3.8	3.8	24.5
	22.73	1	1.9	1.9	26.4
	27.27	5	9.4	9.4	35.8
	31.82	3	5.7	5.7	41.5
	40.91	1	1.9	1.9	43.4
	45.45	3	5.7	5.7	49.1
	50.00	1	1.9	1.9	50.9
	59.09	1	1.9	1.9	52.8
	72.73	2	3.8	3.8	56.6
	77.27	1	1.9	1.9	58.5
	81.82	6	11.3	11.3	69.8
	86.36	4	7.5	7.5	77.4
	90.91	7	13.2	13.2	90.6
	95.45	4	7.5	7.5	98.1
	100.00	1	1.9	1.9	100.0
	TOTAL	53	100.0	100.00	

MEAN	53.774	STD ERR	4.683	MEDIAN	50.000
MODE	90.909	STD DEV	34.094	VARIANCE	1162.376
KURTOSIS	-1.673	SKEWNESS	-0.123	RANGE	100.000
MINIMUM	0.0	MAXIMUM	100.000		
VALID CASES	53	MISSING CASES	0		

APPENDIX F

Descriptive Statistics Based Upon Raw Scores

Scores Broken Down by Trial, Treatment and Reading Ability

Variable	$\bar{x}$	SD	N Treatment	N Reading Ability	N Total
5th Word Deletion Trial	16.25	4.1			60
A. Passage Out	14.31	4.5	29		
High Readers	16.41	3.2		17	
Low Readers	11.33	4.5		12	
B. Passage In	18.06	2.6	31		
High Readers	19.71	1.5		17	
Low Readers	16.07	2.3		14	
Teacher Intuitive	9.40	6.1			71
A. Passage Out	5.14	4.3	36		
High Readers	7.00	4.1		15	
Low Readers	3.81	4.0		21	
B. Passage In	13.80	4.3	35		
High Readers	15.00	2.9		14	
Low Readers	13.00	5.0		21	
Cohesion Deletion	11.83	7.5			53
A. Passage Out	5.60	4.4	22		
High Readers	6.92	5.1		12	
Low Readers	4.00	2.6		10	
B. Passage In	16.26	5.9	31		
High Readers	19.44	1.6		16	
Low Readers	12.87	7.0		15	
Total Population	12.34	6.6			184

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Passage Dependent Summary Cloze: A Method to Determine the Utilization of Cohesion in the Process of Reading Comprehension.

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September 28/91

Date