THE ROLE OF THE SITUATION MODEL IN THE READING COMPREHENSION PROCESSES OF GRADE SEVEN READERS

by

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ABSTRACT

Within the context of reading comprehension research, the present study is an investigation into the role of prior knowledge in the form of a situation model, constructed and used strategically during on-line text processing. Data consisted of Think-Out-Loud protocols collected from ten Grade Seven subjects as they read two expository text passages. The findings shed light on the structure of the situation model as well as its strategic use by subjects. The contents of the model include episodic and semantic memory fragments as well as beliefs, attitudes, values, and opinions. Eight categories of moves and four major strategies were identified in the TOL protocols by the researcher. The reliability of the categorization scheme of moves was established through a process using three independent raters. The study suggests that the strategic uses of the model are mainly for clarifying and evaluating the text, as well as for reasoning and monitoring one's understanding. Implications for research and instruction are discussed.

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Dedication

This dissertation is dedicated to my husband Derrick, who proved to me, during those dark days of despair, that there were no limits to his understanding or his love.

CHAPTER ONE

Introduction

In the last two decades the complex interactions of reader, text, and context during the comprehension process have been studied from several perspectives. Knowledge of text understanding has been enriched by insights from numerous fields including cognitive psychology (e.g. Carpenter & Just, 1986; Rumelhart, 1980), linguistics (e.g. de Beaugrande, 1984; Fillmore, 1985), and literary theory (e.g. Fish, 1980; Iser, 1978). Despite this, we are still a long way from being able to fully explain the moment-to-moment processes used by readers during text comprehension (Lytle, 1982; Spiro & Myers, 1984).

One of the major contributions of cognitive psychology to the study of reading comprehension is the recognition of the fundamental role of the reader's world knowledge in text understanding (Dole, Duffy, Roehler & Pearson, 1991). Advances in theory and research in the last decade have confirmed the notion that comprehension is an active process whereby the reader seeks to connect information from the text with his prior knowledge and experience in ways that will make sense.

Partial insights from research such as the constructivist theory (Bransford, Barclay & Franks, 1972; Spiro, 1980), schema theory (Adams & Collins, 1979; Rumelhart, 1980), progressive refinement theory (Collins, Brown & Larkin, 1980), and metacognitive theory (Baker & Brown, 1984) have resulted

in enlarging and enlightening our view of the reader's role in making, rather than merely taking, meaning from the text. Such a view assumes that understanding text is more than just the interpretation of its message; it involves constructive processes through which readers use their previously-acquired knowledge and experience to construct meaning. The language and content of the text then is but a skeleton, a blueprint for the creation of meaning that needs to be enriched and embellished by the reader's world knowledge for the purpose of text understanding. Much of the information needed to understand the text is not provided by the text itself but must be drawn from the reader's knowledge of the persons, objects, states of affairs, or events the text is about (van Dijk & Kintsch, 1983; Sanford & Garrod, 1981). The knowledge and experience that an individual brings to a reading task are therefore critical factors in comprehension (Langer, 1984; Spiro, 1980).

However, while theorists and researchers agree that knowledge-driven comprehension is an important construct for explaining how readers make meaning from text, there is less agreement as to exactly how this prior knowledge is organized, evoked, and used in the comprehension process. One explanation of the role of prior knowledge in the comprehension process is provided by the strategic theory of discourse processing propounded by van Dijk and Kintsch (1983). The theory holds that during the reading act a comprehender attempts to relate

the situation being referred to in text to his own background knowledge and experience by constructing a mental model from memory to match the text situation. Since all discourse is about some fragment of the world we can term a situation (van Dijk, 1987), this mental model or knowledge representation is known as the situation model.

This study investigates the role of the situation model in the reading comprehension processes of readers at the seventh grade level through analysis of the verbal reports of subjects. Think-Out-Loud protocols are used to gather data to illuminate the moment-to-moment processes of reading comprehension. The general purpose of the study is exploratory and descriptive. It attempts to explore and describe the structure and contents of the situation model when and how it is constructed during on-line interaction with text. The study also seeks to illuminate the strategic use of the model to enhance text understanding.

Specifically, the study seeks to clarify the following questions from the Think-Out-Lout (TOL) reports of subjects:

1. What evidence can be found for the psychological reality of the situation model in the on-line reading comprehension processes of 7th grade readers as revealed by TOL protocols?
2. How is the situation model constructed and used strategically during text comprehension by Grade Seven readers?

The situation model is the cognitive counterpart of the situation being referred to in text. This model is drawn from the reader's knowledge of the persons, objects, actions, states of affairs, and in general, the situation the text is about. (van Dijk, 1987). Elements of episodic and semantic memories, as well as opinions, attitudes, and beliefs of the reader are combined strategically to create a mental model that can enable and enhance the understanding of text. The construction of the model then, takes place in real-time, that is, during the actual reading of the text passage. As more and more information from the text is processed by the reader, the outline or framework of a model that is initially constructed is filled out to better meet the demands of text comprehension (van Dijk & Kintsch, 1983). Full comprehension takes place on-line, as an interaction between the model and the situation in text, often on the basis of partial clues provided in the passage (van Dijk, 1987).

The situation model is used strategically in the understanding process. The strategic use of the situation model is based on the assumption that since language users share much world knowledge, they leave much of this pre-supposed knowledge implicit in discourse. Consequently, written text becomes virtually a contract between writer and reader (Sanford & Garrod, 1981) whereby the writer seeks to present a fragmentary description of a situation of which the reader has some knowledge. Readers, on their part, fulfil the

contract by attempting to decipher as fully as possible the situation being referred to, through the strategic use of their prior knowledge.

Exploring the strategic role of prior knowledge in comprehension requires a research design that directs attention to ongoing processes. Researchers studying cognitive processes in reading have in the past decade shown an increasing interest in the use of verbal protocols as data. Different aspects of the comprehension process have been investigated by asking subjects to think aloud while performing a specified reading task. These Think-Out-Louds (TOLs) are spontaneous verbalizations of subjects telling what's on their minds while reading the texts aloud, sentence by sentence. The audio-taped TOLs are then transcribed and analysed to determine underlying cognitive processes. Thus TOLs are powerful tools for collecting valuable data about the interaction occurring during reading.

Analysis of verbal protocols collected from subjects can prove a valuable source of information into strategic processing (Caron, 1989). Verbal report data are an important source of information regarding cognitive processes that could otherwise only be investigated indirectly (Wade, 1990). Furthermore, they allow access to the reasoning underlying such cognitive behaviours (Afflerbach & Johnston, 1984; Brown, 1987; Garner, 1987).

The strategic manner in which young readers construct and use this situation model in on-line text processing can be best revealed through the use of TOL data. Because the essence of the TOL process is the reporting of thoughts as they occur, Think-Out-Louds offer promise of breaking into the reading process to reveal on-line strategies (Scardamalia & Bereiter, 1984; Bereiter & Bird, 1985).

Insights into the role of the situation model in text understanding can help to enrich and refine existing theories of knowledge representation. The strategies employed by readers as a function of the situation model during text processing can provide valuable data for research and instruction. Such information can illuminate and enrich the current process approach to instruction and evaluation of reading comprehension in schools.

> The understanding of how knowledge influences text processing will be advanced when conceptualizations are developed that provide for an improved description of knowledge, and a better idea of how different types of knowledge interact during comprehension. (Voss & Bisanz, 1985, p. 194).

It is the description of the knowledge representation and its interaction with text during comprehension that is addressed by this study.

Definition of Terms

Consistency in the meaning and use of these terms is critical to an understanding of this study:

situation model: A mental model of the situation denoted by the text passage.

text-base: The meaning representation of the text, built up by the reader from the propositional input; also known as a propositional representation.

TOL protocol: A record of verbalizations produced by subjects when asked to think out loud while reading.

TOL procedure: Refers to the use of subjects' concurrent verbalizations as data.

strategic: Planful, deliberate, and goal-directed.

on-line: In real time, i.e. during the actual reading.

move: A TOL response reflecting what the reader is doing at a point in text processing to make on-going sense of text.

strategy: A pattern of moves reflecting a purpose that helps the reader to deal with a particular problem with comprehension.

element: A TOL unit referring to a single concept or idea from the text and containing a single move.

CHAPTER TWO

Theoretical Framework and Literature Review

A Context for Comprehension: Interactive Reading Models

The interactive model of the reading process has provided a foundation for reading comprehension and theory in the past decade (Weisberg, 1988). The notion that understanding of text involves some combination of assimilative and constructive processes is no longer disputed. Such an interactive view of comprehension assumes that during the reading act several information sources, both data-driven and conceptually-driven, are combined to produce meaning. Information from syntactic and semantic systems is integrated with information from lower stages of cognitive processing, such as the orthographic and lexical systems, to determine conjointly the most likely interpretation of text (Rumelhart, 1977). In order to permit such interactivity during processing, a feedback mechanism is assumed, which allows for sentence-context effects and the role of prior knowledge as facilitating variables in understanding (Just & Carpenter, 1980; Lesgold & Perfetti, 1978; Samuels & Kamil, 1984). Interactive reading models provide the conceptual framework for this study. In providing a mechanism for explaining how prior knowledge is used for text understanding, they are the theoretical underpinnings on which the study rests.

In attempting to reflect a fuller, more realistic, and more flexible conceptualisation of the comprehension process, a compensatory version of the interactive model has been proposed (Stanovich, 1980; 1986). The notion that any one of several knowledge sources can be used to compensate for a lack in any other source has special relevance to this study. In exploring the role of the situation model in the comprehension processes of subjects, individual differences in the amount and type of prior knowledge brought to bear on the reading act become apparent. How and what compensatory knowledge systems are utilised when prior knowledge or text information is insufficient for the task at hand can be illuminated through the focus on strategies in the present research.

Interactivity in reading also takes into account the capacity limits of human memory and processing. It assumes that increase in the performance levels of competing processes can ameliorate the problems of "time-sharing" and prevent cognitive overload (Lesgold & Perfetti, 1978). The use of good readers as subjects in this study permitted the automatization of decoding processes to be assumed, in order to focus entirely on the comprehension process.

The model of the reading process that forms the theoretical framework for this study is in the tradition of the interactive model proposed by van Dijk and Kintsch (1983). In their strategic model of discourse processing, understanding of text proceeds from words to clauses to

sentences to larger textual structures, with continual feedback between less complex and more complex units.

According to their earlier model (Kinsch & van Dijk, 1978), the primary goal of comprehension is the semantic representation of text in the form of a text-base. During reading, the meaning elements of the text (expressed as a set of propositions) are organized into a coherent whole. This process takes place cyclically, due to capacity limits of processing and memory. New texts are generated from the memorial consequences of the comprehension process.

In the later (1983) strategic model of discourse processing, van Dijk and Kintsch add a constructive element to their interactive theory of text comprehension. The process of text comprehension involves not merely the creation of a text-base and its representation in memory, but the construction and use of the situation model from memory. The theory assumes that understanding occurs on-line, and through strategic action on the part of the language user. The theory is intended to be dynamic and flexible, and a closer approximation to what actually takes place during reading (van Dijk, 1987).

The situation model

The interactive aspect of the theory is demonstrated by the introduction of the notion of a situation model which accounts for the role of prior knowledge in understanding of text. The understanding of a text event occurs by interpreting

that event in the light of prior knowledge of such or similar events. External data is processed and interpreted through the activation and use of internal cognitive information. While the situation model enables and enhances text interpretation, the textual information serves to update and transform the model (Morrow, Greenspan, & Bower, 1987). Comprehension occurs interactively, by mapping text onto the situation model (Sanford & Garrod, 1981)and vice versa. This study is an investigation into the role of the situation model, and its interaction with the text in the comprehension process.

The theory is constructive in that the gaps in the text may be filled in by the reader from his/her own background store of knowledge and experience. The constructivist theory of comprehension advocated by Bransford, Barclay & Franks (1972) postulates that individuals construct interpretations of text that go beyond the linguistically presented information.

The model explains text understanding in real-time, that is while processing the input data and based on the Immediacy Assumption (Just & Carpenter, 1980). Text-interpretation is not deferred, but occurs as soon as possible, based on information received from several different processing levels. The methodology selected for the study, namely, the use of a Think-Out-Loud procedure, is based on this on-line assumption of the model. The situation model is constructed and used strategically in the comprehension process. The term

"strategy" borrowed from Greek military science was first introduced into psycholinguistics by Bever (1970) to connote complex goal-oriented action. The concern here is not merely with reaching a goal but also with achieving it in some optimal way. van Dijk and Kintsch hold that the strategic process (as opposed to the algorithmic, rule-governed one) does not in itself guarantee success. The strategies are in the form of working hypotheses derived from textual information received in the early stages of processing, which may be confirmed or negated along the way. Based on the results of this evaluative process, changes in strategies may occur.

The nature and use of a situation model as outlined by van Dijk and Kintsch (1983) is directly related to the two research questions of this study. To obtain evidence for the psychological reality of the situation model in response to the first research question, one needs to know what the model looks like. The model usually incorporates the personal knowledge a reader has about the text situation, accumulated by previous experiences, real or vicarious with such situations. Such episodic memories are continually extended and updated by new information or experiences connected to the situation. A situation model may also contain knowledge that is less personal or unique. Such semantic memory fragments may be a result of socially shared information or repeated episodic experiences. But while situation models are taken to

be some kind of a knowledge structure, they may also contain personal beliefs, attitudes, opinions, and emotions that colour this knowledge and contribute a social dimension to the cognitive model. Evidence of all these different kind of model fragments in the TOL protocols of the subjects in this study can provide evidence for the existence of this model as a knowledge representation constructed in response to the text situation.

The second research question deals with the strategic construction and use of the model, and can in itself provide further evidence of the model. It is in providing the necessary and relevant knowledge for the construction of the text-base which is the overall goal of the discourse, that the strategic use of the situation model emerges. Understanding is not just a process which basically follows rigid rules, but one which serves the purpose of mastering a situation. The concept of strategy then becomes a "global instruction for each necessary choice to be made along the path of the course of the action" (van Dijk & Kintsch, 1983, p. 65). This notion of strategy can be identified with Flavell's (1981) "cognitive action," or the "cognitive event" of Garner (1982): something executed by a reader to attain a goal, make progress or monitor it. Strategies can be formally represented as condition-action pairs when viewed in terms of production systems (Newell & Simon, 1972). If certain conditions are met,

the action is taken; the conditions being the result of information from various sources.

In general, the strategic uses of the model are geared toward an effective use of relevant knowledge. The situation model is used strategically in the understanding, representation, retrieval, and updating processes as well as in relating episodic and semantic memory structures. The specifics of the strategic use of the situation model during text processing as outlined by van Dijk (1987) and van Dijk and Kintsch (1983) will be explained further on in the chapter. Thus while this study aims to investigate and explore the situation model in the text processing, it will help to shed more light on the nature and functions of the model.

Within the context of what we know and can predict about the nature and use of the situation model as outlined by van Dijk and Kintsch (1983), the present study is an attempt to explore and describe its strategic role in the text processing undertaken by grade seven readers, with the goal to establishing the psychological reality of what has been heretofore well-nigh a theoretical construct.

Review of the Literature

Knowledge Representations in Discourse Processing

The issue of knowledge representation is fundamental to a theory of discourse processing. The process of constructing

a semantic representation from discourse relies heavily on prior knowledge, and to understand how it operates we need to understand how such knowledge is organized, represented, and utilised.

Theories of mental models

Interest in the notion of a mental model to understand, describe, and remember world situations has multi-disciplinary foundations. Such a model has been used by researchers and theoreticians in the fields of logical semantics, cognitive psychology, and artificial intelligence.

In formal semantics, models are seen as abstract reconstructions of the world being referred to in discourse (Stenning, 1978; Kamp, 1981). Expressions in the discourse, for example, sentences are interpreted in relation to the model. Formal models in semantics are used to specify truth conditions for discourse elements. A major limitation of these models is their ability to interpret only isolated sentences rather than connected discourse. While there has been some movement towards developing discourse models in this field in the past decade (Kamp, 1981; Petofi, 1980), such formal models have proved highly abstract and insufficient for dealing with the dynamism required in cognitive models (van Dijk, 1987).

In cognitive psychology the idea of a mental model to comprehend world situations is not new. Lippman (1922) based his theoretical analysis of public opinion on a notion similar

to that of a mental model, explaining its role in helping us cope with a larger and more complicated reality.

> For the real environment is altogether too big, too complex and too fleeting for direct acquaintance. We are not equipped to deal with so much subtlety, so much variety, so many permutations and combinations. And although we have to act in that environment we have to reconstruct it on a simpler model before we can manage it. To traverse the world, men must have pictures of the world. (pp. 16-17).

The idea that people construct and utilize models of the world to understand world situations was propounded several decades ago by Kenneth Craik (1943). Craik proposed that thinking is the manipulation of internal representations of an external reality. In a remarkably prescient explanation of how such models are used in information processing and problem-solving, Craik writes

> If the organism carries a small-scale model of external reality and of its own possible actions within its head, it is able to try out various alternatives, conclude which is the best of them, react to future situations before they arise, utilize the knowledge of past events in dealing with the present and the future, and in every way to react in a much fuller, safer, and more

competent manner to the emergencies which face it. (p. 19).

In recent years it has been the work of Johnson-Laird (1980; 1983), and his collaborators (Garnham, Oakhill & Johnson-Laird, 1982; Johnson-Laird & Garnham, 1980) that has served to elucidate and elaborate the theory of mental models. Johnson-Laird views such models as surrogates for reality having in Craik's (1943) terms a similar "relation-structure" to the processes or objects they mirror.

The structure of mental models is analogous to the corresponding state of affairs of the world. Such models play a unifying role in representing objects, events, situations, as well as psychological and social events of everyday life. In fact all our knowledge of the world depends on our ability to construct models of it (Johnson-Laird, 1983).

Johnson-Laird holds that small-scale models need not be completely accurate nor have they to correspond closely to reality in order to be useful. In fact, he believes there are no "complete models" (Johnson-Laird, 1983). In stating that mental models can be constructed on the basis of perceptual or verbal information, Johnson-Laird relates his psychological model to the theory of discourse processing.

Johnson-Laird rests his theory of inference fundamentally on the ability of the language user to construct and manipulate mental models. Inferences, both implicit and explicit can be explained with reference to the model which

allows for the use of general and specific knowledge from memory, perception, imagination, and other mental processes (Johnson-Laird & Garnham, 1980).

van Dijk admits to the work of Johnson-Laird being the seminal influence on the concept of the situation model. However, there are some significant differences between the two notions. While Johnson-Laird's illustrations of mental models are mainly within the framework of isolated sentences, van Dijk and Kintsch apply their notion within connected discourse. Moreover, whereas Johnson-Laird is more interested in the use of the model for explaining inferences and reasoning, the situation model is used for strategic text interpretation.

Sanford and Garrod (1981) also subscribe to the theory of a mental model in discourse processing by referring to a scenario that is evoked in the mind of the reader by the text sentences. During comprehension such a scenario incorporates much information that is absent in the text itself and is needed to draw the inferences necessary for full understanding. If it is accepted that discourse produces models in the readers' minds and that they are under a psychological contract to relate the contents of the discourse to such models, then the different forms of inference can be handled within this framework.

While there is general consensus among most cognitive psychologists regarding the notion of a cognitive model in

text understanding, there is less agreement as to its form and representation.

Propositional Representations and Mental Models

There seem to be two schools of thought regarding the construction of a text representation and a mental model during the comprehension process. Some theorists assume that the text-base is relatively unelaborated from knowledge and memory fragments and that only inferences necessary for establishing coherence at the local or global levels become a part of it. Others hypothesise relatively rich text representations, with much background knowledge brought to bear in a constructive process during text interpretation. Those belonging to the first school of thought hold that the text representation and the mental model are distinct and separate, while those adhering to the latter believe that the two can indeed be equated.

According to Johnson-Laird (1980; 1983) the propositional representation is a prior stage in comprehension to the construction of the mental model, which occurs in the second and optional stage of discourse processing. The essential significance of an utterance is established by relating its propositional representation to a mental model which ensures a more profound understanding through use of general and world knowledge. Johnson-Laird suggests that the text representation and the mental model are distinct and separate. He clearly

distinguishes propositional representations from mental models on the basis of structure and of content.

"Unlike a propositional representation, a mental model does not have an arbitrarily chosen syntactic structure, but one that plays a direct representational role" (Johnson-Laird, 1980, p. 98). According to Johnson-Laird (1980) there is also a characteristic difference in content, models being highly specific. One cannot form a model of a triangle in general, but only of a specific one. Hence to reason on the basis of the model, one must treat it as a representative sample from a larger set to ensure that conclusions go beyond the specific instance being considered.

The semantic representation of text is referred to by Foss (1982) as a "discourse model" and is used to explain the priming effect of high-level text propositions remaining constant instead of decaying as was previously assumed. Fletcher (1983) presents evidence for the distinction between the surface structure representation, the propositional representation and the mental model.

Garnham (1981) however, while agreeing with Johnson-Laird that the use of a mental model is essential for text understanding, differs from his theory in maintaining that the text representation can in fact be equated with the mental model. Sanford and Garrod (1981) also see the mental representation of a text as a combination of textual information and its interpretation in terms of the reader's

knowledge base. The problem as they see it is to characterize the interplay between the two.

Graesser (1981) has demonstrated how texts can become elaborated inferentially during comprehension. van Dijk and Kintsch (1983) propose that such elaborations, other than the ones that are textually necessary, are not a part of the text representation proper but of a model of the situation denoted by the text. Thus in the van Dijk and Kintsch (1983) formulation, the propositional representation is distinct from the model and "is a necessary station on the way toward the situation model" (p. 343). Kintsch (1988) distinguishes between the levels of the text base and the level of the situation model. While the text base, which is the semantic representation of the discourse, is used to construct or retrieve the model, it is represented independently from the situation model (van Dijk, 1987).

Comprehension, in the van Dijk and Kintsch (1983) formulation involves, not merely grasping the meaning of the sentences, but also understanding what the text is denoting or referring to. If readers are unable to imagine a situation in which the events, objects, or individuals have the properties or relations indicated by the text, they will have difficulty understanding the text itself. The notion of the situation model then, introduces into cognitive psychology the distinction, well-known in philosophy, between intensional

(meaning) semantics and extensional (referential) semantics (van Dijk & Kintsch, 1983).

Thus, while cognitive psychologists differ on the details of the mental model theory, there is agreement about the notion that in addition to a discourse representation, a mental model of the text situation is also needed and that it plays a crucial role in discourse processing. As Johnson-Laird (1980) maintains, today "few cognitive psychologists are likely to doubt the power of mental models. What is more problematic is the manner in which they are mentally represented and the use to which they are put in cognition" (p. 73).

Theories of Knowledge Representations in Artificial Intelligence

The increasing interest in the representation and organization of knowledge can be directly traced to the recent developments in Artificial Intelligence (AI). Researchers in AI have investigated the range and type of knowledge needed to understand a discourse, and how such knowledge can be best organized and optimally configured. The concept of semantic networks (Quillian, 1968) was introduced early into computer research for storing large quantities of knowledge. Such networks were hierarchies of concepts organized according to shared semantic components. Despite their popularity in AI, they failed to stand the test as models for knowledge

structures, lacking the openness and flexibility that was needed to characterise knowledge in use.

The idea that knowledge may be organized in terms of settings in which it is used led to the emergence of a new and more structured set of formulations based on schema theory (Rumelhart 1977; 1980). Frames (Charniak, 1977; Minsky, 1975), scripts (Schank & Abelson, 1977), and schemata (Bobrow & Norman, 1975; Rumelhart & Ortony, 1977) were born.

Frames are hierarchical data structures containing normal or typical knowledge and expectations of events, actions, people, etc. One of the attractive aspects of frames is that much of the computation required is done and stored in the frame itself and is thus available for use. The basic idea in the frame hypothesis is that some pieces of text can be better understood if they can be related to a situational stereotype.

Scripts are variants of frames and are mental representations of causally-connected events, objects and participants in stereotypical activities. "Scripts organize all the information we have in memory about how a commonplace occurrence (such as going to a restaurant) usually takes place" (Schank, 1982, p. 101). The events in a script are detailed sequentially and can be used to predict the order of occurrence of events as well as entities in the discourse.

Both frames and scripts rest on the basic notion that generalised clusters of information about stereotypical situations provide a coherent framework for the semantic units

of text. Their claim for usefulness in discourse processing is in the facilitation of inferences and information retrieval on the one hand, and the creation of expectations that focus and guide attention on the other.

It has been found however, that rigid notions such as scripts and frames as knowledge representations, have proved to be insufficient and unsatisfactory in explaining the dynamic and strategic processes of text comprehension (van Dijk, 1987; Kintsch, 1988). When powerful enough, such notions have proved too inflexible, and when general enough they have failed in their constraining function. In recognizing this dilemma, Schank (1980) has made efforts to change expectation-driven data-structures from passive to active. Known as Memory Organization Packets or MOPs, such structures use reconstructive memory to generalise from experience and enhance understanding. In this way a MOP has at once a memory function as well as a processing function.

In AI it is Schank's (1982) notion of scripts and reminding that, despite having developed independently and from a differing perspective, bears closest resemblance to the concept of the situation model (van Dijk, 1987). However, while the original theory of scripts (Schank & Abelson, 1977) contained only general semantic knowledge, the situation model is constructed from knowledge and experiential clusters, whether they be specific episodic or generalised semantic ones.

Theories of knowledge representation in cognitive psychology as well as in AI are all motivated by the same insight: To understand discourse we need a mental representation of what it is about or referring to. Typically, theorists have assumed "smart" knowledge structures to support understanding processes especially in inferencing. Such fixed structures have often proven inflexible in adapting to changing contextual needs (Kintsch, 1989). Instead, a minimally-organized knowledge system is assumed, in which structure is not so much prestored as generated in the context of the task for which it is called up (Kintsch, 1988). It is within this framework that the role of the situation model in discourse processing can be best interpreted.

The situation model as a knowledge structure goes beyond the other representations postulated in psychology or AI in its strategic, on-line construction and use. In the sense that each piece of discourse is unique in some respect, a unique, ad hoc model must be constructed for each piece of text. While most discourse presupposes general knowledge, it also brings in new information that requires more than mere instantiation of a frame or script (Kintsch & van Dijk, 1983). General knowledge <u>does</u> contribute to local and global coherence of the text representation. However, discourse comprehension in the Kintsch & van Dijk model is much more complex. Episodic knowledge combines with instantiated frames or scripts in the construction of the relevant model. Knowledge fragments are

combined in a strategic manner to meet text demands. These fragments could include knowledge of the communicative context, knowledge of social situations, beliefs, opinions, attitudes and emotions of the language user as well as domain and structural knowledge of text features.

How much and what type of knowledge needs to be used are strategic decisions that are to be made on-line, based on the text, context as well as the goals and characteristics of the reader. Based on these decisions, the situational representation called forth may vary greatly in content, form or function; ranging from the very simple and containing only minimal information of a global type, to a very rich and complex representation incorporating much detail about particular events and entities. The on-line nature of comprehension would suggest that the model is built gradually, with new information being added at relevant points.

The discourse processing model of Kintsch and van Dijk (1983) outlines the combinations of knowledge fragments in a strategic manner so that new and unique textual information can be best understood. Thus while the situation model goes beyond other knowledge representations in its construction and content, it is in the strategic use of the model that it assumes its greatest significance in discourse processing.

The Role of Prior Knowledge in Discourse Processing

In recent years, with the increasing interest in how knowledge is represented in memory, the use of knowledge in

text understanding has assumed importance. It is now commonly accepted by researchers, theoreticians and practitioners that the knowledge and experience an individual brings to reading are critical factors in comprehension (Langer, 1984). It is prior knowledge that guides text understanding (Carpenter & Just, 1984). When the reader has no clue about the text topic, understanding and recall is impaired, even if all the words in the passage can be read (Bransford & Johnson, 1973). Conversely, people understand and remember new information about a topic they know well (Spilich, Vesonder, Chiesi & Voss, 1979). Freebody and Anderson (1983) showed that prior knowledge compared to other reading-related factors must be ranked as a potent determiner of performance.

Interest in the use of prior knowledge during comprehension is not new. Huey (1908) believed that comprehension was the result of recollected "meaning feelings" evoked by the surface structure of the text. Ernest Horn (1937) recognized the crucial role of the reader's knowledge and experiential base. "The author does not really convey ideas to the reader. He merely stimulates him to construct them out of his own experience" (p. 154). Gray (1956) recognized that mature readers had the capacity to use knowledge in construing meaning. Bruner (1960) held that the key to knowledge was the integration of old and new information.

It is Bartlett's (1932) work however that is credited with being the chief influence on research in the past two decades explicating the role of prior knowledge in the comprehension of and memory for text. In identifying what he referred to as schemata, Bartlett hypothesised that changes and elaborations in recall of text were a direct result of the reconstructive use of these knowledge structures by readers.

Bartlett discounted the notion that memory is merely a matter of information retrieval from a vast storehouse of past events and maintained that specific memories are actually reconstructed at the time of recollection. Rumelhart (1977; 1980) extended the concept of schemata and hypothesised how these knowledge structures could enhance comprehension.

A schema-theoretic view of reading (Adams & Collins, 1979) is based on the notion that comprehension is the result of top-down and bottom-up processing occurring at all levels (Rumelhart, 1977), working to pull the various fragments of knowledge and information from reader and text into a coherent whole. Important questions in schema theory centre around how readers seek to impose structure on the passage as a whole, how new information from text is assimilated into the old structure, and how the old structure is modified to accommodate the new information.

> The goal of schema theory is to specify the interface between reader and text--to specify how the reader's knowledge interacts with and shapes

> the information on the page, and to specify how that knowledge must be organized to support the interaction. (Adams & Collins, 1979, p. 3).

It was the experimental work of psycholinguists such as Bransford, Barclay and Franks (1972) that demonstrated that representations of discourse were built up by "constructive processes" that served to update information across sentences. The interpretive approach of the structuralists (e.g. Katz & Postal, 1964) was replaced by a new constructivist position that rested on the findings that semantic descriptions of situations contained much more information than that represented in the linguistic inputs. This occurred as a result of synthesis between linguistic input and prior knowledge.

The constructive approach argues that it is people rather than texts that carry meaning. The text sentences merely act as cues that guide the reader to activate and utilise prior knowledge for better text understanding. The constructive approach does not negate or deny the existence of a semantic representation of text in memory; it merely denies that this alone is sufficient to characterize the information available to the reader during text processing.

Spiro (1980) extended Bartlett's (1932) concept of comprehension as "an effort after meaning." "Constructed meaning is the interactive product of text and context of various kinds, including linguistic, prior knowledge,

situational, attitudinal, and task contexts among others" (p. 246).

That text understanding is as much a product of the reader's knowledge structures as it is of the text itself, is no longer disputed (Bower & Cirilo, 1985). Text processing can only be interpreted satisfactorily if one proceeds from a close interaction between the information communicated in the text and the world knowledge of the reader (Rickheit & Strohner, 1985). There is less information and consensus however as to exactly how this knowledge is used in the comprehension process.

Knowledge use in text processing

One answer to how readers use prior knowledge to better understand a text was provided by Collins, Brown and Larkin (1980) in their Progressive Refinement Theory of text understanding. In a paper on inference processes, they explain that when people comprehend text they create in their minds a complex scenario in which the events described in text might plausibly occur. Their theory seeks to represent the process readers engage in during text comprehension. Understanding, in their perspective, takes place through the construction of a tentative model of the text situation by the reader based on partial information available in the initial stages of text processing. As more and more information becomes available to the reader, the model is revised or refined and becomes more specific through the process of constraint satisfaction.

Bruce and Rubin (1981) liken this process to that of theory building from a limited set of data. The reader uses background knowledge and textual cues to bring forth tentative theories which proliferate and become increasingly complex as the reader proceeds through the text; comprehension is viewed as a hypotheses-forming and hypotheses-evaluating process, seeking to account for all data. In this way, reading becomes a problem-solving act.

In exploring the role of the situation model, the use of prior knowledge in text interpretation can be elucidated. How does the situation model promote the effective and efficient use of relevant knowledge during the reading act?

van Dijk and Kintsch (1983) hold that a general procedure for such strategic use is on the basis of an analogical reasoning and transformation process as outlined by Carbonell (1982). Carbonell's theory rests on the premise that the bulk of problem-solving occurs in spaces that are either familiar or vary only slightly from familiar situations. When a person is remirded of a past situation, upon encountering a new one that bears strong similarity to it (Schank, 1979), the experience serves to retrieve behaviours that were appropriate in the past situation but may need to be adapted to meet current demands. Commonalities in the past and present situations serve as the basis for generalization. Reasoning by analogy then can provide procedures for transforming existing but ill-fitting models into ones that are adequate for

particular text demands. The only requirement is that the new problem must be structurally similar (if not identical) to the previously encountered situation. It is at this stage that the environment in which the problem solver is operating assumes its "reactive" nature, in informing him of the degree of success or failure attained, for generalisation to apply. The process of transf ~ming the existing knowledge structure then takes place, based .n means-ends analyses within a problem-solving framework.

In general terms the situation model is used strategically in the understanding process. van Dijk (1987) outlines the specific strategic uses of the situation model during text processing. Knowledge of the communicative context of similar discourse situations contained in the situation model is used in order to produce a fuller understanding of the text situation. The goals and interests of the reader can also be utilised in selecting, understanding, and retrieving the necessary information from the text. The situation model, often evoked from textual cues such as titles, themes, or initiating statements, helps in building up the macro-structure of the text. Coherence between text sentences, as well as referential identity of participants in the text is developed through matching information from the model with textual information. The knowledge sources in the model are also used to monitor the categories of time, location and circumstance in the discourse.

Evaluation of the text against the activated knowledge base is another important strategic use. The text may be evaluated on the basis of the facts and information (truth values) as well as on other aspects such as beliefs, opinions, attitudes and values of the language user. Personal evaluation, positive or negative, of the discourse, for example, as being interesting, boring, stupid, exciting, could also be part of model use.

Updating of the model itself takes place as a result of the evaluative process in the text-model interaction. New information is added to the model at relevant points rather than arbitrarily. This is another example of the on-line strategic use of the situation model in text processing.

This study can shed light on the general and specific strategies of knowledge use during text processing. The way in which this strategic use can enhance a reader's text understanding is a significant aspect of this study.

Methodological Review

Verbal Reports as Data

The intent of this section is to focus on verbal reporting as a viable method for deriving information and insight into the cognitive processing of subjects during on-line text comprehension. Although the verbal reporting procedure is commonly used and accepted as a research tool in comprehension studies today, its acceptance in the field of reading research is a fairly recent occurrence. In fact, a methodological review of process research in reading (Chang, 1983) failed to mention the use of verbal reports as one method. Despite this fact, the use of verbal reports in psychological investigation and reading research is not new. In reading research, the use of verbal reports as data can be traced as far back as Huey's (1908) studies into the interpretive reading of college students. Since then, researchers and theorists (Marbe, 1901; McAllister, 1930; Piekarz, 1956) have used concurrent and retrospective verbal reporting to gain access to the cognitive processing of readers.

Verbal reporting fell into disuse during the period of behaviourism but was revived in the 1970's in the area of problem-solving within an information-processing framework (Ericsson & Simon, 1985). The model for protocol analysis was developed by Simon and Newell (1972) at Carnegie-Mellon for

studying how human beings solved problems, so that they could apply such insights to their work with computers. Controversy over the use of verbal reports soon arose focusing mainly on their unreliability (Nisbett & Wilson, 1977) on the basis that subjects may tell more than they can know. With the publication of a paper outlining a model for the verbal reporting procedure (Ericsson & Simon, 1980), the now-familiar debate on the use of verbal reports as data was initiated.

Criticism of verbal reports as data has been based mainly on their lack of validity, reliability, objectivity, and veridicality as well as their incompleteness (Hayes & Flower, 1983). The ability of subjects to describe the processes being performed and the degree of interference of the reporting task on the comprehension task has also been questioned by Ericsson and Simon (1980). Despite this, they conclude that verbal reports that are "elicited with care and interpreted with full understanding of the circumstances under which they were obtained" (p. 247) can produce worthy findings.

TOLs in comprehension research

In verbal reporting, the "Think-out-loud" procedure has been found to be a valuable source of information regarding the thinking and problem-solving process involved in reading. By breaking into the cognitive process directly, TOLs have revealed on-line strategies (Olson, Duffy & Mack, 1984; Bereiter & Bird, 1984). TOL protocols are a rich source of

hypotheses and are therefore appropriate for discovery research (Black, Galambos & Reiser, 1984).

In the last decade, there has been an increasing use of verbal reports by researchers interested in the cognitive processes of readers in text understanding. Different aspects of the comprehension process have been investigated by asking subjects to think aloud while performing a reading task. The audio-taped TOLs are then transcribed and analyzed to determine underlying cognitive processes. One of the important areas of comprehension that has been studied by means of Think-Out-Louds has been the use of strategies in text processing.

Olshavsky (1975), viewing reading as a problem-solving activity, used subjects' verbalisations to identify strategies used during story comprehension. Kavale and Shreiner (1979) investigated the reasoning process used by subjects in answering comprehension questions on standardised tests. A study at the University of Stockholm (Waern, 1979) used TOLs to describe the changing contents of the short-term memory store during on-line text processing. Verbalisations of subjects were used as data to study recall and thought processes of high school students under two different contextual conditions (Christopherson, Schultz & Waern, 1981). Lytle (1982) investigated the strategies used by 12th grade readers while processing three different text passages. She

developed a novel system of categorization of strategies for analyzing and coding the data.

In the past few years the use of TOLs in reading comprehension research has proliferated. The strategic nature of the understanding process has been studied from different perspectives using verbalisations as data sources. Garner (1982) as well as Garner and Anderson (1982) investigated strategic text processing through concurrent and retrospective reporting of subjects. How children read to remember was the subject of a study by Hare and Smith (1982) with good and poor sixth graders. Differences in memorizing and monitoring strategies were noted. Alverman (1984) investigated the strategic preferences of second-graders while reading stories from basal readers. Scardamalia and Bereiter (1984) used TOLs to provide information on how young readers deal with difficulties in comprehension, while Bereiter and Bird (1985) analysed verbal protocols of adults to identify teachable strategies. Afflerbach (1985) looked into the strategic processes involved in main-idea construction in expert readers. Myers (1989) investigated differences in strategy use between problem and non-problem readers. Caron (1989) has studied summarization strategies of adult readers.

While these and other studies have shown that the use of the TOL procedure is a valid methodology for strategy-based research, concerns and cautions expressed by Afflerbach and Johnston (1984), Ericsson and Simon (1985), and Johnson (1985)

were kept in mind for the collection, analysis, coding and interpretation of the verbal data in the present study.

In the present study, while practice and demonstration sessions for subjects for whom the verbal reporting would be a novel task were considered critical, the danger of biasing the subjects through such means was also recognized. Keeping such demonstrations and instructions general and neutral without suggesting specific strategies or procedures reduced the risk of contaminating the verbal data. Concurrent rather than retrospective reporting, restricted to the contents of subjects' thinking rather than the process behind it, increased the validity of reporting and reduced the interference between the twin tasks of processing and reporting. The use of probes was also eliminated to increase validity.

The selection of subjects was also a critical factor in this research. The decision to use subjects at the seventh grade level who were good at reading and verbalising was based on the fact that younger or less verbal subjects may produce less complete reports (Afflerbach & Johnston, 1984). Teacher recommendation was used to select subjects who might feel most comfortable with the verbal reporting task. The use of good readers could prove beneficial for revealing models of proficient or strategic reading processes. The experimental task itself was carefully selected in order to be "do-able," since too difficult a task may cause "thrashing," involving a

near-complete breakdown of the comprehension system (Britton, Glynn & Smith, 1985), while too easy a task may reduce the conscious verbalisation of processes that have become automatized.

Thus in the present study, while avoiding the pitfalls and dangers, the potential of the TOL process was exploited to provide a reliable record of subjects' thinking during text comprehension. As Lytle (1982) states "Generating a protocol is actually a composing task" (p. 96). As such, in a study based on the constructive view of text processing, the use of the TOL procedure is to be deemed entirely appropriate.

Chapter Three

The Study

This chapter describes the method used to investigate the role of the situation model in the on-line comprehension processes of seventh grade readers. The chapter is divided into three parts. The first section outlines the pilot study and describes the selection of the research setting, subjects, texts and procedures. The second section delineates the procedures for data-collection as well as the transcription of the think-out-loud protocols. The method used for analyzing the data and the development of the coding /categorizing system from the data-analysis are presented in the final section.

The Chronology of the Study

The pilot study

A pilot study was conducted in Nanaimo, a few weeks prior to the onset of the actual research, with four seventh grade readers from a school not involved in the main study. The subjects, ranging from poor to good readers according to their teachers, were asked to read expository and narrative text passages of varying length and difficulty, and to verbalise their thoughts as they read. Each subject was given demonstration of and practice in the TOL procedure. These audio-taped protocols were later transcribed and provided

insights into the feasibility of the different aspects of the research design and procedures.

The pilot study revealed that poorer readers often did not show evidence of adequate verbalising ability, that they did not employ strategic behaviours during the comprehension process, and they did not express sufficient metacognitive awareness regarding their understanding or lack of it. Also, poor readers often experienced difficulties with decoding and other surface level reading processes that could interfere with the reporting task. On the basis of these findings a decision was made to use only good readers as subjects for the actual study.

The results of the pilot study showed that oral reading of the text rather than silent reading by subjects had several benefits for the research. Reading the text aloud helped to reduce self-consciousness in subjects about the TOL process, allowed verbalisation to flow more smoothly and naturally, and reduced the need for probes. Familiarity with the researcher coupled with a feeling of mutual trust helped to put subjects at ease. The warm-up sessions prior to the actual TOLs led to an increase in the quantity and quality of verbalisation.

Since there was a tendency for subjects to pattern their verbalisations on the demonstration and practise sessions as well as to provide answers to cues and probes, it was felt that in the actual study it was important to keep the demonstration and practice general enough and to reduce or

eliminate probes. This would consequently reduce the degree of bias in the study. The pilot study findings also revealed that a passage length of between 150 to 175 words was most effective for sustaining interest in the content as well as in the verbalisation process. These insights garnered from the pilot study were used to guide the selection of subjects, texts, and procedures in the actual study.

The main study

The actual study took place in Nanaimo in the fall semester of the 1989-1990 academic year with follow-up sessions extending into the spring term. Permission for conducting the research was requested and received from school authorities early in September, 1989. Teachers, students, and parents were contacted and approval for the study was secured by early October of the same year. There were a total of six sessions with subjects; with four of these sessions being held between late October and early December 1989. The final group and individual follow-up sessions took place in May/June 1990.

The sessions were about an hour in length and took place during school time when Language Arts classes were in session. During the first two sessions the subjects were familiarized with the Think-Out-Loud procedure. Demonstration and explanation of the verbalisation process was provided by the researcher. During the practise sessions the subjects were asked to verbalise their thoughts as they read the passage aloud sentence by sentence. Initially some help was given by

the researcher in the form of prompts or cues. However, these were gradually reduced and completely eliminated for the actual study.

A brief outline of the sessions is as follows:

1st session - Introduction, Orientation, Explanation

2nd session - Demonstration, Practice

3rd session - Practice, First Expository Passage

4th session - Practice, Second Expository Passage

5th session - Group Follow-up

6th session - Individual Feed-back.

All ten subjects who were initially selected, completed the study. One of the ten subjects was not present at the final follow-up session as she had moved to another school district.

School Setting

The study was conducted in two large elementary schools in Nanaimo, on central Vancouver Island. Information regarding the socio-economic nature of the school population was obtained from the administrators of the two schools. One school, in the north end of the city, comprised some 400 students between Kindergarten and grade seven. The students in this school came from predominantly middle-income families. In the majority of cases, only one parent, usually the father, worked outside the home. There was a low degree of mobility among the families in the area and all of the subjects in the study had been at the same school for over five years.

The other school, in the south, had a population of just over 300 students, mostly from low-to-middle income families. As a rule, both parents worked. A considerable number were on welfare. The school had a very high transiency rate, and none of the subjects had been in this school continuously since Kindergarten. It was felt that selecting subjects from schools differing so widely in geographical location, size of student population, transiency rate, and socio-economic backgrounds could provide a more accurate and complete picture of a cross-section of the school population in the area.

The researcher met with the principals of both schools after having secured permission from the Superintendent of the School District for conducting the research. Both principals readily agreed to the study after consulting with the teachers to be involved. The teachers and principals continued to show great cooperation and interest in the study both during and after completion. A meeting was also held with the staff members from one of the schools, which had a reading focus as one of its objectives for the year. It was felt that the findings from the study could prove useful to staff and students in the further understanding of the meaning-making process involved in reading.

The teachers of the students actually involved with the study felt it would be a unique opportunity for their students to think and talk about their own comprehension process

especially at a stage just prior to entering the less-structured environment of a secondary school.

Selection of Subjects

Ten Grade seven students, five from each school were selected as subjects. There was an equal number of boys and girls in the sample.

The subjects were all average-to-good readers as determined by their scores in Vocabulary and Comprehension on standardized reading tests. All students whose scores placed them at or over the 50th percentile in the Gates-McGinitie Reading Test, Level E, Form 1 (McGinitie, 1980) administered in early October of 1989, and on the Canadian Test of Basic Skills, Multilevel Edition (King, 1981) administered in May, 1989, were considered. Of the students who fell into this category, ten subjects were selected on the basis of teacher recommendation as being suitable subjects for the study in that they would be comfortable with the verbalisation process as well as proficient at the reporting task. These students were interviewed and the purpose and procedure of the study was outlined. All ten students readily agreed to participate.

The selected students, rather than perceiving themselves merely as "objects" of study, saw their involvement as an opportunity to learn more about their reading behaviours which could benefit them in their future learning. This self-perception was expressed verbally by many of the subjects in response to the question "How do you feel about being a part

of this research study?" asked by the researcher at the end of the first session. Letters were sent home seeking parental permission after initial contact had been made over the telephone.

The decision to use average-to-good readers as subjects was influenced by the findings from the pilot study, as well as by the fact that since the study was an investigation into comprehension processes, assuming automaticity of decoding and other surface-level processes could permit a focus on higher level processing.

Text Selection

The selection of text-type was a critical decision in the study. Expository text passages were selected because, although the ability to understand expository text is critical for learning at the upper elementary level (Armbuster, Anderson, & Ostertag, 1987), research on processing of such passages through TOLs was limited. The influence of background knowledge on the understanding of expository text had received relatively little attention (Voss & Bisanz, 1985).

Two expository passages of 154 to 165 words each were selected for the study. Both passages were from the Barnell-Loft Multiple Skills Series Level G (cf. Appendix A). Criteria for the length of passage as well as for the level of difficulty were partly determined by the results of pilot-testing. The passage length seemed most effective for

sustaining interest in the content as well as the verbalisation process.

Readability levels were determined for both passages in terms of the difficulty level of the materials as well as the level of understanding of subjects. To ensure that the task was "do-able" the text selections were given as Cloze passages (Taylor, 1953) to ten Grade Seven students with comparable reading test scores from a school not involved in the study. Every fifth word was deleted. The first and last sentences were left intact and only exact replacements for the words deleted were scored as correct.

The results, averaged for the group and worked out as percentages, were 59% for the first passage "Strange Wills," and 54% for the second, "A Different Kind of Wedding" passage, indicating that the passages were between instructional and independent levels of comprehension for seventh grade students (Bormuth, 1966, 1967, 1968). According to Fry's Readability Graph (1967) also, both passages were found to be at the seventh grade level of readability. Both attempts at establishing readability showed that of the two passages the "Strange Wills" passage was less challenging to seventh grade readers.

Text Structure of Passages

Some attempt was made to examine the text structure of the passages selected for the study. In order to examine how information from a written text is being processed, the

researcher needs to know how the written information is actually presented in the text (Meyer, 1985).

Another reason for specifying the structure of text in the passages is to generalize the findings from research with a particular passage to other passages with similar text-structures. Both passages, although containing some narrative elements, could be classified as expository according to Meyer's (1985) classification. Both passages fall into the descriptive category. Their purpose was informative and their organization hierarchical. "There is a consensus that an expository passage often involves a hierarchical organization consisting of a top-level statement in relation to a number of sub-topics" (Voss & Bisanz, 1985, p. 190). The "Strange Wills" text starts with the top-level structure and uses the examples or instances that follow to corroborate the initial summary statement.

Specifically, the opening statement of this passage asserts that "Some people leave wills containing unusual or comical requests" and then proceeds to cite specific examples of this general statement. According to Black (1985) the support coherence relations found in such expository text link general propositions that make assertions with other propositions that support the truthfulness of those assertions. In this passage, the support is provided by citing examples of different kinds of strange wills and bequests as evidence. The statements proceed from abstract to concrete,

from general to specific. The superordinate is less precise and more inclusive, while the subordinates are more precise and less inclusive.

The second passage, "A Different Kind of Wedding," again follows the same pattern with an initial summary statement, "A wedding in the Philippines has many unique features." It then proceeds to enumerate and elaborate on these features and to provide support for the initial statement by describing the details that lend the uniqueness to a Philippine wedding. The wedding text, then, can be also classified as a descriptive cognitive unit, being a cluster of stative propositions linked together by property coherence relations. The statements in the wedding passage are also linked chronologically in that they follow a time order or sequence, beginning from the festivities the day before until the completion of the wedding ceremony.

Data Collection Procedures

The researcher met with each subject individually in a small private room that was assigned for the study at each of the two schools. The subject sat beside the researcher during the TOL sessions. Each passage was printed on a separate sheet of paper with the sentences separated by space ·s in Appendix A. A blank sheet of paper was used to cover the text passage and to reveal the text sentence by sentence to the subject. This constrained the subjects from reading ahead, and also ensured that the TOLs related to text that was currently being

processed or had been already read by the subject. Concurrent verbalisations can help to identify clearly and easily the inputs and the resulting outputs, since verbalisations are produced in the same sequential order as the information that was heeded (Ericsson & Simon, 1984). Look-backs were permitted since the orientation in expository text is retrospective in that the reader must seek to relate each new element being processed to earlier elements in the text (Olson, Duffy, & Mack, 1984).

Instructions

Written instructions were provided to each subject and were read aloud by the researcher while the subject read them silently. Subjects were instructed to verbalise their thoughts as they occurred, without seeking to analyse, interpret, or evaluate them, in an effort to increase the veridicality of verbal reporting. Since the TOL procedure was initially novel to the subjects, the instructions for the practise session were much more detailed and provided more guidance regarding the verbalisation procedure than the instructions given for the actual study.

Instructions during practice sessions

SAY WHATEVER'S ON YOUR MIND: DON'T HOLD BACK HUNCHES, GUESSES, WILD IDEAS, IMAGES, PICTURES. SPEAK AS CONTINUOUSLY AS POSSIBLE. AFTER EACH SENTENCE SAY SOMETHING, EVEN IF IT IS ONLY "I'M DRAWING A BLANK" OR "I CAN'T THINK OF ANYTHING TO SAY."

SPEAK CLEARLY AND LOUD ENOUGH. WATCH FOR YOUR VOICE DROPPING OR GETTING SOFTER AS YOU GET INVOLVED.

SAY WHAT YOU ARE THINKING AT THAT POINT NOT WHAT YOU THOUGHT OF BEFORE.

Instructions prior to data collection for actual study

YOU WILL BE GIVEN A PASSAGE TO READ. READ EACH SENTENCE OF THE PASSAGE ALOUD AND THEN TELL WHAT YOU ARE THINKING ABOUT OR WHAT COMES TO YOUR MIND. IN OTHER WORDS "THINK OUT LOUD" WHILE YOU ARE READING.

YOU WILL BE TAPE-RECORDED DURING THIS SESSION.

Two tape recorders were used to safeguard against data loss through equipment failure or malfunction. The use of probes or prompts was not found to be necessary during the actual sessions, although occasional probes such as "What are you thinking of now" had been used during the practise sessions when verbalisation was not forthcoming.

Procedure

The "Strange Wills" passage was the first text used for the TOL recording since it had been found to be less challenging for Grade 7 students during the Cloze readability testing. The passage "A Different Kind of Wedding" (hereinafter referred to as the "Different Wedding" passage) was used in the second TOL recording session. There was no communication among subjects during the actual recording sessions since each subject returned to class before the next subject was called.

Transcription and Analysis of the Data

The audiotaped verbal protocols were first transcribed by hand and then onto a word processor. The process of transcribing the verbal protocols presented a variety of problems and decisions. How and where to punctuate, how to indicate pauses and emphases, what to include or omit, were decisions that could invariably affect the analysis of the data.

The method of transcription used was an attempt to preserve the features of the spoken language which might have been lost in a simple transcription and without consideration of which the interpretation might be less than accurate. Pauses were coded by using a "." (dot) for each second of silence. Thus ... (3 dots) in a transcript would indicate three seconds of silence at that point in the TOL. All verbalizations including "um", "ah" and giggles were included in the transcription. Errors made by subjects in the oral reading of the text, self-corrections, as well as oral re-reading of the text were retained for authenticity. Although much of the prosody and intonation of the verbal protocols was lost in the transcription, some features such as stress and emphasis were retained through the use of underlining.

Categorization and Coding of the Data

The development of the categorization system and the coding of the data into the moves and strategies involved several stages.

First stage: Developing idea or thought units

One of the basic decisions in developing a coding system for analysing protocols is how to divide the data into units (Johnson, 1985). The constant comparative method (Glaser & Strauss, 1967; Goetz & Lecomte, 1984) was used to reduce the data to manageable chunks or units which could then be categorized and coded. The method allows every statement in the data to suggest a category. The next statement is then considered by the researcher to determine if it fits the same or a different category as the previous statement. This next statement is then categorized accordingly. As more and more statements are considered for inclusion in, or exclusion from a given category, the definition of that category becomes clearer. The researcher proceeds with the coding thus, considering one statement at a time in relation to those statements already coded, until the data are saturated. In that the method uses explicit coding and analytic procedures designed for discovery studies, it could aid in the creative generation of theory "that is consistent, integrated, plausible and close to the data" (Glaser & Strauss, 1967, p. 103). As such, it was ideally suited to the present research.

The aim was to develop a flexible coding system that would reflect the thinking processes of subjects rather than a rigid system based on clauses or sentences. That such an aim could be best realised through the use of this method is substantiated by its use for data analysis and reduction in

recent studies (Alverman, O'Brien & Dillon, 1990; Caron, 1989; Pritchard, 1990).

In this initial stage, the researcher, working under the guidance of her supervisor, read and reread the protocols examining the TOLs for patterns of responses with similar or recurring characteristics. This careful and systematic study of the transcripts resulted in an initial division of each protocol into thought or "idea" units.

The idea unit was a TOL response referring to a single concept, idea, or feature in the text. For example, in the "Different Wedding" passage, S#1 responds to the text segment that says that there is a counter at the pala-pala where cigarettes and rice cakes are sold, by remarking, "Well, that's weird. I thought the whole place was for dancing and stuff like that. Huh, when they are all sold, they probably use the money so they can afford to go somewhere or buy more food."

In this case, there is clear justification for dividing the TOL into two idea units since the first part of the statement refers to the sales counter in the pala-pala, and the second part to the sale of cigarettes and rice cakes. To give another example, the TOL response of Subject #4 (S#4) while reading the "Strange Wills" passage states: "Oh, rubles must be like money or something in Russia. The man is probably going to ask them to do something with it." This TOL also clearly contains responses to two separate ideas in the text,

one about the meaning of the word "rubles," and the other concerning the fortune left to the daughters. Consequently, this TOL segment was divided into two idea units.

Thus each statement was carefully scrutinized to determine if it contained more than one idea unit. Also every successive statement was carefully examined to determine if it belonged to the same or a different idea unit. In this manner, the preliminary "chunking" of data was organized and achieved.

Second stage: Categorization of moves

In this second stage a closer examination of the idea units revealed a number of on-line reading behaviours that were attempts by subjects to make sense of text. These behaviours, termed "MOVES" (Lytle, 1982; Myers, 1989; Myers & Lytle, 1986) were an indication in this study of the type of strategic on-line behaviours involved in using the situation model to comprehend the text. These moves were listed and described in an effort to make their definition clearer and more precise. For example, the idea unit in the TOL protocol of S#1 "Well, I guess he must have been pretty rich to leave a million dollars" was categorized as DRAWING A CONCLUSION move, while a statement by S#6 such as "This seems a lot different from what we do... different customs" was termed EVALUATING TEXT INFORMATION.

Two purposes guided this initial categorization process. First, since the study was a descriptive and exploratory one, an inductive system was used, where the categories flowed out

of the data rather than forcing the data (Fareed, 1977) into pre-determined categories. Secondly, in attempting to develop a system that would best describe what subjects were doing during text processing, a decision was made to overlook the quantitative dimension of moves to the extent that the frequency of occurrence would not be the basis for the inclusion of a move in the categorization scheme. This decision was guided by the fact that in ignoring unique or infrequently used strategies, a classification system may be less sensitive to individual differences in cognitive processing of text (Johnston & Afflerbach, 1985).

It was during this second stage of data analysis and reduction that a refinement in the unit of analysis occurred on the basis of moves. Attempts to discover or uncover the type of move in each idea unit revealed that such units, while referring to a single idea or concept, often contained more than one move on the part of the subject.

For example, the idea unit of S#3 "That is very queer. I can say that is really strange... I guess they worked for it.. for the rubles or whatever" contains two moves--in the first part of the idea unit the subjects seeks to EVALUATE THE TEXT INFORMATION on the basis of personal opinion, while the latter segment contains a PREDICTION/INFERENCE on the part of the subject. The unit of analysis was now determined on the basis of moves as well as ideas.

The researcher proceeded to examine each previously identified idea unit closely to determine if it contained one or more than one move. If there was more than one move being used by the subject in dealing with the same text idea, the thought unit was further divided between different moves in use.

Thus, all idea units were re-examined and re-analysed at this stage in light of moves contained in each. The result was a further division of each idea unit into "elements." Each element contained both a single idea as well as a single move.

Each statement in the TOLs now became a different element on the basis of the following: (a) the same idea unit as the previous statement but using a different move, (b) a different idea unit from the previous statement with a similar move, or (c) a different idea unit from the preceding statement and with a different move. Some examples of each of these is provided below:

(a) Same idea, different move:

Text: People bring pigs, chickens, fruit and vegetables to the wedding party.

TOL: Down here they bring cakes; up there they bring pigs and chickens. I guess they are probably going to have a special roasting for the pigs and chickens and everything.

This TOL was divided into two elements as shown above because, despite both the statements referring to the same

idea from text, (the pigs and chickens brought to the wedding party) they involve two different moves: evaluating the text information in the first statement followed by a prediction in the second.

(b) Different ideas, different moves:

Text: All profits go to the couple.

TOL: Yeah, I was right about that. I think the next thing they are going to talk about the dancing and the rituals.

Here the first TOL statement shows the subject confirming his/her own prior interpretation about the profits of sale, and the second statement containing a prediction regarding the ceremonial rituals to follow.

(c) Different ideas, same move:

Text: At one end is a kitchen.

TOL: Oh, it must be pretty big because to have a kitchen in it. That's probably where they prepared the pigs, and the chickens, and the fruits and the vegetables . . . for the party.

Here both statements are in the form of inferences /predictions, although they refer to different ideas in the text: the size of the kitchen in the former statement and the possible use of the kitchen in the latter.

It was in this category that the element (based on ideas and moves) as a unit of analysis differed from other systems using only moves as the basis for division into units (e.g. Lytle, 1982; Myers & Lytle, 1986). Using only moves for

dividing the protocols into units would result in two consecutive TOL statements containing the same type of move being considered part of the same unit. For example, a TOL segment such as "So it must be a pretty good fortune if he is like . . . rich. And he must have been married at some time, to have daughters" would have been classified as a single unit of analysis since both statements contain inferences on the part of the subject. In the present study however, using both ideas and moves as the basis for dividing protocols into units of analysis, the above segment was divided into two elements since the former statement refers to a different idea (fortune) from the latter (daughters) despite containing similar types of moves.

As more and more statements were analyzed and classified in subjects' protocols, the categories of elements and moves became more clearly defined.

An element could be a word, a group of words, one or more than one sentence. Elements represented the point of contact between textual ideas and prior knowledge. As such the frequency count of elements in a protocol could present a picture of the amount and degree of interaction during on-line processing of that passage. Thus while elements indicated the amount of strategic interaction between situation model being constructed and the growing text representation, moves were an indication of the type and nature of that interaction.

Third stage: Moves and strategies

This stage involved the first phase of a procedure to validate the psychological reality of elements and moves. To do so, the researcher enlisted the help of Dr. R.D. Armstrong, a Professor in the faculty of Education, to determine independently, the boundaries of elements in the protocols on the twin bases of ideas and moves. While most of the elements and the categories of moves were retained intact, some changes and refinements resulted from this initial attempt to infuse internal validity into the classification scheme. One of these changes was the division of the EVALUATING TEXT move into two moves; one called EVALUATING TEXT INFORMATION and the other EVALUATING TEXT FEATURES. In contrast, two of the initial categories had to be collapsed into one, due to difficulty in differentiating between a move such as MAKING HYPOTHESES/ PREDICTIONS and another such as INFERENCES/DRAWING CONCLUSIONS.

As a result of this collaboration, a list of eight moves was established. These were:

1. Defining/Explaining concept or term
2. Restating/Paraphrasing/Elaborating
3. Evaluation of Text Features
4. Evaluation of Text Information
5. Making Hypotheses/Predictions/Inferences/Drawing Conclusions
6. Expressing Doubts/Self-Questioning

7. Confirming Understanding/Interpretation

8. Re-examining/Revising Interpretation.

A major breakthrough during this stage was the establishment of Strategies under which moves were grouped. This was largely a matter of inferring the purpose or intent behind the moves. For example, in examining the three moves of EXPRESSING DOUBTS /SELF-QUESTIONING, CONFIRMING UNDERSTANDING/INTERPRETATION, and RE-EXAMINING/REVISING INTERPRETATION, the researcher found it possible to group them together on the basis of their underlying purpose, namely MONITORING UNDERSTANDING. As a result of this process, four different groupings of moves, called STRATEGIES were identified. Such strategies involved inferring the planning and intent behind the moves. Moves could be easily identified in the protocols, while strategies had to be inferred from the moves.

Four major strategies resulted from the final analysis on the eight moves. These are listed below:

I CLARIFYING

II EVALUATING

III REASONING

IV MONITORING UNDERSTANDING.

The substantive content of the strategies and moves in the category system is explained and elaborated in Chapter Four - Findings.

Final stage: Establishing inter-rater reliability

The last stage in the categorization system was to determine its inter-rater reliability. Three independent raters, all teachers with a master's degree in Education (Language Arts), coded the elements in the protocols into the previously identified types of moves. The purpose of the exercise was to provide a check as to whether these moves in the TOLs of subjects represented the same constructs to external coders as to the researcher who was intimately connected with the data analysis and reduction.

A decision was made to restrict the coding to moves, since strategies, being largely a matter of inferring the intent of the comprehender, were subject to differing interpretation by coders. Moves, on the other hand, being specific actions and behaviours that were overt in the verbalisations, could be more readily identified and coded.

All 20 protocols were coded by the raters, after demonstration, explanation and practice were provided by the researcher. Independent coding with some discussion produced an average reliability estimate of 93% for total moves in both passages as shown in Table 1. The percentages represent the degree of agreement between the coding of each independent rater and that of the researcher. As Table 1 indicates the degree of agreement was highest between the researcher and Coder 2, while it was lowest between the researcher and Coder 3.

Table 1

Inter-rater Reliability

	Passage 1	Passage 2	Mean
Coder 1	95.1%	93.6%	94.0%
Coder 2	94.5%	96.6%	95.0%
Coder 3	90.9%	91.1%	91.0%
Total	93.5%	93.7%	93.3%

On the strength of the high reliability estimate, it was decided to use the researcher's coding as the basis for determining the frequency of use for each move. The researcher, having had the benefit of listening to the subjects in person as well as on tape was in the nature of an "expert" on the verbal protocols and as such, lent greater credibility to the categorization.

The reliability and consistency of the coding system was also established separately for each move. Table 2 indicates the degree of agreement ranging from 87.8% to 95% for coding of types of moves across both passages. This exercise helped to establish the stability of the coding system and to determine which moves were most reliable in the sense that they could be easily recognized, identified, and confidently used by other independent coders.

Table 2 shows that C1 was the move with the lowest overall inter-rater reliability (87.8%), indicating that it was most problematic in terms of coding. The highest inter-rater agreement across passages was achieved for M7 (95%) showing that there was least difficulty in identifying it as such in the protocol elements. Table 2 also shows the degree of agreement between the coders and the researcher in coding moves in each passage. Within passages, the highest degree of agreement between coders and researcher is in coding Move E3 in Passage One (100%), and in coding move E4 in Passage Two (97%). The lowest degree of agreement is for move M8 in

Table 2

Inter-rater Consistency for Moves

Move	Passage 1	Passage 2	Mean
C1	93.3%	82.3%	87.8%
C2	91.9%	91.6%	91.7%
E3	100%	83.3%	91.6%
E4	92.4%	97.0%	94.7%
R5	95.4%	93.9%	94.6%
M6	90.4%	88.8%	89.7%
M7	96.2%	93.9%	95.0%
M8	83.3%	93.9%	88.6%

Passage One (83.3%) and for move C1 (82.3%) in Passage Two.

The frequency of each type of move became the basis for a qualitative analysis of Moves, Passages and Subjects which will be elaborated on in the next chapter.

Chapter Four

Findings

This chapter reports on the findings of the study. It draws on an in-depth analysis of the research data to elaborate on the two research questions. In the process, it defines and explains through examples the categorization system developed from the verbal protocols of ten grade seven readers responding to two expository passages. Operational definitions for each strategy and move, together with the exemplars provided, help to clarify the coding system and to set parameters within which these strategies and moves can be identified and understood. The data are then viewed through the different lenses of move, text, and subject in order to present a clearer and multi-dimensional view of the interactive nature of the comprehension process in action.

The Research Questions vis-a-vis the Findings

The two research questions addressed in the study were as follows:

1. What evidence can be found for the psychological reality of the situation model in the on-line comprehension processes of seventh grade readers as revealed by their Think-Out-Loud protocols?

2. How is the situation model constructed and used strategically during reading comprehension by average and above-average seventh grade readers?

The exploratory nature of the study is brought into play in the investigation of the first research question. The strategic theory of discourse processing as put forward by van Dijk and Kintsch (1983) holds that a reader, in an attempt to make meaning, seeks to build a text-base out of the meaning propositions in the text. To facilitate, clarify and enrich this process, he attempts to relate the situation represented in text to his own background knowledge and experience. This is done by constructing a mental model from memory to match the situation that is being referred to in text.

Does such a situation model exist? If it does, what evidence can be found in the TOL protocols of seventh grade readers? The Think-Out-Loud protocols of all ten subjects in the study provided ample evidence for the psychological reality of the situation model. The model is revealed at different times and in different ways by different subjects while processing different text passages. The first research question then can be answered by identifying when and how the model is evident in the verbalisations of subjects in this study.

While reading the "Strange Wills" text passage, the TOL protocols of most subjects reveal the existence of a model related to their prior knowledge of wills and bequests. In the "Different Wedding" text, the subjects are seen to bring forth a situation model of a wedding ceremony as they know it, on the basis of which they attempt to comprehend the situation

being referred to in the text. In both cases then, the model is not brought forth by the subjects as a pre-packaged script ready for use, but is developed and constructed from relevant fragments of knowledge in response to attended text fragments.

When Is Evidence of the Situation Model Found in the TOLs of Subjects During Text Processing?

In most cases the framework of the model is evoked or brought forth immediately on reading the title. The process of model construction in these cases is usually through a single hypothesis formed by the reader on the basis of clues received early on in the passage. Examples of this are given below for both text passages.

The situation model as a response to the title in the "Strange Wills" passage

S #2

Text: Strange Wills

TOL: In this... the story is probably about wills... like when somebody leaves something to other people when they die and these ones are probably strange....

S #5

Text: Strange Wills

TOL: Probably about... Um.. when you die you leave something to your family.. different from what you'd leave normally.

S #6

Text: Strange Wills

TOL: Well, that must be about.... a person who left a really strange will... like you have to do certain things.... where you have to spend a certain amount of money... or else you don't get...

S #8

Text: Strange Wills

TOL: Um...Um.... A picture that comes to my mind is a different kind of will... like not giving to your family but giving to your friends or something.

S #9

Text: Strange Wills

TOL: What they're telling you about probably is the will that you leave in case you die.... that gives your property and stuff that you own to family and friends. This will probably be about strange ones.

S #10

Text: Strange Wills

TOL: I get... this will, when people die, the wills they give.

The situation model as a response to title in the "Different Wedding" passage

S #2

Text: A Different Kind of Wedding

TOL: So this is... this story talks about a different kind of wedding from our picture of whatever we do.

S #6

Text: A Different Kind of Wedding

TOL: So this must be a different kind of wedding than the one we usually have...

S #7

Text: A Different Kind of Wedding

TOL: That means it's different from most of our weddings here. I guess it means that it's different customs, different places maybe...

The Situation Model From Multiple Hypotheses

In all the above TOL fragments it is clear that a single situation model of what the text is referring to is called up by the subject through prior knowledge or experience of the situation, almost immediately on reading the title. In other cases, however, the title merely serves to evoke tentative hypotheses in the mind of the reader which await on-going textual cues for confirmation. On the basis of these clues the reader selects the best single hypothesis and calls up the situation model corresponding to it. Some examples are given below:

The situation model from multiple hypotheses in the "Strange Wills" passage

S #1

Text: Strange Wills

TOL: Well, that might be like will power to do something... like if you are being possessed by a magnetic force and

you have the power to hold yourself back or it could be about somebody writing their will... bunch of wills, like make them inherit a big bird or something like that.. something strange.

Text: Some people leave wills containing unusual or comical requests.

TOL: Well yeah. The wills would happen sometimes because they leave things like a family house or leave things like a cupboard or something to certain people who like them...

S #3

Text: Strange Wills

TOL: Probably a will about a person who's going to die.. made up... or even some guy's name...

Text: Some people leave wills containing unusual or comical requests.

TOL: Yeah, I was right about it being some type of will.

S #4

Text: Strange Wills

TOL: What comes to my mind is, a will that.. like you write that you're leaving all this money to such and such. Um.. next thing that comes to my mind is like worrying that like after I die, will you do this or could you do this for me.... or something strange.. really strange like that.

Text: Some people leave wills containing unusual or comical requests.

TOL: I think this will be about strange wills before you die and some funny ones. Maybe one person made some funny ones that they want somebody to do.

The situation model from multiple hypotheses in the "Different Wedding" passage

S #4

Text: A Different Kind of Wedding

TOL: The picture that comes to my mind is of an ordinary kind of wedding. Maybe it will be about a wedding in a different land. Maybe it will have rituals like walking on coals or something.

Text: A wedding in the Philippines has many unique features.

TOL: Now I know that it's going to be about people in the Philippines having a wedding and it's going to be way different from our kind of wedding.

S #2

Text: A Different Kind of Wedding

TOL: So this is... this story talks about a different kind of wedding from our picture of whatever we do.

Text: A wedding in the Philippines has many unique features.

TOL: So this wedding, it is in the Philippines, and it has.. is different... like unique features, like they probably have things like... throwing flowers and all that..

S #5

Text: A Different Kind of Wedding

TOL: Probably something different from.... the picture I get in my mind is, two people going on a cruise, probably down in the Caribbean or something.

Text: A wedding in the Philippines has many unique features.

TOL: Well, as I said before, could be some place tropical, and the Philippines is nice, like it's sunny, by the equator and it's different. It probably has all those palm trees... like here we have fir trees and all that.

How is the Model Revealed?

An exploratory, descriptive study responds to questions but also often generates them. In this study, while evidence for the psychological reality of the situation model was being explored in the TOLs of seventh grade readers during text processing, a description of the situation model and its structure was obtained, which in itself provided further evidence for the reality of the model. The framework or skeleton of the situation model evoked from the title or initiating statements, is filled out by memory fragments brought forth strategically in response to text.

What Does the Model Look Like?

The analysis and examination of the TOLs of seventh grade readers reveals that the situation model is constructed mainly from the two elements of episodic and semantic memory.

Episodic Memory

Episodic memory is the kind of memory that is involved in remembering past events that were participated in directly or vicariously by the individual (Tulving, 1983). The basic unit of episodic memory is an individual act of remembering that begins with the witnessing or experiencing of an event or episode, and ends with subjective remembering.

The episodic memory system receives and stores information about temporarily dated episodes or events and the temporal-spatial relations among them (Tulving, 1972). Examples of the use of episodic memory can be found in the TOLs of subjects processing both passages.

Episodic memory use for construction of situation model in the "Strange Wills" passage

S #1

Text: A man in the U.S. left his cars to his chauffeur.

TOL: You know what? That's not very strange. Because people like... if their chauffeur was a... used to driving cars and stuff like that and guess if he was real nice and they decided to leave his cars to him. Just like when I was watching a TV show, like they show how they left his

cars to his chauffeur and his tea sets to his maid, and dusters and stuff like that.

S #4

Text: "He almost ruined them," the man wrote in his will, "and I want him to have the satisfaction of finishing the job."

TOL: (Laughter) He probably, the guy probably needed glasses because that's part of the reason why he was crashing into cars and all that. I saw a movie once, about a chauffeur who had the wrong kind of glasses and he was always crashing into everything.. going the wrong way...

S #6

Text: Strange Wills

TOL: Well, that must be about.... a person that left a really strange will... like you have to do certain things.... where you have to spend a certain amount of money... or else you don't get... like a box containing a really large amount of money. And it reminds me of a movie I saw about a man, he left a whole bunch of money to his friends but the grandson had to spend three million dollars of it, he could not give any of it away. He had to spend a certain amount of it before he could get it. So maybe this is about a rich man or a poor man and a strange will.

S #9

Text: Some people leave wills containing unusual or comical requests.

TOL: Which would be true. I know one of my relatives did. Um... He asked for something like... He had a pet snake, and he asked to give the snake five dollars and get him to eat it or something strange like that. I don't know how long ago that was... I think that was my great-uncle. He was a s-t-r-a-n-g-e man as far as I heard.

Examples of the use of episodic memory in the construction of the situation model can also be found in the TOLs of the Different Wedding passage.

Use of episodic memory in the construction of the situation model in the "Different Wedding" passage

S #3

Text: The rest is used for eating and dancing.

TOL: I guess it's like a hall. All my aunts had it with..Oh, it was a huge dance floor and there were tables on the side, and then there was a door on the side of it, where it was cut in half and that was the kitchen..it wasn't at the end.

Text: The wedding ceremony takes place in a church.

TOL: Every ceremony... like lots of people have weddings in churches.. but then, Melissa, like her mom just had a wedding in her house.

S #3

Text: Everyone has a good time and the bride and groom receive many presents.

TOL: That would be neat. Well like at all regular weddings, the bride and groom receive presents, and like maybe dishes and stuff, and sometimes jokes things... We sent... my mom's friend got married a while ago. And we gave her a chest full of Loonies... There was about a hundred Loonies in there... like our whole family chipped in...

S #6

Text: A different kind of wedding

TOL: So it must be a different kind of wedding than the one we usually have and it reminds me of when my mother and her second husband got married.... It was different.

S #6

Text: A wedding in the Philippines has many unique features.

TOL: Many unique features... Then it must be different customs, yeah, and well my sister's wedding I guess had, was different than other receptions.... We had it in a temple, so it was different from getting married in a church. And the reception wasn't a sit-down dinner so that was sort of different.

Text: The festivities begin when friends of the bride and groom meet at the bride's house the day before.

TOL: Um.... My sister's fiance, well, my sister's husband now, his parents came to dinner at our house before the wedding. And I guess the parents usually do meet before the wedding and things are prepared and all that.

Text: The wedding ceremony takes place in a church.

TOL: My sister's wedding was in the temple... and our reception was in the church hall though.

S #9

Text: They build a pala-pala a tent with a roof of palm leaves and bamboo supports.

TOL: this really reminds me... kind of makes me think ut "lean-to's" or forts that some people make, de in cubs or when I was on camp-outs.

hese protocol fragments, the subject is using

pri i the form of personal and unique memories to

build uation model.

Semant mory

While episodic memory is often utilised in the strategic construction of the situation model, the TOL protocols of subjects in this study reveal a more prominent and critical use of semantic memory. Semantic memory is the organized knowledge a person possesses about the world. It contains the memory necessary for the use of language. It deals with world knowledge that has no necessary connection to the individual's personal identity or past. Semantic memory refers to generalized, stereotypical knowledge that is usually socially

shared (Samuels & Kamil, 1984). The TOLs of subjects in this study contain numerous semantic memory fragments that are utilised in the process of model construction.

Use of semantic memory in the construction of the situation model in the "Strange Wills" passage

S #1

Text: For instance a rich Russian left his daughters a fortune of four million rubles.

TOL: Well, I guess he must have been rich to leave a million rubles.

S #3

Text: One of the funniest stories is not about a strange condition attached to a will, but about the reason for the inheritance.

TOL: I gotta hear this. Some people leave their cats things, or something really, really weird like that.

Text: A man in the U.S. left his cars to his chauffeur.

TOL: Wow... Chauffeurs drive cars, maybe for some business or something like that.

S #4

Text: One of the funniest stories is not about a strange condition attached to a will, but about the reason for the inheritance.

TOL: Probably going to be like they have in fairy tales.. like they have three daughters, how many things each kid gets.. something like that.

S #5

Text: A Frenchman who loved good food left an order in his will, that every day a new recipe should be pasted on his tombstone.

TOL: Well, that's funny, because people don't normally ask for that. Once they are buried they don't normally want you to... They just want to be left alone. They don't want recipes to be put on their tombstone.

S #4

Text: For instance a rich Russian once left his daughters a fortune of four million rubles.

TOL: What's rubles? I don't know what rubles means. So it must be a pretty good fortune, if he is like.. rich. And he must have been married at some time to have daughters.

Use of semantic memory for the construction of the situation model in the "Different Wedding" passage

S #1

Text: The festivities begin when friends of the bride and groom meet at the bride's house the day before.

TOL: Yeah, that's well sort of like ours. We have a bridal shower where the bride goes and she gets a lot of presents, and the groom goes with a bunch of his friends to the bar or something.

S #3

Text: The wedding ceremony takes place in a church.

TOL: Every ceremony... like lots of people have weddings in churches..

S #3

Text: The highlight of the festivities is a dance which the newlyweds perform.

TOL: I wonder what kind of a dance it is.. Is it fast or slow or? I guess for normal weddings there is... the first dance is a slow dance, like a waltz or whatever. And the bride and groom start it off and then everybody else can start dancing.

S #4

Text: There is a counter at the pala-pala where cigarettes and rice cakes are sold.

TOL: Down here they usually hand out little cookies and cakes and stuff like that...

S #5

Text: The festivities begin when friends of the bride and groom meet at the bride's house the night before.

TOL: Um... We don't. Here we don't meet at people's houses for the wedding. We just see them on the wedding evening. Help them to get ready for the wedding. Here we are not supposed to see them. There is a custom that the husband is not supposed to see the wife before they get married.

Text: People bring pigs, chickens, fruits and vegetables for the wedding party.

TOL: Well, we normally have caterers and... Their friends bring in pigs. We don't have pigs here, but like we have ham which sits on a big table.

S #8

Text: A wedding in the Philippines has many unique features.

TOL: Um, it'll be different from the way we do it., and well, we usually... they play music and the father walks the daughter down the aisle, and then they get married....

Text: The festivities begin when friends of the bride and groom meet at the bride's house the day before.

TOL: Well in our weddings we don't usually do that. We just have a bachelor party or a bachelorette party and this is when all the people meet to talk about it.

Text: People bring pigs, chickens, fruits and vegetables for the wedding part.

TOL: Um, that's different. Because we usually bring, like household gifts, like coffee machines and stuff.

S #8

Text: The rest is used for eating and dancing.

TOL: It seems quite different from, like our houses, we have a kitchen, living room, and downstairs and everything...

Text: Then the couple go to the pala-pala with the band leading the way.

TOL: Um, it's really different from ours, because we usually just get into cars and honk our way... honk the horns all the way home..

S #9

Text: A wedding in the Philippines has many unique features.

TOL: Which I guess would be quite true because different countries have different customs and they <u>are</u> different in other ways... which I've heard about. In different countries or some places they have weddings which have lots of people.. some places they don't even have weddings. What happens is like the wedding is pre-arranged for.

S #9

Text: Then the couple go to the pala-pala with the band leading the way.

TOL: Which is sort of what happens here. Except we don't have a band which leads the way. Normally it's just other cars, other guests, normally the best man and flower girls are in the front cars as far as I know.

The above TOL fragments then are evidence that semantic memories are brought forth strategically to construct the relevant situation model.

<u>Beliefs, Opinions, Attitudes and Values</u>

The situation model constructed by the subjects in the study as a response to the situation referred to in text, also

contained statements of beliefs, attitudes, opinions and values, as revealed by the Think-Out-Loud protocols.

Such statements are sometimes seen to be personal and idiosyncratic, while at other times clearly the result of group or societal norms. As such, they can flow from episodic or semantic knowledge. The subjects seem to be consulting their store of such beliefs, opinions, and attitudes in order to make the events, actions, objects, and states of affairs in text more comprehensible to themselves. Some examples of these are provided below.

Use of beliefs, opinions, attitudes, and values for the construction of the situation model in the "Strange Wills" passage

S #1

Text: If the requests are legal however, they must be carried out.

TOL: Yeah, well that's true, because if somebody leaves a will you just can't say "No, I don't want that, throw it away".. You have to take it because they depended on you to have it.

S #1

Text: "He almost ruined them," the man wrote in his will, "and I want him to have the satisfaction of finishing the job."

TOL: Huh, Huh, well, that would be mean. If he really, really wanted to give him the cars, it would be kinda mean to say he wasn't dependent enough.

S #3

Text: His will stated that each daughter, before she could collect her share, had to spend a year working on a farm or as a cleaning woman.

TOL: That is very queer. I can say that is really strange. But I guess they probably worked for it.. the rubles or whatever.

S #4

Text: His will stated that each daughter, before she could collect her share, had to spend a year working on a farm or as a cleaning woman.

TOL: So that's the drawback! Well, I would do that.. for like.. four million dollars.. or a whole bunch of money.

S #6

Text: His will stated that each daughter, before she could collect her share, had to spend a year working on a farm or as a cleaning woman.

TOL: Well, he must not want them to get rich.. or like a spoiled brat. Like, looking down on other people... and also, just to help out other people by working on farms and stuff like that, or cleaning. He had this good idea.

S #8

Text: His will stated that each daughter, before she could collect her share, had to spend a year working on a farm or as a cleaning woman.

TOL: Um.. The girls will probably be disappointed that they didn't get their share right away... and... I guess he just... he was a comical man or something.... that he... he just wanted to make it hard for them to get it.

S #8

Text: A man in the U.S. left his cars to his chauffeur.

TOL: A happy chauffeur! And an unusual man! I wouldn't leave my cars to my chauffeur... but....

Use of beliefs, opinions, attitudes, and values for the construction of the situation model in the "Different Wedding" passage

S #3

Text: As they dance relatives pin money on their clothes, sometimes even deeds to property.

TOL: On whose clothes?.. Oh, the newly-weds clothes. That would be a nice wedding gift.

Text: They dance three times, each session lasting about thirty minutes.

TOL: I'd get tired. Like normal dances last about five minutes, or ten minutes at the most. Not even ten minutes.

S #4

Text: There is a counter at the pala-pala where cigarettes and rice cakes are sold.

TOL: Down here they usually hand out little cookies and cakes and stuff like that... rice cakes, that will be okay... but cigarettes... I don't know if I really want to buy that stuff.

S #4

Text: They dance three times, each session lasting about thirty minutes.

TOL: That's an hour and a half! That's a long time to dance. I think I'd get tired.

S #7

Text: As they dance relatives pin money on their clothes, sometimes even deeds to property.

TOL: Must be kind of funny, dancing around with money on your clothes. Kinda neat actually, Yeah, money earrings and all that...

Text: They dance three times, each session lasting about thirty minutes.

TOL: Must get pretty tired. Three times thirty is ninety minutes. So.. must dance for over an hour. Get very tired.

S #8

Text: As they dance relatives pin money on their clothes sometimes even deeds to property.

TOL: I think of a couple.. very happy... Well, that's much different from ours, you don't usually pin things on

clothes... but... I wouldn't mind that.. could live with it.

As can be seen from the TOL protocols of subjects in this study, the situation model contains various elements of prior knowledge and experience which are both cognitive and affective.

The Second Research Question

How is the situation model constructed and used strategically by subjects during on-line text processing?

The information and insights garnered from the TOL protocols of ten seventh grade readers as they read two expository passages, clearly indicate the strategic construction and use of the model.

Categories of Strategies and Moves

The procedures of analytic induction and constant comparison (Goetz & Lecomte, 1984; Glaser & Strauss, 1967) applied to the TOL data resulted in the categorization of subject responses into eight moves, which were later collapsed under four major strategies. The moves and strategies indicate the construction and use of the situation model during on-line text comprehension. The four major categories of strategies are listed below:

I Clarifying

II Evaluating

III Reasoning

IV Monitoring Understanding

Each of the strategies seemed to indicate a reader's orientation during text comprehension. The categories themselves seemed to correspond to a different question that readers were asking themselves as they tried to make sense of the passage.

I Clarifying: What does this mean?

II Evaluating: How good/valid/true is this?

III Reasoning: How can I figure this out?

IV Monitoring Understanding: How successful is my understanding?

Each of these four strategies consisted of moves which are recognizable actions performed by the comprehender to achieve the purpose (strategy) under which they are subsumed. Thus, while the moves are identifiable by the analyst, the strategy has to be inferred from the behaviour of the reader. The eight types of moves formed the basis of the coding and analysis of the data. The table of strategies with the accompanying moves is illustrated below;

I Clarifying

- C1 Defining/Explaining concept
- C2 Restating/paraphrasing/elaborating

II Evaluating

- E3 Evaluating text features
- E4 Evaluating text information

III Reasoning

- R5 Making hypotheses/predictions

Making inferences/Drawing conclusions

IV Monitoring Understanding

M6 Expressing doubts/Self-questioning

M7 Confirming understanding/interpretation

M8 Re-examining/Revising interpretation.

Definition of the Categories of Moves

The eight moves found in the TOL protocols of the subjects are defined below. Examples of each move are drawn from subject protocols of both passages. The accompanying text units are included with the subject response to provide a clearer picture of the categorization system.

C1 - Defining/Explaining concept

This represents an attempt by the reader to make a term or concept more explicit, intelligible and understandable, often within the context of the phrase or sentence. The purpose of clarifying is usually achieved through examples, instances of use, or analogies.

Some examples from subject protocols:

S #1

Text: Some people leave wills containing unusual or comical requests.

TOL: Mm..... comical.. maybe funny, like a comic or something like that.

S #2

Text: A man in the U.S. left his cars to his chauffeur.

TOL: Chauffeur, which is the guy who drove him around wherever he wanted to.

S #7

Text: If the requests are legal they must be carried out.

TOL: And it's binding; that's what legal means.

C2 - Restating/Paraphrasing/Elaborating

While the intent or purpose in these moves is also to make the text clearer, the subject here refers to a larger text element (than a term or concept). The moves subsumed under C2 are reiterating the text almost verbatim (restating), rephrasing the text (paraphrasing), and explaining its meaning by adding details, giving examples, providing reasons, using visual imagery and so on (elaborating).

Some examples from subject protocols:

Restating:

S #2

Text: At one end is a kitchen

TOL: So at one end there's a kitchen.

S #2

Text: The wedding ceremony takes place in a church.

TOL: So they have a church where the wedding ceremony takes place.

S #1

Text: The rest is used for eating and dancing.

TOL: But the rest is for eating and dancing.

Paraphrasing:

S #2

Text: Some people leave wills containing unusual or comical requests.

TOL: So, some people leave wills that are unusual or comical or funny that they request to happen.

S #5

Text: For instance a rich Russian once left his daughters a fortune of four million rubles.

TOL: He was very rich... so he left them four million rubles which is a lot of money... his daughters.

S #5

Text: His will stated that each daughter before she could collect her share, had to spend a year working as a servant on a farm or as a cleaning woman.

TOL: Before they got their money they had to be a servant or a cleaning woman because, uh, if they didn't, they wouldn't be able to get their money.

S #10

Text: If the requests are legal however they must be carried out.

TOL: So that means if it's nothing like... illegal, that they must be carried out. So they have to do it.... even if they don't want to.

Elaborating:

S #5

Text: If the requests are legal they have to be carried out.

TOL: If they're illegal, like go rob a bank or something, you can't do it. But if they're legal, they must happen... they must be.. must do it.

S #1

Text: Some people leave wills containing unusual or comical requests.

TOL: Well. yeah. The wills would happen sometimes because they leave things like a family house or leave things like cupboards or something to certain people who like them...

S #8

Text: Some people leave wills containing unusual or comical requests.

TOL: Some people leave wills like a game, like you have to try and find something to get it, or containing like, little pranksters that they did on people... or unusual things.. um.. like little jokes and things that they did to people, and saying that in your will.

S #5

Text: They build a pala-pala, a tent with a roof of palm leaves and bamboo supports.

TOL: It's sort of like.. it looks like a tent. The picture I have is sort of.. has walls made out of bamboo and stuff. Has a circular sort of roof over it.

E3 - Evaluating text features

This move involves statements of reader response to the surface structure of the passage. The move is characterized by comments on words, phrases, sentences, or to the text-structure. The move presupposes a norm or expectation against which the text feature is evaluated or judged and indicates the use of the situation model in interaction with the text.

Examples from subject protocols:

S #4

Text: They build a pala-pala, a tent with a roof of palm leaves and bamboo supports.

TOL: That's the first time I've heard of "pala-pala."

S #9

Text: One of the funniest stories is not about a strange condition attached to a will but about the reason for the inheritance.

TOL: It's rather a long sentence.

S #4

Text: A Frenchman who loved good food once left an order in his will, that every day a different recipe should be pasted on his tombstone.

TOL: Oh, it's broken off into another story now.

E4 - Evaluating text information

The reader uses various criteria (cognitive, linguistic, affective, social etc.) to evaluate the information contained in the text on the basis of appropriateness, effectiveness, credibility, or acceptability. It includes personal reactions of the reader on the basis of values, beliefs, opinions and attitudes.

Some examples from subject protocols:

S #1

Text: Then the couple go to the pala-pala with the band leading the way.

TOL: Well, that's really different from ours because we don't have a band.

S #3

Text: They build a pala-pala, a tent with a roof of palm leaves and bamboo supports.

TOL: That would look pretty nice. Kinda romantic.

S #4

Text: There is a counter at the pala-pala where cigarettes and rice cakes are sold.

TOL: Rice cakes, that will be okay... but cigarettes... I don't know if I really want to buy that stuff.

S #8

Text: People bring pigs, chickens, fruits, and vegetables to the wedding party.

TOL: Um, that's different. Because we usually bring, like household gifts, like coffee machines and stuff, but they bring animals. That's strange... very. Different from ours.

R5 - Making hypotheses/predictions/inferences/Drawing conclusions

Here the comprehender's response seeks to go beyond information received from text up to that point. The strategies involve higher level thinking processes either on the basis of implicit textual information or purely on the comprehender's world knowledge. The definitions for the moves in this category do not contain an evaluative component, in the sense that whether the hypotheses, predictions, inferences, or judgements are correct or incorrect they are still coded as such.

Some examples from subject protocols of m a k i n g hypotheses/predictions:

S #1

Text: Strange Wills

TOL: Well that might be like will power to do something... like you are being possessed by a magnetic force and you have the power to hold yourself back, or it could be about somebody writing their will.

S #4

Text: They all did their work and collected the money.

TOL: He's probably going to say something else in his will after that.

S #7

Text: A Frenchman who loved good food left an order in his will that every day a different recipe should be pasted on his tombstone.

TOL: Oh, he could probably have been a chef or something and really devoted to cooking so he wanted to be with them.

Some examples of making inferences/drawing conclusions:

S #6

Text: For instance a rich Russian once left his daughters a fortune of four million rubles.

TOL: So he must have been married at some time or other to have daughters.

S #4

Text: For instance, a rich Russian once left his daughters a fortune of four million rubles.

TOL: Oh! Rubles must be like money or something in Russia.

S #5

Text: A man in the U.S. left his cars to his chauffeur.

TOL: Well, I guess he was pretty rich and his chauffeur had been with him for probably a few years, so he left him his cars for doing the job.

M6 - Expressing doubts/Self-questioning

The moves in this category are statements showing awareness of cognitive confusion or lack of information in the situation model. The moves indicate that the subject is receiving information from the text that is new, unknown or confusing with respect to the constructed situation model, and reflect the conscious monitoring of prior knowledge and self-understanding.

Some examples from subject protocols:

S# 8

Text: "He almost ruined them," the man wrote in his will, "and I want him to have the satisfaction of finishing the job."

TOL: Um, I don't know why the chauffeur would try to ruin them.

S #6

Text: For instance a rich Russian once left his daughters a fortune of four million rubles.

TOL: What's rubles? I don't know what rubles means.

S #4

Text: Then the couple go to the pala-pala with the band leading the way.

TOL: I wonder what they play in the band down there..

M7 - Confirming understanding/interpretation

Statements signifying metacognitive awareness and on-going monitoring of one's understanding, where the subject

asserts that prior interpretation or predictions based on the situation model have been confirmed by the text, or that current understanding as a result of the text-model interaction, has been achieved.

Some examples from subject protocols:

S #5

TOL: They probably use the money.. they give it to the bride to pay for the honeymoon or something.

Text: All proceeds go to the couple.

TOL: I was right what I said before, the money they get from the cigarettes and rice cakes do go to the couple.

S #4

Text: A wedding in the Philippines has many unique features.

TOL: Now I know it's going to be about people in the Philippines having a wedding.

S #9

Text: All profits go to the couple.

TOL: Like I said, maybe they don't have enough money to support it.

M8 - Re-examining/Revising interpretation

Statements indicating that prior interpretation needs to be re-examined or revised in the light of current information or understanding. Indicates evidence of metacognitive control,

in that the subject is not only aware of self (mis)understanding but is taking steps to correct it.

Some examples from student protocols:

S #6

TOL: So maybe the chauffeur really cared about the cars, or something like that.

Text: "He almost ruined them," the man wrote in his will, "and I want him to have the satisfaction of finishing the job."

TOL: Well, I guess I was wrong about really caring about them.

S #7

TOL: Yeah, that's what it is, like a gazebo.

Text: At one end is a kitchen.

TOL: Well, now it must be bigger than a gazebo.

S #6

TOL: Like you have to go and you have to embarrass yourself, like standing..... running up and down the road naked or something like that.

Text: If the requests are legal however they must be carried out.

TOL: So I guess you can't run up and down the road naked.

The eight moves extrapolated from the TOL protocols of ten grade seven readers presented a clear picture of the strategic construction and use of the situation model during

on-line text processing. The inter-rater procedure for establishing the reliability of these moves has already been outlined in Chapter Three. Using the researcher's coding, an attempt was made to look at the moves in greater depth and from varying perspectives.

Tabulating the frequency of occurrence of moves provided an interesting and detailed view of the data as seen through three different lenses: in terms of moves, passages, and subjects. This could, in turn, help to elaborate and clarify the strategic construction and use of the situation model and thus respond to the second research question of this study.

Differences Between Types of Moves

The ranking of moves according to overall use is as follows:

1. R5 - Making Hypotheses/Predictions/Making Inferences/Drawing Conclusions
2. E4 - Evaluating Text Information
3. C2 - Restating/Paraphrasing/Elaborating
4. C1 - Defining/Clarifying Concept
5. M6 - Expressing Doubts/Self-questioning
6. M7 - Confirming Understanding/Interpretation
7 M8 - Evaluating/Revising Prior Interpretation
8. E3 - Evaluating Text Features

A comparison between the eight moves in terms of frequency of usage is illustrated in Figure 1.

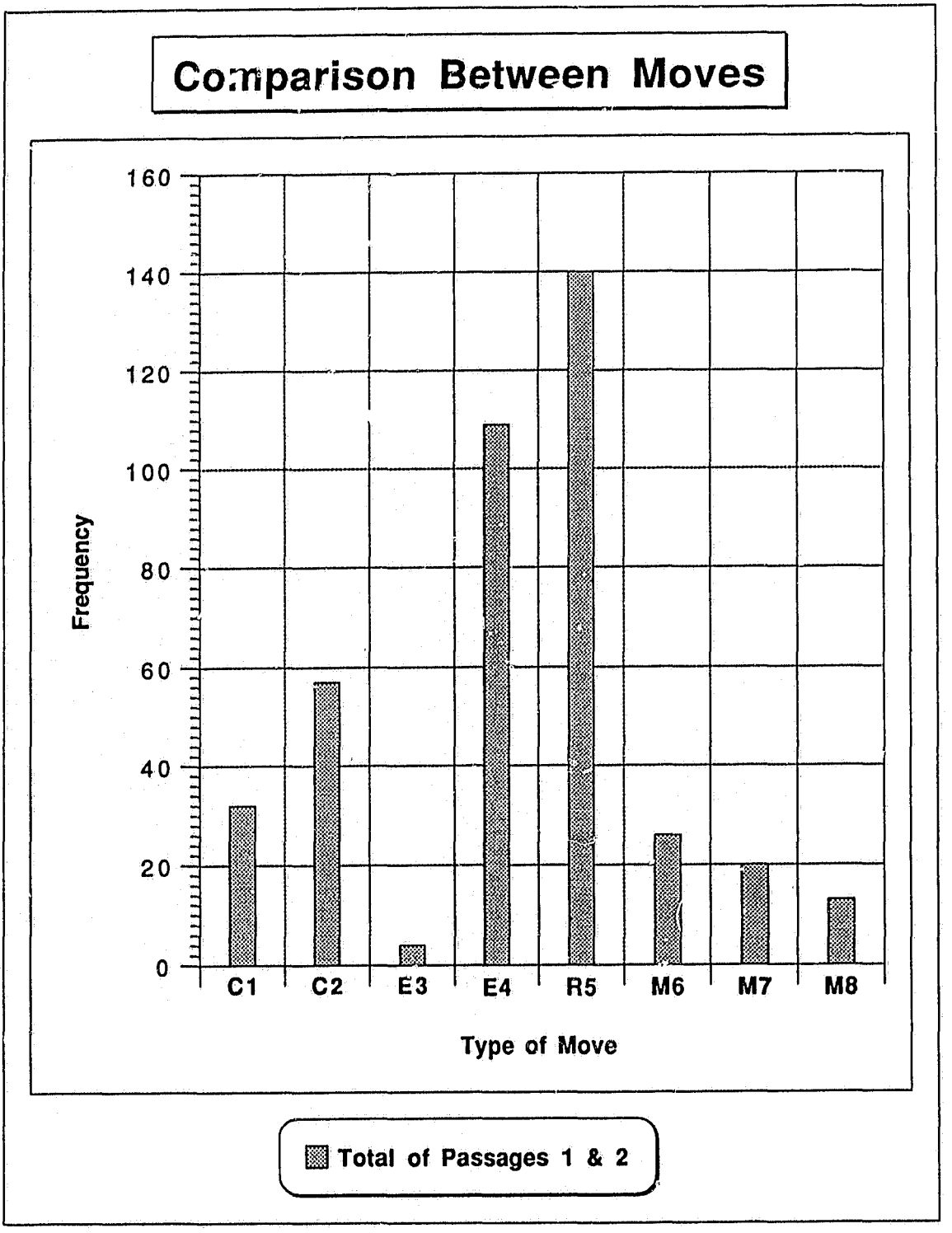

Figure 1. Comparison Between Moves

The frequency of total moves in the two passages, and the percentage is further elaborated in Table 3. It is evident from the table that the three moves, R5, E4 and C2 make up 76% of the total number of moves used by all subjects in the two passages, with the other five moves accounting for less than 24%. In both passages the R5 is the most frequently used, accounting for 35% of total moves. E3 is rarely used in both passages, accounting for only 1% of total use. The implications of these findings will be discussed in Chapter Five.

Differences Between Passages

Elements

In developing the coding system, subject protocols were divided into units called elements, which facilitated the identification of moves. This process revealed that protocols for Passage Two contained substantially more elements than those for Passage One. The difference in elements for the two passages is illustrated in Figure 2. As shown, the elements in Passage One account for 41% of total elements and those for Passage Two account for 59% of the total, indicating more points of contact between the situation model and the text in the processing of the second passage.

Types of moves

The types of moves made by subjects were also tabulated separately for each passage. The findings reveal differences in the use of strategic moves between the two text passages.

Table 3

Ranking and Frequency of Moves in Both Passages

Rank	Move	Frequency	Percentage of Total Use	Cumulative %
1	R5	141	35.1	35.1
2	E4	109	27.1	62.2
3	C2	57	14.2	76.4
4	C1	32	7.9	84.3
5	M6	26	6.5	90.8
6	M7	20	5.0	95.8
7	M8	13	3.2	99.0
8	E3	4	1.0	100.0

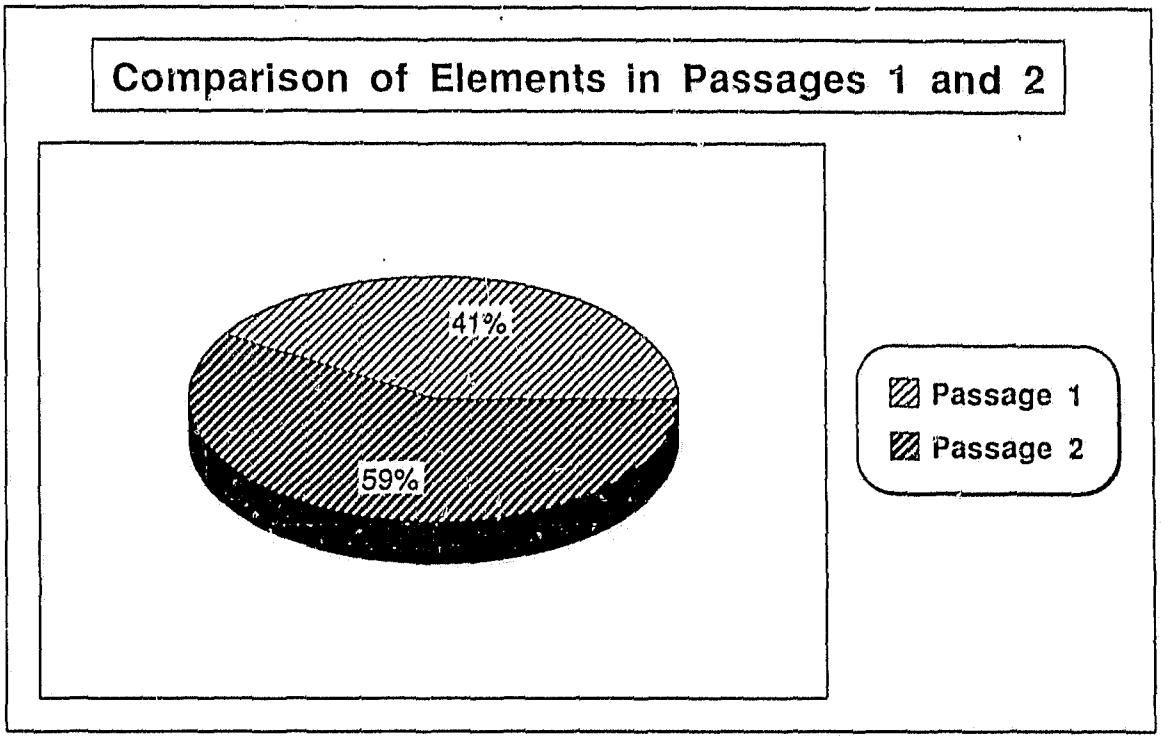

Figure 2. Comparison of Elements in Passages 1 and 2

Differences between the two passages in terms of frequencies of the eight identified moves is expressed in Figure 3 and Table 4.

The frequency count of moves between passages indicates that there is a substantial increase in the total number of moves used by subjects in the second passage. This indicates a higher degree of strategic processing through the situation model in the second passage. An interesting difference in moves between passages is seen in the use of E4 and C2. Although R5 continues to assume the #1 position in both passages, E4 and C2 exchange rankings between passages. C2 ranks #2 in frequency of moves in Passage One while it goes down to #3 position in Passage Two. Conversely, while E4 is in #2 position in Passage Two, it assumes a lower, #3 rank in frequency in Passage One. There is a substantially higher use of C2 in Passage One, nearly 10% more, than in Passage 2. E4 however has the opposite effect in Passage Two with an increase of about 14.2% from use in Passage One.

The pattern of other rankings and percentages remain fairly consistent across passages, implying that the subjects used most moves in comparatively the same order of frequency in both passages. Thus, while a greater number of moves were used in Passage Two by all subjects, all moves, except C2 and E4, maintain the same rank order in both passages. Figure 3 further illustrates the differences in moves between passages.

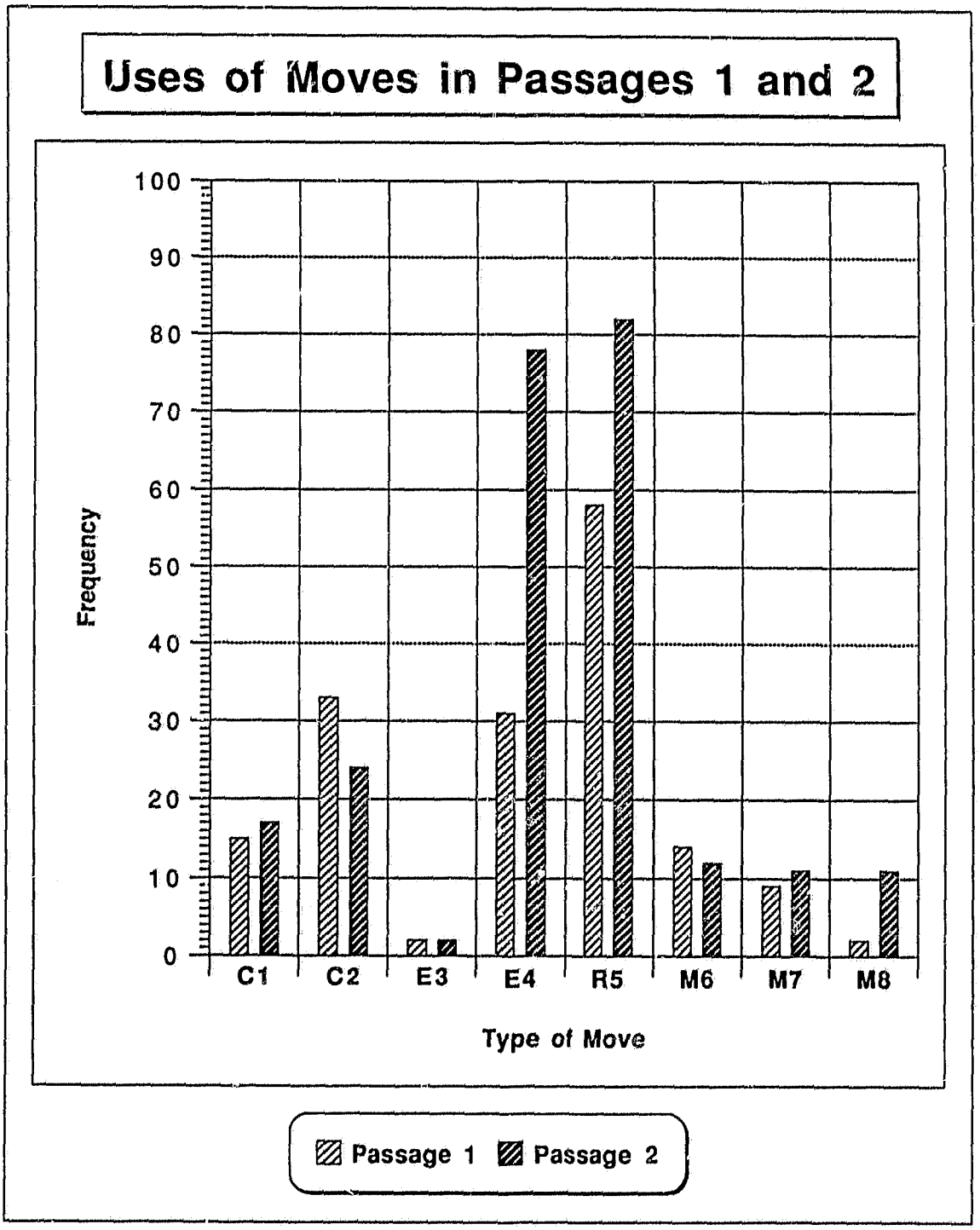

Figure 3. Uses of Moves in Passages 1 and 2

Table 4

Comparison of Ranking and Frequency of Moves Between the Two Passages

Passage One				Passage Two			
Rank	Move	Frequency	%	Rank	Move	Frequency	%
1	R5	59	35.7	1	R5	82	34.6
2	C2	33	20.0	2	E4	78	33.0
3	E4	31	18.8	3	C2	24	10.1
4	C1	15	9.0	4	C1	17	7.2
5	M6	14	8.5	5	M6	12	5.1
6	M7	9	5.5	6	M7	11	4.6
7	M8	2	1.2	6	M8	11	4.6
7	E3	2	1.2	7	E3	2	.8
Total Moves = 165				Total Moves = 237			

Differences Between Subjects

The frequency count of moves provided interesting data for viewing the differences between subjects. Which subjects used which moves most frequently? or least frequently? The frequency count of moves used by different subjects is tabulated separately for each passage. Table 5 shows that the number of moves used by different subjects in Passage One is fairly similar. Most subjects have used between 15 and 19 moves. Subject #9 shows the highest frequency of strategy use in this passage with 19 moves, with Subject #5 showing the least use, that is, 12 moves.

Table 6 illustrates the use of moves by subjects in Passage Two. Despite the increased use of moves in this passage as compared to Passage One, the range of use between subjects has narrowed, ranging mostly between 22 and 28 moves per subject. Subject #1 and #7 show the highest use of moves (28) and Subject #6 the least (19). Subject #4 has used all eight moves at least once in this passage. There is no data in this study to indicate a relationship between the number of moves used by subjects and their level of comprehension.

The data also revealed similarities within subjects as to the types of moves used in both passages. Figures 4, 5, and 6 provide snapshots of three individual subjects' use of moves during comprehension of the two passages, and are provided so that similarities and differences may be better illustrated and understood. As Figure 4 shows, S #6 has used the same six

moves in both passages. S #5 (Figure 5) has used only a few moves; the same five in both passages, while S #4 shows a wider use of moves as indicated by Figure 6. Other individual subject profiles are included in Appendix B.

Table 5

Use of Moves by Subjects in Passage #1

Subject	C1	C2	E3	E4	R5	M6	M7	M8	Total	%
S#1	1	2	0	4	6	0	2	0	15	9.1
S#2	2	9	0	0	5	0	0	0	16	9.7
S#3	3	2	0	4	4	2	2	0	17	10.3
S#4	1	3	1	3	6	1	1	9	16	9.7
S#5	1	5	0	2	3	0	1	0	12	7.3
S#6	2	1	0	1	10	1	0	2	17	10.3
S#7	2	3	0	3	5	3	2	0	18	10.9
S#8	0	4	0	5	6	3	0	0	18	10.9
S#9	2	0	1	6	6	4	0	0	19	11.5
S#10	1	4	0	3	8	0	1	0	17	10.3
Total	15	33	2	31	51	14	9	2	165	
%	9.1	20.0	1.2	18.8	35.8	8.5	5.5	1.2		100.0

Table 6

Use of Moves by Subjects in Passage #2

Subject	C1	C2	E3	E4	R5	M6	M7	M8	Total	%
S#1	1	3	0	9	8	1	2	4	28	11.8
S#2	2	11	0	1	8	1	0	1	24	10.1
S#3	5	0	0	8	4	3	2	0	22	9.3
S#4	1	1	1	10	9	2	2	1	27	11.4
S#5	1	2	0	9	7	0	2	0	21	8.9
S#6	1	1	0	2	13	1	0	1	19	8.0
S#7	3	1	0	8	12	1	1	2	28	11.8
S#8	1	0	0	13	7	0	0	1	22	9.3
S#9	1	1	1	11	4	3	1	0	22	9.3
S#10	1	4	0	7	10	0	1	1	24	10.1
Total	17	24	2	78	82	12	11	11	237	
%	7.2	10.1	0.8	32.9	34.6	5.1	4.6	4.6		100.0

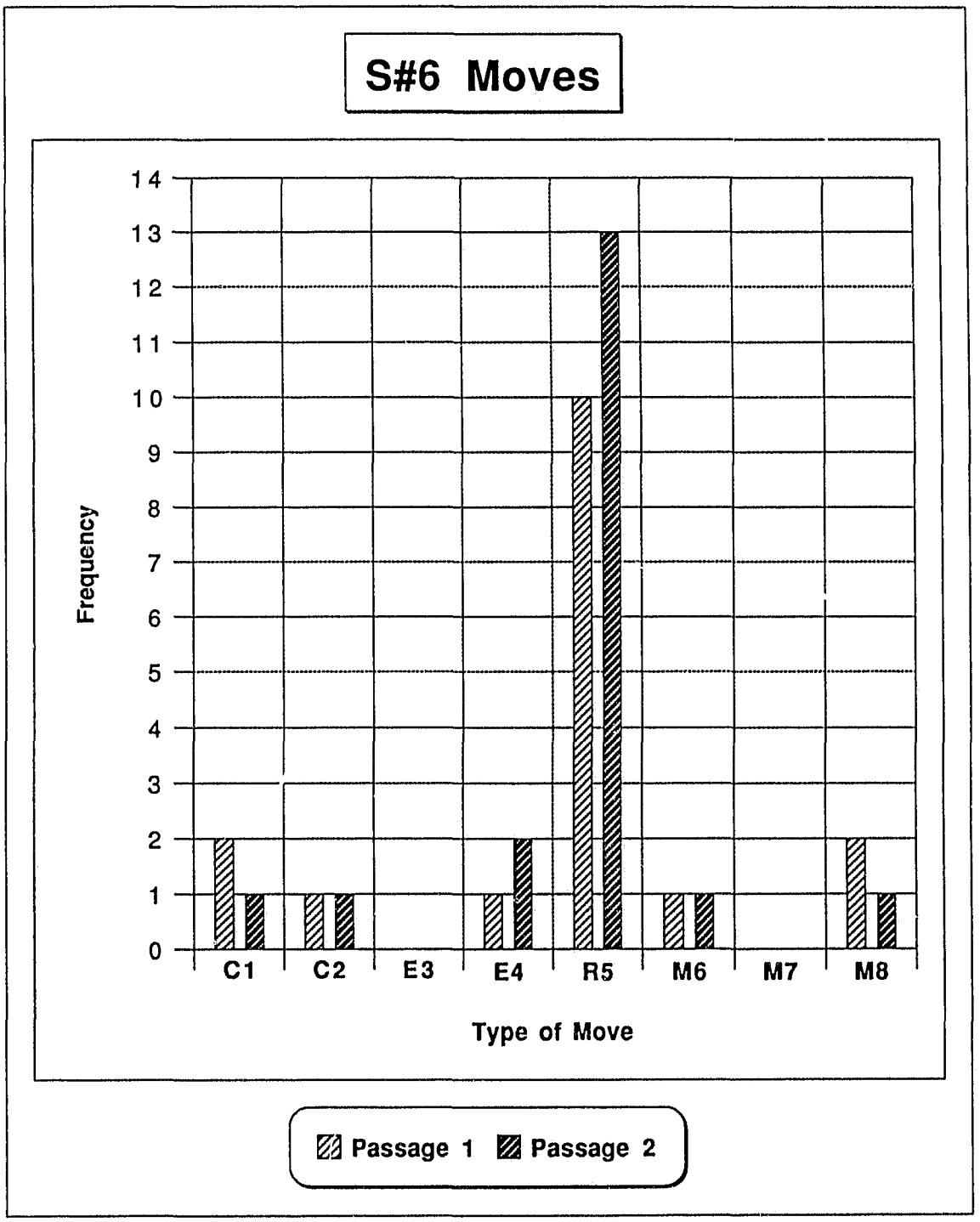

Figure 4. S#6 Moves

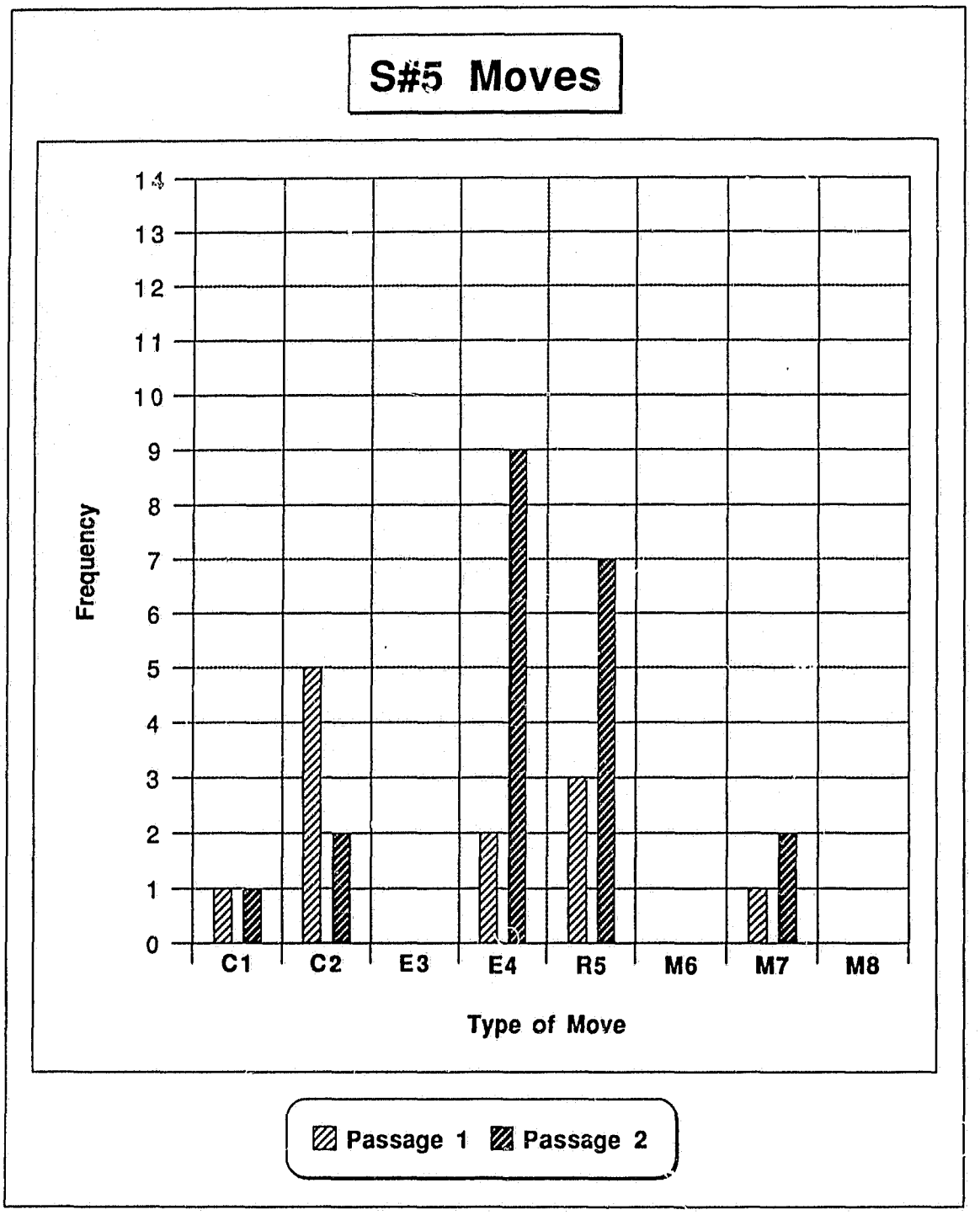

Figure 5. S#5 Moves

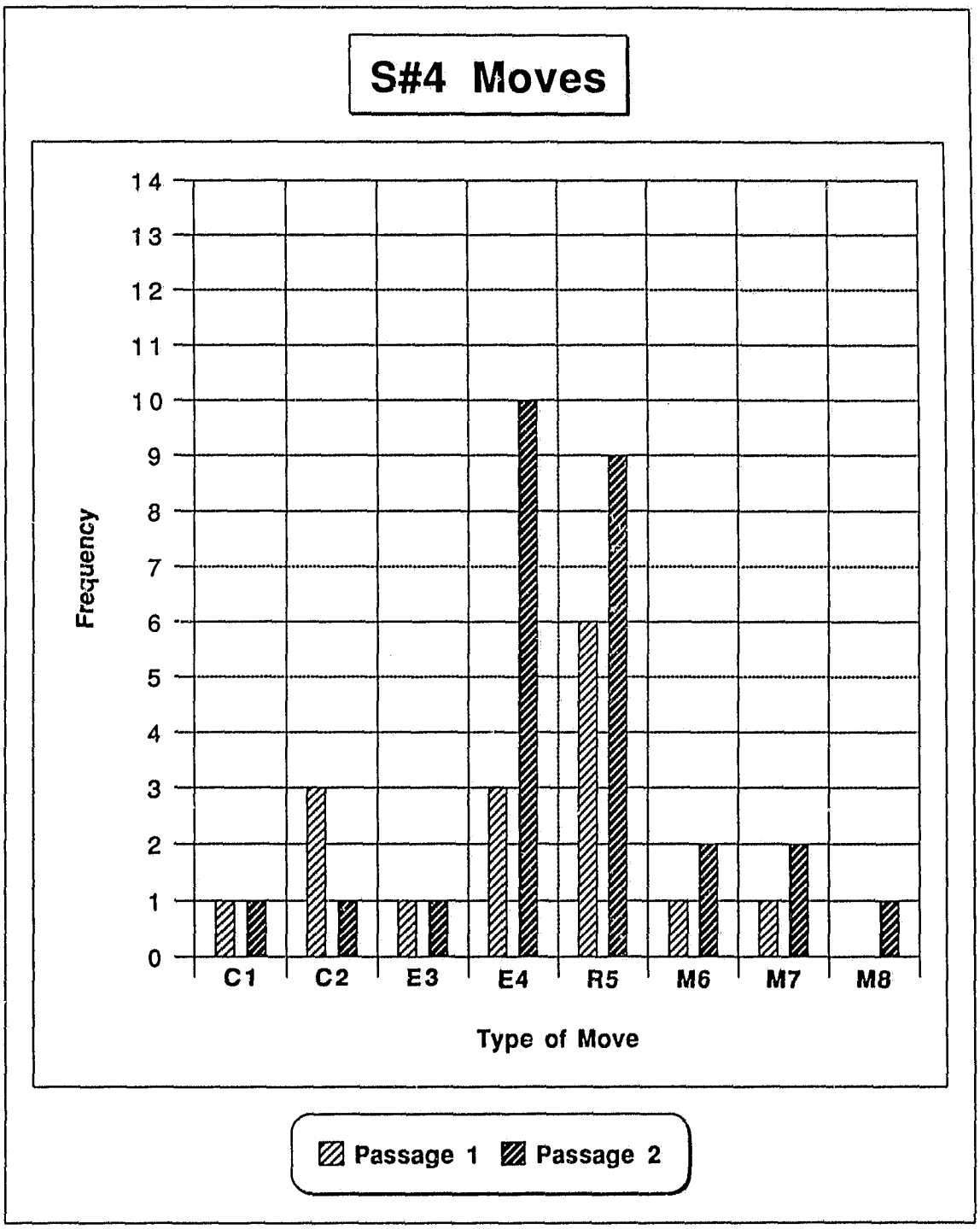

Figure 6. S#4 Moves

CHAPTER FIVE

Discussion

This chapter discusses the findings reported in Chapter Four. To do so, it draws on the analysis of the research data to elaborate on the research questions, while relating the study to the theoretical underpinnings on which it rests. It then proceeds to suggest implications for education and research. The chapter concludes with a discussion of the limitations of the study.

Discussion of the Findings Vis-a-Vis the Research Questions

The first research question attempts to validate the existence and psychological reality of the situation model from the TOL protocols of seventh grade readers. There is indeed sufficient evidence found in the data to substantiate the validity of this theoretical construct. All subjects are seen to construct or evoke a mental model of the text situation in their attempt to comprehend the text passages. In the initial stages of text processing this model is in the form of a broad framework to be elaborated as additional clues are received from the text.

The TOL protocols of the ten subjects reveal that this framework of the model to be constructed, is evoked in two ways. The first is through a single hypothesis that is brought forth as a response to cues from the title.

For example, as soon as S#2 reads the title of Passage One "Strange Wills," he states "This story is probably about wills.. like when somebody leaves something to other people when they die and these ones are probably strange....," or when S#7 reads the title of Passage Two "A different kind of wedding" and remarks "That means it's different from most of our weddings here. I guess it means it's different customs, different places maybe..."

The other way in which subjects in this study evoke their model of the situation in text is to consider one or more than one tentative hypotheses on the basis of initial cues from the title, and await on-going cues from the text for confirmation or negation. For example, when S#6 on reading the title "Strange Wills" hypothesizes, "Well, that might be like will power to do something... like you are being possessed by a magnetic force and you have the power to hold yourself back... or it could be about somebody writing their will... bunch of wills, like make them inherit a big bird or something like that.. something strange.." but upon reading the next sentence of text, namely, "Some people leave wills containing unusual or comical requests" quickly asserts, "Well yeah. The wills would happen sometimes because they leave things like a family house or leave things like a cupboard or something to certain people who like them...".

The subjects who initiated more than one working hypothesis of a model attempted to answer questions arising

out of the various models by utilising clues revealed by the unfolding text passage. When a question from one model was answered, constraining the solution to questions from other models, the cognitive process converged quickly into a single situation model often without necessitating verbalization of this convergence. The initial construction of the model is, in this case then a narrowing down of the tentative hypotheses which arise from textual information through a process of "constraint satisfaction" (Fikes, 1970; Waltz, 1975), through the use of prior knowledge and utilizing the clues from text.

The Structure of the Situation Model

What does the model look like?

When a situation model is evoked on the basis of information received in the initial stages of text processing, the subjects, (in the interest of cognitive economy perhaps) bring to working memory only a broad framework or scenario of the situation being referred to in text, and leave it to the gradual unfolding of the text information to fill in or fill out the details of the model. These details of the model are made up of relevant fragments of episodic and semantic memory interacting with information from the text passage. van Dijk and Kintsch (1983) theorize that in the sense that each piece of text is new and unique to some extent, a new and unique "ad hoc" model needs to be constructed on-line during reading. As such, the construction of the model requires more than the mere instantiation of pre-stored scripts or frames; rather, it

calls for the strategic combination of relevant knowledge fragments from the reader's episodic and semantic memory.

In the sense that all we say is to a greater or lesser degree in some way coloured by what we know or have experienced, the separation of language elements from memory elements in the TOL protocols is artificial and well-nigh impossible. Rather, perhaps, it is more accurate to state that some of the verbalisations of subjects reveal more specifically than others, elements of episodic and semantic memories that form part of the situation model used in comprehending the given passage.

As the findings reveal, episodic memory elements are used strategically in the construction of the situation model. The process is akin to what Schank (1982) calls "reminding," when people recall previous experiences similar to the situation presented, and use the memory of these experiences to guide their understanding and expectations. For example, S#1 states while reading the Strange Wills passage, "Just like when I was watching a TV show, like they show how..." etc. Or again like S#4 stating, "I saw a movie about a chauffeur..." etc. While processing the Different Wedding passage, S#3 is reminded about sending her mom's friend a hundred loonies for a wedding present, or S#6 talks about the wedding of her mother and the mom's new husband. The strategic construction of the model is well-demonstrated in these examples, in that the entire episode that the subject is reminded of is not brought into

working memory but only that fragment that is relevant or necessary for the task at hand.

Episodic memory structures are based directly on personal experience, while semantic memory structures are acquired by abstracting and generalizing from multiple experiences by oneself or others. Semantic memory (while being in some cases an off-shoot of repeated episodic experiences), forms a major segment of the situation model structure. The psychological literature has provided ample empirical evidence that people are able to relate their knowledge of the world to impose organization and understanding on the information they receive.

While semantic memory could be loosely defined as everything other than episodic, in the TOL protocols the findings show that certain segments can be more clearly identified as semantic than others. These elements cover knowledge of words, for example, S#1 states, "Chauffeurs are people who drive cars"; knowledge of text structures, as when S#4 says "Probably going to be like they have in fairy tales.... like they have three daughters, how many things each kid gets... something like that"; knowledge of social customs and procedures, e.g. S#1 states "Yeah, we have the bridal shower, where the bride gets a lot of presents, and the groom goes with a bunch of his friends to the bar or something"; and knowledge of feelings and emotions, as when S#5 says, "Well, that's funny because people don't normally ask for that. Once

they are buried they don't normally want you to... they just want to be left alone." S#8 also gives evidence of this kind of knowledge when she states "The girls will probably be disappointed that they didn't get their share right away."

The data also reveal the frequent use of beliefs, attitudes, values, and opinions in the construction of the situation model during comprehension. Thus while mental models are taken to be some kind of knowledge structures, they not only contain knowledge in the narrow sense but also what is termed as "hot cognition" (Abelson, 1979; van Dijk, 1982; Wegman, 1981), implying that despite the difficulties in separating a belief system from a knowledge system, there are real differences between the two.

As understanders, the subjects seem to use and consult these beliefs, attitudes and opinions to decide on whether the text information is proper, correct, good, acceptable, etc. While such beliefs, attitudes, values, and opinions are also an off-shoot of episodic or semantic memories, they stand out in the protocols as representing a great deal of ego-involvement with the issue at hand. As such they can be seen to perform an evaluative function and form a major part of the E4 move, evaluating text information. Different aspects of values, beliefs, opinions and attitudes are brought up in the verbalisations of subjects, like when S#1 says, "Well, that would be mean," or S#3 states, "That is very queer. I can say that is really strange," or S#8 points out, "A happy

chauffeur! And an unusual man! I wouldn't leave my cars to my chauffeur.." or S#4 pronounces "Rice cakes, that will be okay... but cigarettes... I don't know if I really want to buy that stuff." Considering the preponderance of E4 as a move, one could conclude attitudinal contexts have a profound effect on comprehension for subjects in this study. As Spiro maintains, "The cognitive aspect of prose incorporates an aspect contributed by the comprehender and not derivable from the text itself--in this case an evaluative aspect" (1980, p. 255).

The findings that elaborate the structure of the situation model are representative across subjects and across text passages. However further research into the relative use of different memory fragments would be needed to shed more light on these findings. The findings also suggest that the different elements of memory combine in strategic ways to form the situation model and that a lot more and different information seems to be active than would be predicted from theories based on the notion of scripts as discrete memory packages. However, from such information the system brings into active working memory only those fragments and elements that are necessary and these not all at once, but only when needed in the process of interaction with text. It is in this context that the strategic construction and use of the situation model takes place. How much and what information from prior knowledge is needed at what point in text

processing is the answer to the second research question of this study.

The Second Research Question

How is the situation model constructed and used strategically during text processing?

The strategic construction and use of the situation model is revealed in the findings through the frequency and type of moves employed by subjects in constructing a text interpretation. The strategies and moves identified in the TOL protocols of subjects were categorized and coded as follows:

CLARIFYING	C1	Defining/Explaining concept or term
	C2	Restating/Paraphrasing/Elaborating
EVALUATING	E3	Evaluation of Text features
	E4	Evaluation of Text information
REASONING	R5	Making Hypotheses/Predictions
		Making Inferences/Drawing conclusions
MONITORING	M6	Expressing Doubts/Self-Questioning
UNDERSTANDING	M7	Confirming Understanding/Interpretation
	M8	Re-examining/Revising Interpretation

The findings emanating from the data as outlined in Chapter Four can be discussed from the viewpoint of differences in types of moves, differences in moves between passages and differences in moves between subjects.

Types of Moves

As the data show, R5 is the move used most frequently across both passages, accounting for 35% of total moves. R5

belongs to the Reasoning strategy and includes the making of inferences and judgements by subjects. The preponderance of this move is not surprising. Researchers supporting the theory of mental models hold that the formation of inferences is a process closely related to the comprehender's use of world knowledge (Garnham, 1989; Garrod, 1985; Johnson-Laird, 1982; Sanford, 1985; van Dijk & Kintsch, 1983). Such inferences are of two types. Starting out with the propositions contained in text, the reader attempts to answer questions asked by himself in order to relate the focused event to preceding events in the passage. As such, they are usually made in the backward direction, and utilise world knowledge to a greater or lesser degree. Such linking or bridging inferences (Clark, 1977) establish coherence in the text passage and help the reader in constructing the propositional text-base, which is the semantic representation of the text.

Examples of linking inferences made in the backward direction can be found in the TOL protocols. For example, when S#1 says while reading the Strange Wills passage "I guess rubles must be money now 'cause it's in the other one." Or in the Different Wedding passage when S#5 draws a conclusion by linking information from two non-adjacent text sentences, that the kitchen section of the pala-pala would be used to prepare the pigs and chickens brought by friends the previous day.

Greater use of world knowledge, however, is made through elaborative inferences (Garnham, 1982) which arise in the

process of interpreting the text expressions "against a mental model of the discourse domain" (Garrod, 1985, p. 161). Such inferences are made in the forward direction and help to fill in the gaps that are left in discourse by writers (Collins, Brown, & Larkin, 1980). The TOLs of the subjects in this study contain numerous examples of such elaborative, forward inferences. In the "Strange Wills" text, S#4 infers that the chauffeur probably crashed up the cars because he could not see well and needed glasses. He makes this inference on the basis of knowledge in his episodic memory about a movie he had seen of "a chauffeur who had the wrong kind of glasses and he was always crashing into everything.. and going the wrong way...". Another example is when S#5 states in the Different Wedding passage that there are probably going to be lots of palm trees in the Philippines because it's sunny and near the equator. Such an inference, while not being in the strict sense a "necessary" one, is useful in elaborating, by the strategic use of world knowledge, the text representation that is being developed by the reader.

The relationship of the situation model with inferences has two important implications. On the one hand the formation of inferences based on text help to fill out the existing framework of the situation model, while on the other the semantic representation being created is embellished and enriched by the inferences generated from the model.

Minimal use of E3 as a type of move

As the findings reveal, there is minimal use of E3 as a strategic move (only 1% of total moves). Despite the fact that only four instances of use of the move were found in the TOL protocols of subjects, the move was retained in keeping with the spirit of the research which was primarily exploratory and descriptive. It had been decided early on in the study that rather than force the data into pre-determined categories, the categorisation scheme would "flow out" of the data. This implied that a different category would be used to describe a different move, however minimal its frequency of use by subjects.

Lytle (1982) and Myers (1989), in their studies of comprehension strategies through TOL protocols, also found that a similar category designated by them as Analysing Text Features was rarely used by subjects. This is not surprising in that Evaluating text features is a move that is usually employed only when some direct difficulty with text is encountered. Lytle (1985) holds that this type of move is used mainly when the nature of the text lends itself to an assessment of its features. Most subjects in the present study, being good readers, did not seem to encounter such problems in the direct engagement with text features. As such, the level of their interaction could have been at the "automatic," or subconscious level.

Moves involving monitoring of understanding

The findings reveal that seventh grade readers use monitoring moves infrequently. As indicated, such moves are used in order to monitor self-understanding during on-line comprehension and as such involve a metacognitive function. The notion of metacognition is a relatively recent theoretical concept and comprehension monitoring has emerged as one of the more prominent and useful metacognitive functions.

Monitoring of understanding involves mainly keeping track of one's current level and degree of understanding in order to select effective strategies to correct comprehension breakdowns. Although the frequency of these three moves accounted for barely 15% of total moves, the TOL data indicated that the subjects were constantly monitoring their understanding or lack of it. Perhaps the verbalisation of such monitoring did not seem necessary to students, particularly when their understanding was not in doubt.

Differences in Moves Between Passages

Number of moves

The findings revealed a difference in the number of moves between the two expository passages. Although the passages were similar in terms of length (word count), and level of difficulty (readability), the "Different Wedding" passage seems to have called forth a much higher number of total moves (total moves = 227), than the "Strange Wills" passage (total moves = 165). The fact that the "Different Wedding" passage

contained a good deal of information that was unfamiliar to the subjects in this study may be responsible for the increased number of moves. Hare and Smith (1982) hold that an expository passage about an unfamiliar topic induces more conscious analytical processing than an expository passage about a highly familiar topic. Several other researchers (Pearson, Hansen, & Gordon, 1979; Spillich, Vesonder, Cheisi & Voss, 1979) also emphasise the powerful role of domain knowledge in the comprehension process. They hold that fluent comprehension in a familiar domain is mainly a matter of recognition and does not involve strategies.

Strategies are needed mainly when the text has ambiguities or gaps, or when the reader's knowledge is insufficient, which often occurs when subjects are processing unfamiliar materials. Voss and Bissanz (1983) showed that when subjects are processing text of low-domain-knowledge the working memory capacity is strained, conceptual links in relationships cannot easily be formed, and the reader has difficulty relating high-level information to low-level information. Kintsch (1982) also warns that in the absence of a well-established knowledge base within which to organize the content of text, performance may break down.

This could necessitate the use of a greater number of strategic moves in order to help the comprehender achieve his or her goal. A larger amount of new information was contained in the "Different Wedding" passage which could have strained

the cognitive capacity of the subjects to take in the new information on the one hand, while organising it and connecting it to older knowledge structures on the other (Johnson & Kieras, 1983). The non-standardness of the situation in the Different Wedding passage, of a Philippine wedding ceremony and its action sequences as differing from the subjects' model of a North American wedding ceremony, seemed to necessitate Bartlett's (1932) "schema-plus-correction" model. Thus the text effect on the situation model in passage two could have led to a greater degree of verbalization as well as of strategic moves for text understanding.

Types of moves

Afflerbach (1985) states that the relative familiarity of the text influences the particular strategies readers use. This study shows that such a passage effect could influence not only general comprehension strategies but also those specifically related to the use of the situation model. In this context, a finding that warrants discussion is that E4 (Evaluating text information) changes ranks between passages. While E4 is in #2 position in frequency of use in the "Different Wedding" passage, it goes down to #3 rank in the "Strange Wills" passage. Analysing the protocols and the findings, it seems that the increased use of E4 is necessitated by the passage. The larger amount of new and unfamiliar information that has to be processed in the

"Different Wedding" passage calls for an evaluation of this information on the basis of analogical reasoning (Carbonnel, 1982). Evaluation occurs as a function of examining commonalities and contrasts between the unfamiliar text situation and a situation model made up of episodic and semantic memories of similar (but not identical) situations. The "Different Wedding" passage protocols contain numerous examples of this information evaluation process. S#3 when reading about the friends of the couple meeting at the bride's house the day before, states "Well, we have.. it's kinda like a wedding shower," or when S#8 on reading about people bringing pigs and chickens and fruits and vegetables to the wedding party remarks, "Um, that's different. Because we usually bring, like household gifts, like coffee machines and stuff, but they bring animals."

The increased use of the R5 strategy in Passage Two (frequency=82) as against Passage One (frequency=59) is also related to the analogical reasoning process. Predictions and inferences form a substantial part of this reasoning strategy and are needed to compensate for the lack of textual information that cannot be readily filled in from the reader's prior knowledge. The increase in hypotheses,predictions, inferences, and conclusions in the "Different Wedding" passage is also directly related to the increase in the M8 strategy. The analysis of subject verbalisations involving the re-examining or revising of prior interpretations shows that the

M8 move in this passage occurs as a direct result of the tentative hypotheses and inferences made by the reader, that have to be re-evaluated on the basis of on-going clues from text. The lack of congruency between the text and the situation model lends itself to a Progressive Refinement Theory of text processing (Collins, Brown, & Larkin, 1980) where the subjects make inferences and predictions and draw conclusions from information available to them up to that point, that have to be often changed or revised on the basis of increased information being provided by a gradually unfolding text. The amount of new and unfamiliar information in this passage almost necessitates the use of this move, and seems to set up what Reiger (1977) termed "watchers" in the minds of the subjects.

For example, when S#1 reads that there is a kitchen at one end she remarks, "Oh!.. then I think it is changing and different. I thought it was gonna be for keeping all the food in." Or when S#4 who had previously predicted that the Philippine wedding would have rituals like dancing and walking on hot coals, reads that the pala-pala is used for eating and dancing, remarks "Yeah, I think the dancing ritual will still be but I don't think they're going to rock on hot coals or anything." Or when S#8 re-evaluates her idea of a pala-pala, "I think my picture of this story is changing now. The pala-pala will just be different" and so on. M8 then is another example of the two-way interaction between the textual and

mental representations, and shows how the developing textual representation has a corrective effect on the developing situation model with the aim of reducing comprehension conflict.

Differences Between Subjects in the Types of Moves

Some similarities among subjects in number and types of moves was evident from an analysis of the TOL protocols. All subjects used an increased number of moves while thinking-out-loud during the reading of the "Different Wedding" passage as compared to the "Strange Wills" passage. All subjects favoured the use of R5, E4, and C2 while reading both passages. The data also indicate that the seventh grade readers in this study do not use (or verbalise the use of) moves such as M6, M7, M8, and E3 much during reading comprehension.

Similarities in the types of moves are also seen within subjects across passages. Individual subjects showed consistency in the types of moves used in both passages. The same two subjects, S#4 and S#9 are seen to utilise E3 as a move in both passages; in fact they are the only ones to use the move of evaluating text features.

Differences Between Subjects in the Use of Moves

Most subjects show evidence of an individual processing or cognitive style, in that they are consistent in the types and ranking of moves used across passages.

S#2 is seen to favour the use of C2 as a strategic move in both passages, with nine instances of use in the "Strange

Wills" passage and eleven in the "Different Wedding" passage. This same subject seems to utilise E4 quite infrequently however; with no instances of use noted in the first passage and only one instance in the latter, despite the fact that there is a substantial increase generally in the use of E4 in the "Different Wedding" passage.

S#9 utilises a wide repertoire of moves, in that this subject has used all the eight types of moves at least once in the "Different Wedding" passage and has used seven of the eight types of moves in the "Strange Wills" passage. S#2 on the other hand, makes meaning through use of a limited number of types of moves using only three types in the "Strange Wills" passage and five types in the "Different Wedding" passage. Thus a subject's use or non-use of specific moves provides a profile of the kinds of knowledge that is brought to the comprehension act, as well as of how that knowledge is utilised in interaction with the text in the effort to make meaning.

While the purpose of the study was not intended to tease out individual differences in cognitive processing styles, such a focus in future research studies could provide insight and information into the use of moves by students based on their reading ability, interest in and knowledge of the topic, as well as other reader-text variables.

In analysing the types of moves utilised by subjects, it would appear that differences in moves could be due to

differences in the overall approach of readers to text processing. Some subjects are constantly building top-level holistic structures and constantly recognizing that the whole is more than the sum of its parts. Such subjects are seen to utilize Reasoning and Evaluating strategies more often during text processing. While those subjects who read more serially and in a linear fashion without much reference to the situation in text, use the Clarifying strategy to analyse and elaborate text to make it clearer to themselves.

Discussion of the Findings Vis-A-Vis the Theoretical Frameworks

The model of text processing that is revealed by the TOLs of seventh grade readers can be viewed through several lenses. The model is interactive, in the sense that what subjects already know informs in a top-down fashion information from the text that is being processed bottom-up. The model is constructive, in that subjects utilise knowledge and experience beyond what is contained in text to make meaning. The model is developed gradually and on-line as a continuing and progressive refinement process with the unfolding text. The model is dynamic and flexible, in that the knowledge sources utilised for its construction and use are not pre-packaged scripts or frames, but the model is constructed, revised, evaluated and transformed during the reading act. This requires that the actions of the comprehender involve a

cognitive monitoring process that facilitates on-line model construction and use.

Implications For Research

The study builds on and extends the scope of prior research showing that comprehension is an active and interactive process whereby readers use their prior knowledge in the form of a situational model of the text passage to construct an interpretation of its meaning. As exploratory, discovery research however, the study has provided hypotheses which can be verified through future research. The findings lead one to question the contention of Johnson-Laird (1983) and van Dijk & Kintsch (1983) that the text base is a necessary precursor to the mental model, and that the latter is constructed only in the second stage of text processing. As the TOL protocols of grade seven subjects indicate, the two mental representations, namely the text base and the situation model, are constructed simultaneously and interactively by readers, with the information in one helping to shape and develop the other. However, with the qualification noted above, the on-line, strategic use of knowledge in discourse processing as outlined by van Dijk and Kintsch (1983) is to a large extent validated by this study. Perhaps further research could provide opportunities for confirming this, through more detailed and narrower investigations that will ensure that the findings are "ecologically valid" (Neisser,

1967) in the sense that they can be generalized to issues of concern in the real world.

The taxonomy of strategies and moves developed from the TOL protocols of subjects in this study could prove a starting point for verification research. While this list represents the sum total of all cognitive operations verbalised by subjects during on-line text processing, it is not intended to be taken as an exhaustive list of all possible strategies and moves. Further research could shed more light on differences in the number and types of moves as a function of differing reader and text characteristics. Use of moves by subjects could also be studied in terms of the relationship between the number and types of moves and the level of comprehension attained. The use of specially contrived passages of varying length and difficulty on the one hand, and the use of subjects of differing reading ability on the other, could shed more light on this subject.

The methodology of the study also has implications for future research. The unit of analysis used in this study was a novel approach to the categorization and coding of the data. In place of a superficial and arbitrary division of protocols into units based on sentences and clauses (as in many other such studies), subjects' protocols were divided into "elements," which were reflections of their cognitive interaction with text. Each element contained a response based on the situation model (move) to text (idea or feature), and

had to be determined individually for each subject-protocol for each passage. As such, this method of data analysis and reduction proved time-consuming and difficult. However, it provided a more accurate and realistic picture of the amount and degree of cognitive processing entered into by different subjects in response to different text passages. Further research using the "element" as the basis for the categorization process could confirm the validity and usefulness of this unit for the analysis, coding, and interpretation of TOL data.

Implications for Instruction

The model of text interpretation that emerges from the study has implications for teaching and learning. As a process model, it emphasizes the strategic use of knowledge through on-line, reader/text interaction that enables understanding. Traditionally, the activation and use of prior knowledge has been taught as a pre- (and sometimes post-) reading activity. Modeling the TOL technique as an on-line procedure could help students learn the dynamic and flexible use of prior knowledge during the reading act, as a response to changing textual demands.

Such teacher-modeling can create instructional scaffolding that can help students restructure their understandings of the reading process as active and constructive (Dole, Duffy, Roehler, & Pearson, 1991). The strategies and moves extrapolated from the TOLs of good

readers could be used to benefit poorer readers (Davey, 1983). Helping them recognize that partial understanding can be achieved despite lack of adequate domain knowledge could be of much educational benefit. By demonstrating that comprehension can result from even a partial match between knowledge structures and text information, the findings from the study assume pedagogical implications.

Limitations of the Study

This study is not without limitations and drawbacks. The relatively small size of the sample (n=10), limits the generalizability of the findings to other readers of similar category. The selectivity of the sample population is also a limiting factor. Seventh grade readers functioning at or above grade level in reading competence were used as subjects. This further narrows down the category of readers to which the findings of this study may be applicable.

While the text passages selected were "naturally occurring" that is, not written or re-written for the purpose of the current research, they were selected only on the basis of passage length and readability factors (see Chapter Three). There was no attempt to analyse the content or propositional structure of the passages.

The use of only two expository passages is also a limitation of the study in generalizing the strategies to other expository passages. The study did not seek to explore or determine the relative efficacy of the different strategies

used, in terms of the level of comprehension achieved by subjects. The intent of the study being merely to examine and describe the strategies themselves, no attempt was made to investigate the superiority of one strategy over another for particular text segments. This could be attempted in future research.

The methodology of the study, namely the use of TOL protocols to investigate the on-line comprehension processes of readers, has several inherent limitations.

Firstly, TOLs are reflections rather than reproductions of the thought processes of subjects and therefore must be accepted with caution. The TOLs slow down and modify the natural reading process. The slowing down occurs through asking students to read a text orally that they would have otherwise read much faster silently. The "natural" reading process is altered by having the students read the text line-by-line, by preventing readers to forward-scan, or preview what was to follow in the passage.

While utmost care was taken to keep instructions general and to eliminate the use of cues, the practice and demonstration sessions themselves may have biased the TOLs of subjects.

As research data, the TOLs of subjects are relatively impoverished in that they may reveal only partial elements of the strategic activity occurring during reading. Thus verbalizations are to be taken as reflections rather than

reproductions of the mental activity of subjects during text processing.

The empirical procedures used during data analysis allowed the data to be analysed within its context. In other words, the classification system of strategies and moves represented a theory that was derived from the data and was used in turn to validate the data. Hence the findings are limited and presented with caution.

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Appendix A

Passages As Presented To Subjects

Text Passages as presented

Passage One: (154 words.)

STRANGE WILLS

Some people leave wills containing unusual or comical requests.

If the requests are legal, they must be carried out.

For instance, a rich Russian once left his daughters his fortune of four million rubles.

His will stated that each daughter, before she could collect her share, had to spend a year working as a servant on a farm or as a cleaning woman.

They all did the work and collected their money.

A Frenchman who loved good food left an order in his will that every day a different recipe should be pasted on his tombstone.

One of the funniest stories is not about a strange condition attached to a will but about the reason for the inheritance.

A man in the U.S. left his car to his chauffeur.

"He almost ruined them," the man wrote in his will, "and I want him to have the satisfaction of finishing the job."

From Barnell Loft
Multiple Skills Series
Level G3

Passage Two: (164 words.)

A DIFFERENT KIND OF WEDDING

A wedding in the Philippines has many unique features.

The festivities begin when friends of the bride and groom meet at the bride's house the day before.

People bring pigs, chickens, fruits, and vegetables for the wedding party.

They build a pala-pala, a tent with a roof of palm leaves and bamboo supports.

At one end is a kitchen.

The rest is used for eating and dancing.

The wedding ceremony takes place in a church.

Then the couple go to the pala-pala, with a band leading the way.

There is a counter at the pala-pala, where cigarettes and rice cakes are sold.

All profits go to the couple.

The highlight of the festivities is a dance which the newlyweds perform.

As they dance relatives pin money on their clothes, sometimes even deeds to property.

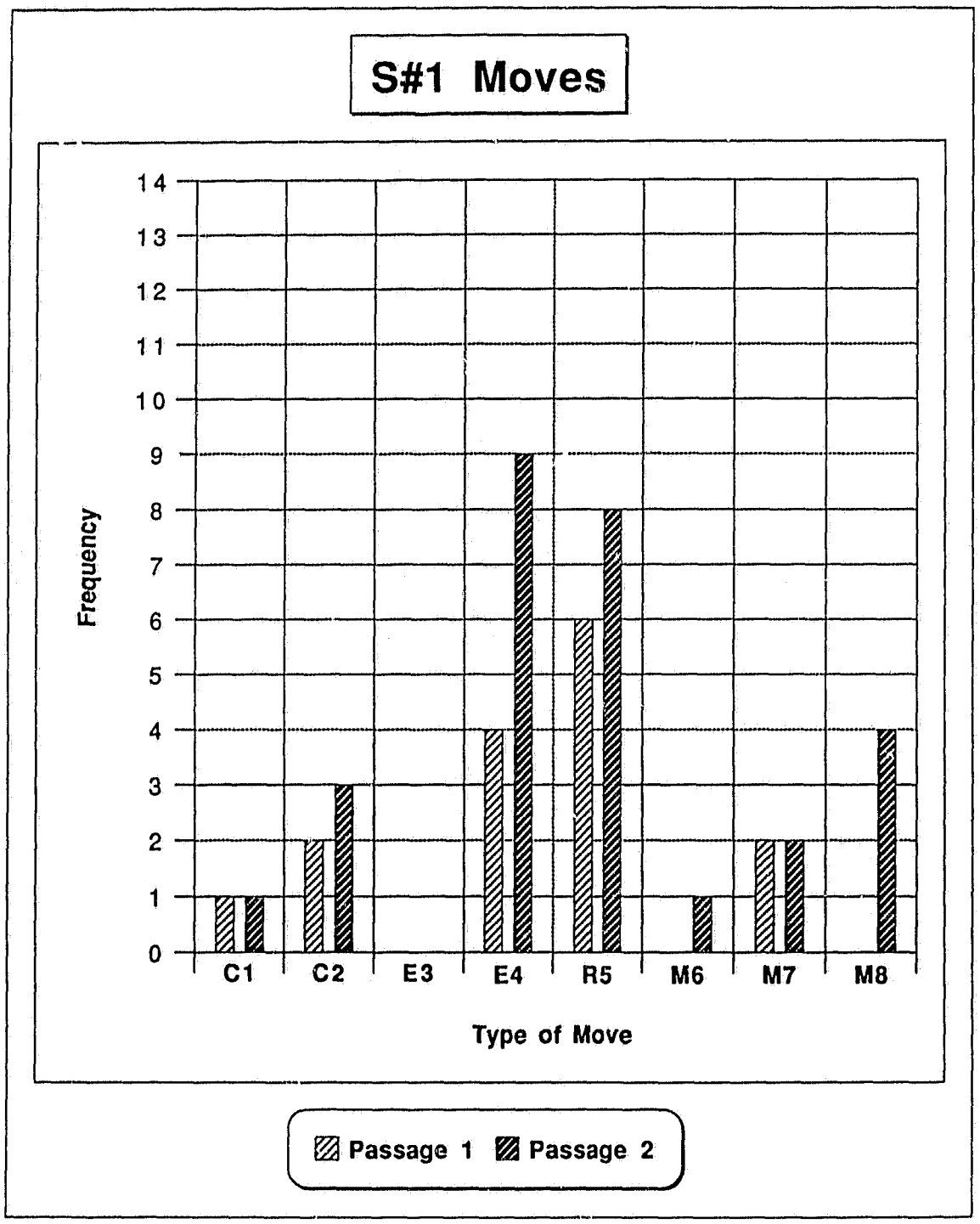
They dance three times, each session lasting about thirty minutes.

Everyone has a good time, and the bride and groom receive many presents.

From Barnell Loft
Multiple Skills Series
Level G4

Appendix B

Subject Profiles


S#1 Moves
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13
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11
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7
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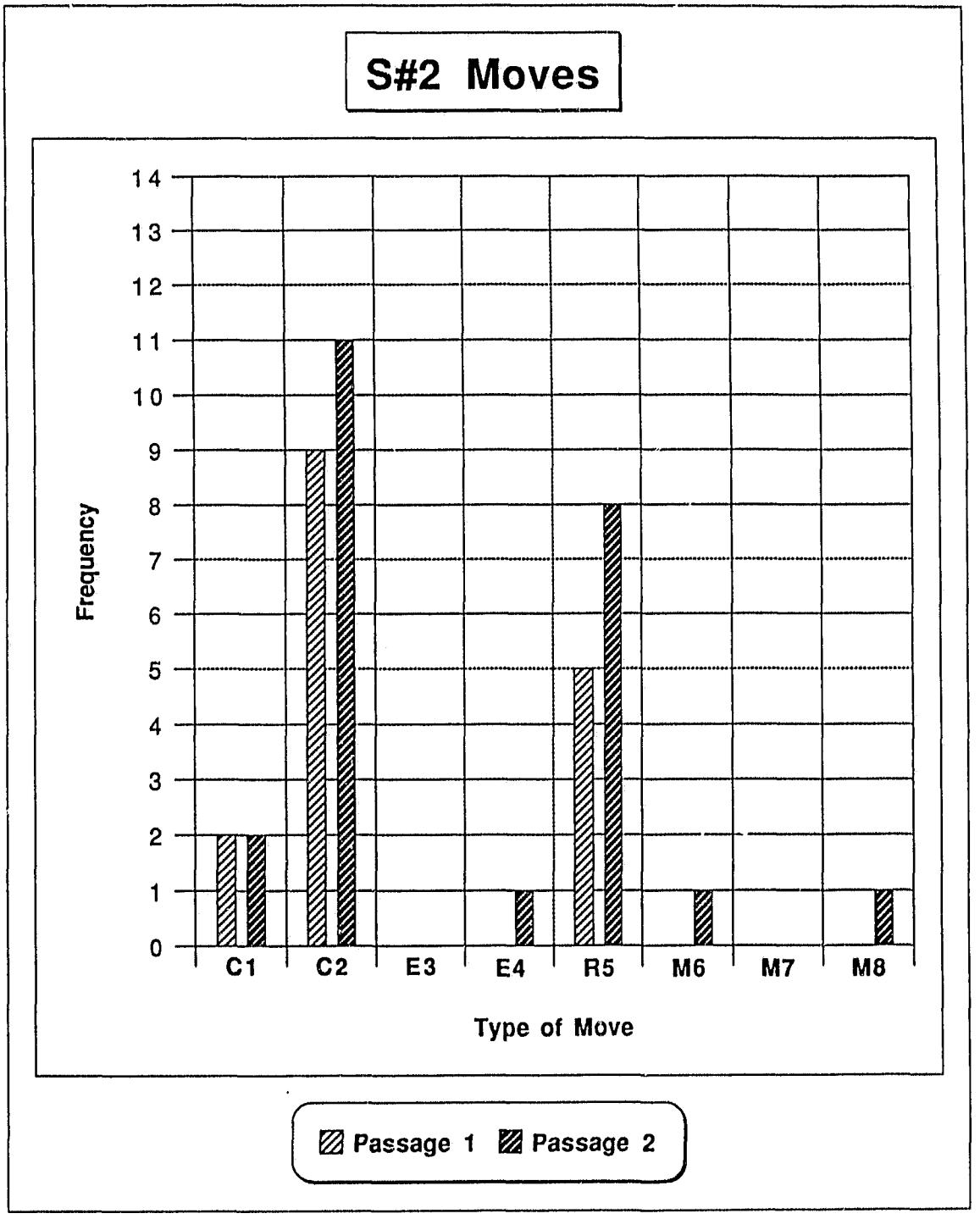
C1
C2
E3
E4
R5
M6
M7
M8
Type of Move
Passage 1
Passage 2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M7
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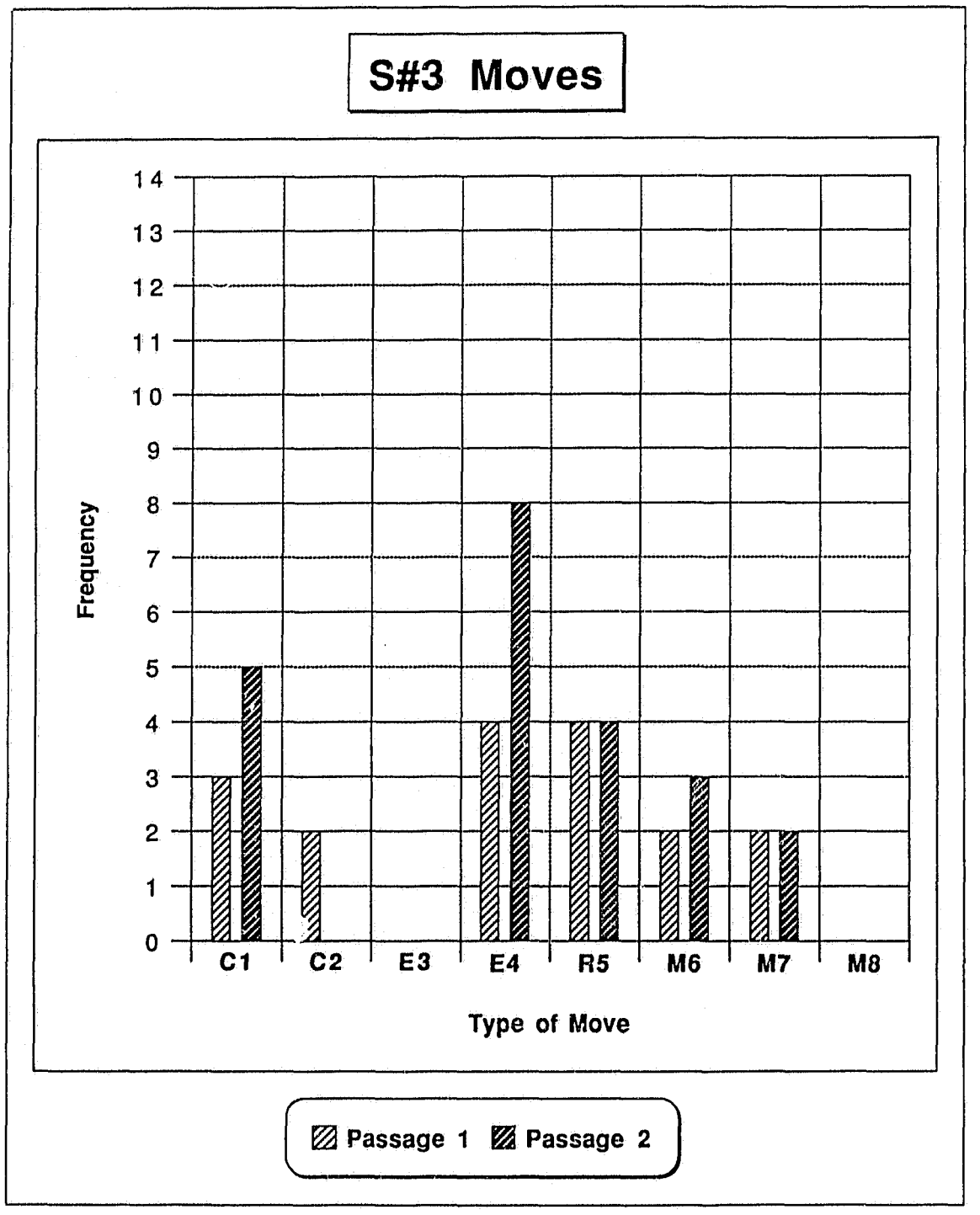
Type of Move
Passage 1
Passage 2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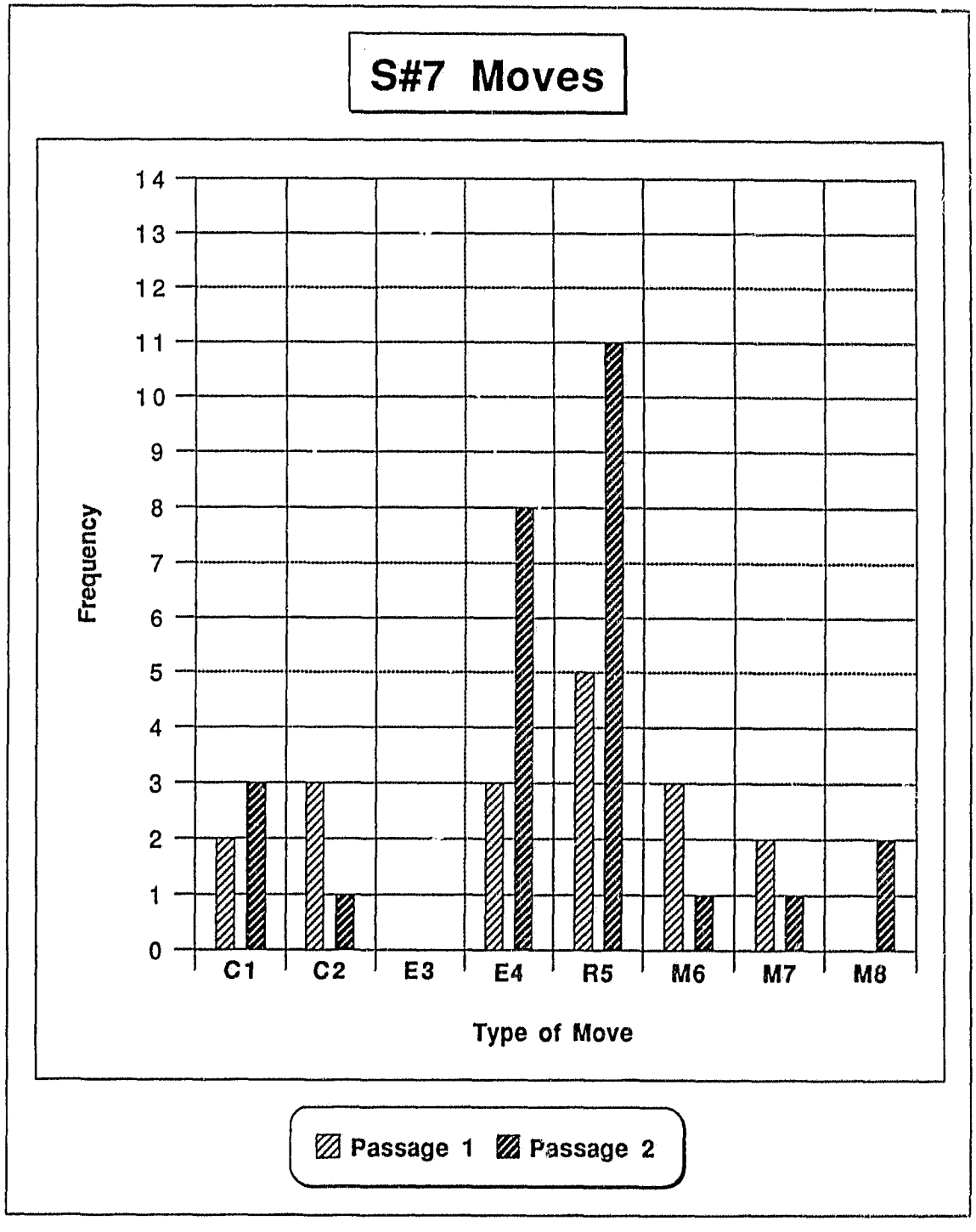
R5
M6
M7
M8
Type of Move
Passage 1
Passage 2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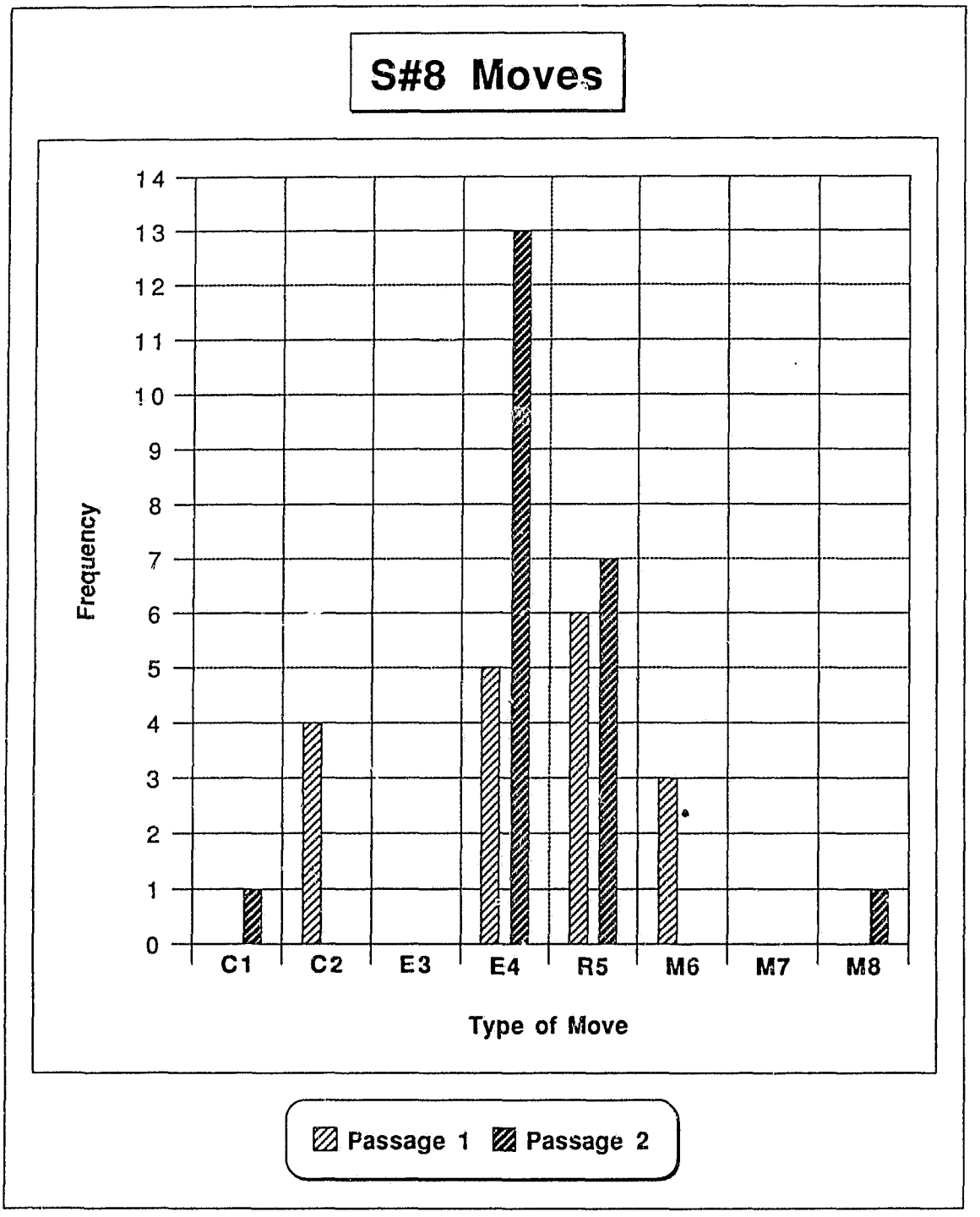
R5
M6
M7
M8
Type of Move
Passage 1
Passage 2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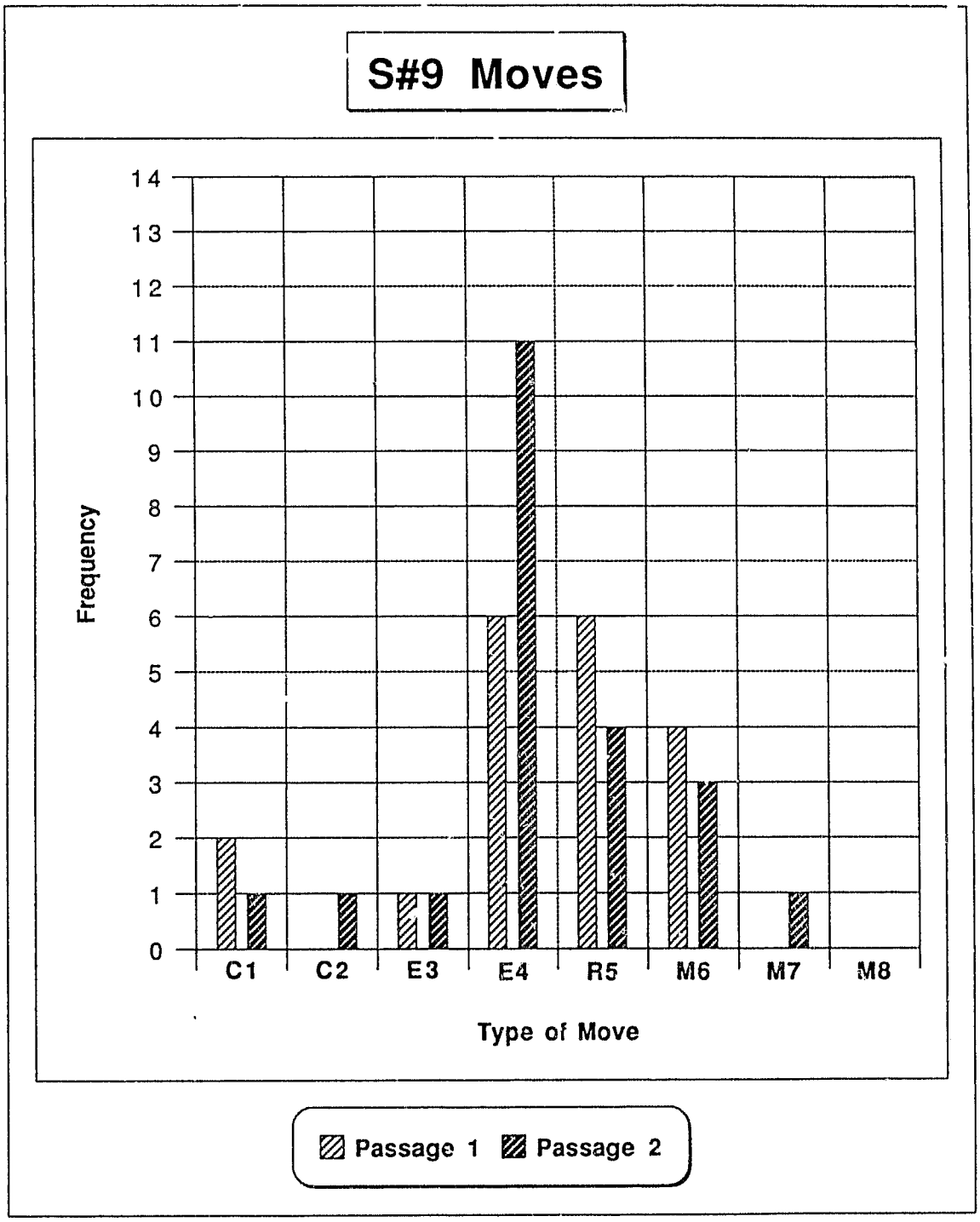
M8
Type of Move
Passage 1
Passage 2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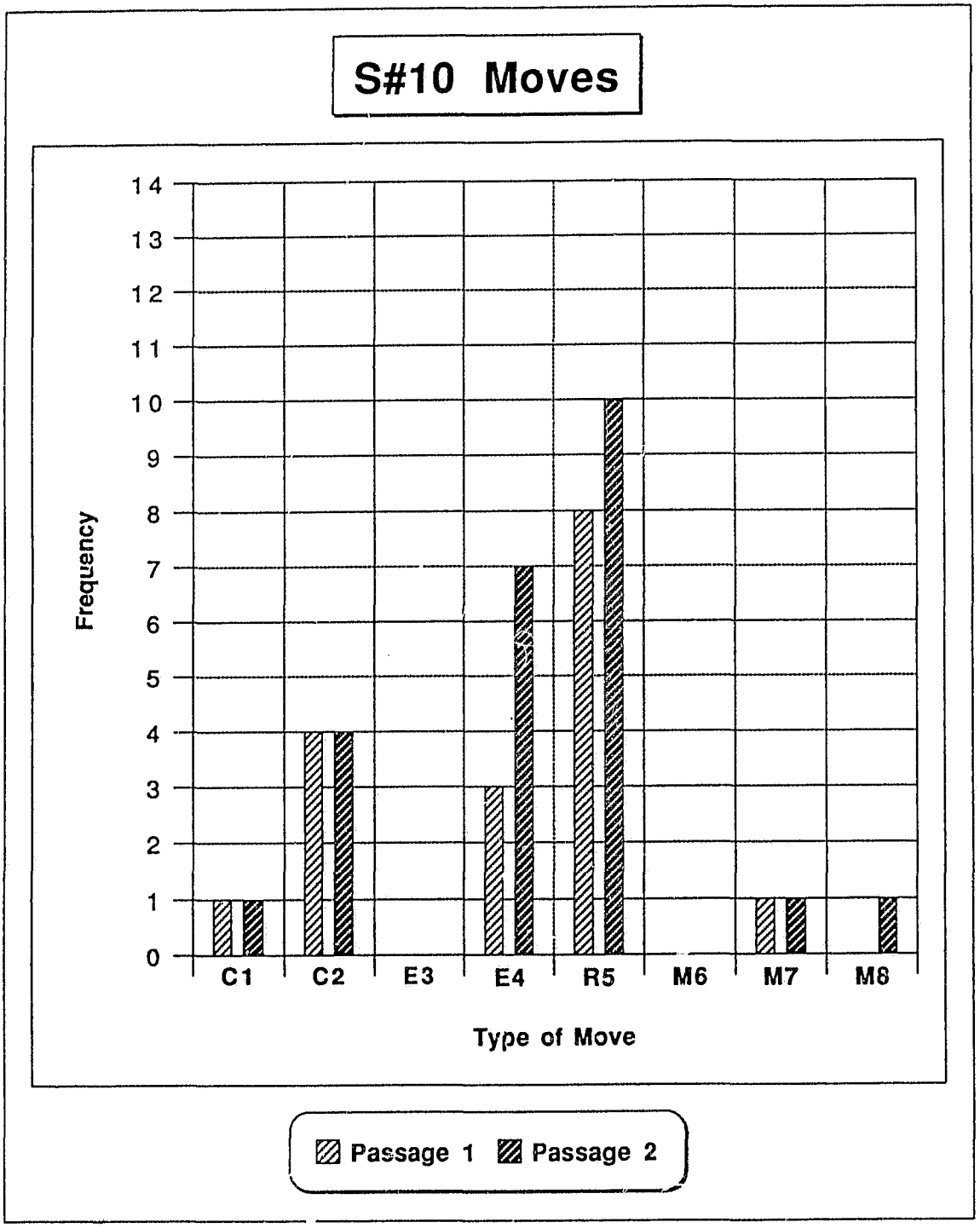
R5
M6
M7
M8
Type of Move
Passage 1
Passage 2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C2
E3
E4
R5
M6
M7
M8
Type of Move
Passage 1
Passage 2