

A STUDY OF STORY SCHEMA ACQUISITION AND ITS  
INFLUENCE ON BEGINNING READING

by

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DEDICATION

To My Parents

With gratitude to my father,  
    who always told me I could write,  
And to my mother,  
    who first taught me how.

## ACKNOWLEDGEMENTS

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## Chapter 1

### THE PROBLEM

#### Introduction

The fact that a significant number of children are not taught to read successfully in the nation's schools (Gibson and Levin, 1975) despite a proliferation of materials and the investment of substantial funds reflects, in part, the many unanswered questions educators have regarding the complex psychological processes involved in the comprehension of written discourse. The present study represents an investigation into an aspect of cognition believed to be important in reading the type of material generally encountered in elementary reading programs. Specifically, the investigation examined the between and within group differences among young children in their developmental acquisition of story schema. It also attempts to ascertain the degree to which a child's concept of a story is related to success in beginning reading.

#### Rationale

##### Story Schemata

The introduction into psychology of schemata, or abstract cognitive constructs, is generally credited to Bartlett (1932). In his investigations of human memory Bartlett found that people's memories for stories was hardly ever exact. Rather, a reconstruction seemed

to occur rendering the recalled stories closer to idealized stories than were the originally encoded stimuli. Bartlett concluded that story memory was a function not only of the structure of encoded material but was also influenced by cognitive structures which the listener had previously acquired. For many years thereafter Bartlett's work stood as the only investigation of the cognitive processes involved in the comprehension and recall of stories.

Recently, Rumelhart (1975) proposed a story grammar based on Bartlett's research and Propp's (1968) morphology of the folktale. Propp performed a complex analysis of the content and structure of stories from a linguistic and anthropological perspective (Propp, 1968). Despite variations in the semantic content, simple episodic stories were found to have a stable organizational pattern. Rumelhart was able to use this finding in delineating a set of rewrite rules which may describe the underlying cognitive structures used in the encoding, representation, and retrieval of story information.

In the Rumelhart grammar, a set of syntactical rules are specified which generate the constituent structure of stories, and a corresponding set of semantic interpretation rules are described which determine the semantic representations of the story. For example, the first syntactic rule is:

Rule 1: Story -- Setting + Episode

The rule states that a story consists of a setting followed by an episode. A "+" is used to denote two items in a sequence. The corresponding semantic rule is:

Rule 1': ALLOW (Setting, Episode)

This rule says, in effect, that the setting forms a structure into which the remainder of the story can be linked. The ALLOW relation specifies that the setting plays no integral part in the body of the story and under some conditions can be eliminated. The grammar continues to delineate 10 more rules which are set forth in the same manner (Rumelhart, 1975).

Rumelhart's characterization of story structure has proven to be seminal because of its emphasis on global structures which specify suprasentential relationships. Other researchers such as Mandler and Johnson (1977), and Stein and Glenn (1975) have used the Rumelhart grammar as the basis of their own analysis in attempting to account for a greater variety of stories.

Story grammars differ from the linguistic study of prose in that they attempt to specify the psychological structures which may guide the comprehension process and also because predictions concerning qualitative aspects of comprehension can be derived from them. In other words, story grammars are representations of schemata in that they specify the type of information that will occur in a story and the kinds of relationships that will exist between the information (Thorndyke, 1977; Stein and Glenn, 1975). Several researchers have undertaken investigations which have attempted to demonstrate that the semantic structure of memory is similar to the internal semantic structure of prose (Kintsch, 1974; Meyer, 1975; Bower, 1970). Some authors, including Kintsch, (1977) Frederiksen (1972), and Thorndyke (1977), have concluded that the structure of a passage is the single most important factor in predicting what will be comprehended and recalled.

Evidence for the existence of story schemata and their effects on the encoding and retrieval of information has been supplied in several studies some of which have used story grammars to analyze the semantic and syntactic features in a stimulus story for the purpose of comparing which propositions appear in later recall (Thorndyke, 1977; Mandler and Johnson, 1977; Stein and Glenn, 1979; Anderson and Pichert, 1978). The findings of these studies suggest that adult readers, as well as very young children, utilize mental frameworks in comprehending written discourse. Through a process of instantiation, incoming information appears to be matched against existing schema. These same constructs or schemata apparently act as retrieval plans in recall or as guides in output editing (Anderson and Pichert, 1978). Thus schemata function to alert the reader to important information during encoding and to aid in the selective recall of such information at retrieval. That good readers are highly selective about which information to process has been demonstrated by Meyer (1977). Her research suggests that effective readers recall the higher level propositions in a story, as identified by the story grammar, whereas poor readers seem to lack an overall organization and therefore tend to recall lower level propositions. This finding was supported in a study completed by McDonnell (1978) in which the ability of poor readers to comprehend and recall simple stories was improved by instruction in the use of story schema. Thus the research to date seems to indicate that comprehension is in part dependent on the preexistence of a schema and on the ability to engage the schema in processing incoming information (Thorndyke, 1977; Mandler and Johnson, 1977; Stein, 1978).

### Schemata: An Aspect of Top-down Processing

Schema theory represents a significantly different perspective than is exemplified by models of the reading process that emphasize the perceptual aspects of reading with a sequential, hierarchical view of comprehension (Gagne, 1970; Venezky and Calfee, 1970; Gough, 1972; LaBerge and Samuels, 1974). In the LaBerge and Samuels (1974) model there are alternative routes for the processing of graphemic input. For example, incoming information from the page may be analyzed first by detectors which process features. Next, the relevant features may be coded into letters. The "unitizing" of a word may then occur when the visual pattern and its phonological response are associated. At that point, it is assumed that the meaning of a word can be elicited. "Meaning units," or groups of words, are presumably scanned one-by-one by attention and are organized as a coherent whole; thus comprehension occurs. This model explains how graphemic input is translated into meaning codes. It specifies several routes, in addition to the one just described, that a visually presented word can take in the access of meaning. While other routes can access meaning more directly, the entire model is dependent upon graphemic input. For LaBerge and Samuels (1974), reading is primarily a data driven, sequential process.

In contrast, the model of reading proposed by Rumelhart (1976) presents an interactive view of the comprehension process. In his model, the phonological, syntactic and semantic systems in language as well as higher order levels of knowledge, for example, expectations based on past experience, or inferences based on context, simultaneously and

interactively contribute to the reader's comprehension of written discourse. Top-down processes, those that are concept driven, originating in cognitive structures; and bottom-up processes, those that are data driven, originating in the perception of graphemes, act in concert. In fact, Rumelhart (1979) maintains it is often the case that top-down processing may precede graphemic input, as when the reader approaches a page of discourse and, as a result of nonprint cues to meaning, begins to generate inferences, infer associations, and activate possible phonological representations.

The facilitative effects of story schema on comprehension may be one type of top-down processing. Schemata represent knowledge about language and the world which enable readers or listeners to make hypotheses about a text which fit their expectations. Schemata are also believed to let the reader or listener know when some part of a story is complete and can be stored or is incomplete and must be held until more information has been encoded (Mandler and Johnson, 1977).

#### The Acquisition of Story Schema

Children's acquisition of story schema is believed to occur over time through exposure to stories and as a function of knowledge about human social interaction (Bower, 1977; Mandler and Johnson, 1977; Stein and Glenn, 1979). Research suggests that children as young as four understand logical relationships and have some knowledge of story structure (Brown and Murphy, 1975; Poulson, Kintsch, Kintsch, and Premack, 1979).

In studies that have examined children's recall of stories

(Mandler and Johnson, 1977; Stein and Glenn, 1978) consistent differences have been observed across age groups in the processing of story information. These differences are presumed to be attributable in part to the developmental level of story schema. Variation in the performance of older children (ages 8 to 10) and that of younger children (age 6) has been reported in the total amount of recalled information (Mandler and Johnson, 1977; Stein and Glenn, 1978); in the saliency of particular story categories in recall (Mandler and Johnson, 1977; Stein and Glenn, 1978); and in children's ability to reorganize stories with deviant structures and to construct stories with coherent structures (Stein and Glenn, 1979). However, the range of developmental differences that exist within and between age groups, the percentage of children who have well developed schemata at the time of initial instruction in reading, and the developmental changes in story schema that occur over an academic year have not been investigated to date.

This information would be valuable in light of what is now suspected concerning the role of top-down processing in reading. If children learning to read in first and second grade are unable to engage a schema in comprehending a story, their processing of story information may be hampered. Where the facilitative effect of a macrostructure is not optimally influential in comprehension, there may be a greater reliance on data driven processing. Research suggests that such a reading style does characterize many disabled readers (Neville and Pugh, 1977).



### Reading Readiness Practices

Over the past thirty years psychological theories have influenced the field of reading and the conceptualization of the reading process that has been the basis of instructional programs. Thus, it is not surprising that the perceptual skills of the beginning reader have received more attention from researchers, curriculum developers and teachers, than has the child's internal representation of knowledge. In her investigation of reading readiness practices among kindergarten teachers, Ross (1974) found that the majority of the teachers she sampled relied on children's auditory and visual perception skills in assessing readiness for reading. Correspondingly, Downing (1972) reported that the majority of commercially available materials designed to prepare children for the task of reading consists of batteries of perceptual training activities planned to improve children's visual and auditory discrimination abilities.

In addition to perceptual training, most kindergarten and first grade classrooms stress language activities in readiness programs (Ross, 1974; Wilson, 1976; Fry, 1977) which often revolve around the oral reading and discussion of stories. Fry (1977) expressed the view of many educators in observing that the practice of reading stories to children is an important and beneficial language arts exercise. In light of recent research, this practice may have the profound effect of helping to develop children's story schema, which in turn may be a significant factor in the understanding and recall of stories they will read on their own. To date, readiness batteries do not measure this developmental knowledge (Rude, 1973), but it would not be surprising if teachers have

an implicit awareness of it through their interaction with children. However, before instructional programs are modified to facilitate further children's acquisition of story schema, two research questions must be answered: first, the relationship between children's concept of a story at the outset of instruction in reading and their subsequent achievement in reading must be established; secondly, the processing differences between those children who have well developed schemata and those who don't must be identified.

#### Statement of the Problem

The literature suggests that preexisting cognitive constructs, which develop over time, enable readers to instantiate specific elements in a story. Encoding and retrieval of narrative discourse seem to be facilitated by schemata which are themselves aspects of top-down processing as delineated by Rumelhart (1976). The literature further suggests that to the extent a reader possesses a schema corresponding to the structure of a passage, to that extent is comprehension and recall possible. This study investigated the between and within group developmental differences among children in four groups, a pre-school program, kindergarten, first grade, and second grade, relative to the acquisition of story schemata, and attempted to delineate the change that occurred over an academic year in the development of story schemata within these age groups. It also determined the degree to which success in beginning reading can be correlated with the preexisting knowledge of story structure.

The first purpose of this study, then, was to identify the between

and within group differences that exist among young children in their acquisition of story schema and in their processing of story information. These differences were identified by an examination of the developmental level of story schema acquisition and the concomitant processing of story information exhibited by each child in a sample of preschool, kindergarten, first, and second graders. In order to assess these aspects of cognition, a series of experimental tasks was carried out with each child participating in the study. The tasks selected were chosen on the basis of previous research suggesting that children's performance on these measures varies with their developmental level of story schema, and because the type of analysis that can be performed on the resulting protocols lends insight into differences in processing of story information that characterize children at varying stages of story schema development. Specifically, these experimental procedures were designed to assess:

1. metacognitive knowledge of story structure
2. the ability to detect structural variations in a story
3. the ability to recognize that information is missing in a familiar story and to supply it
4. the ability to infer causal connectors
5. the degree to which story schema is reflected in written stories (produced by first and second grade subjects).

The research supporting these tasks will be reviewed in Chapter two.

The second purpose of this study, to describe the developmental changes in story schema that take place over the course of an academic year, was achieved through a comparison of the participant's performance on experimental tasks one through four in the beginning of the

school year and again at the end of the year. Conclusions were drawn from an analysis of these two data collections as to the type of story schema development that occurred, within the age groups under study during this time period.

The third purpose was to assess the value of story schema as a predictor of success in beginning reading. For the first and second graders this determination was made through a comparison of the children's performance on the experimental tasks with their progress in learning to read. Progress in reading was measured by the administration of a standardized reading test at the beginning of the school year and again at the conclusion of the year. For the kindergarten and four year old children the experimental data was used for descriptive purposes and was not correlated with classroom performance.

## Chapter 2

### REVIEW OF THE LITERATURE

#### Introduction

Adams and Collins (1979) have described the traditional approach to the analysis of the reading process as one which begins with the product of reading, the comprehension of written discourse, and works backward attempting to identify the prerequisite perceptual and cognitive operations. The goal of reading, an understanding of the meaning intended by the author, is thus seen as being dependent on the comprehension of individual sentences. The comprehension of sentences is regarded as dependent on the accurate processing of phrases and clauses, which in turn depends upon the reader having successfully recognized individual words. Word recognition is viewed as a product of the successful perception of word parts, individual letters.

This analysis of the reading process results in a model of reading which is data-driven, sequential, and hierarchical. Viewed this way, the attainment of comprehension at any given level: text, paragraph, sentence, phrase or word, appears to be dependent on accurate processing at the lower levels. The process is, in this sense, unidirectional. This unidirectional and sequential flow of processing appears to be supported by the fact that capable readers comprehend phrases and sentences whether or not they are embedded in larger contexts. In the same way, individual letters are recognized in isolation, as well as in

words. This seeming asymmetrical nature of reading, which has been the basis of past analyses of reading, has influenced the nature of research and the design of instructional programs. As a result, while there have been a great many investigations of word recognition, research focusing on text comprehension has received considerably less attention. While comprehension is the recognized goal of reading programs, most instruction is not in fact aimed at developing comprehension (Durkin, 1979).

Although research on the higher order processes in reading is still in the embryonic stage, there is ample evidence to suggest that reading is a concept driven as well as a data driven process; that it requires simultaneous as well as sequential operations; and that it is characterized by interactive rather than hierarchical processing (Adams and Collins, 1979). The notion that abstract cognitive structures or schemata are used in the encoding and retrieval of information in fact rests on these prior assumptions about the nature of information processing.

Therefore, to provide a theoretical foundation for this study, the research supporting a schema-theoretic view of reading will be examined along with those studies dealing specifically with story schemas as they appear to be operative in young children. The review will also include a consideration of research findings related to predictive factors of success in beginning reading.

#### Research in Support of an Interactive Model of Reading

Data driven models of the reading process such as those proposed

by Roberts and Lunzar (1968), Venezky and Calfee (1970), Gough (1972), Mackworth (1972), and LaBerge and Samuels (1974), all specify slightly different transformations, yet they are similar in that they each presume the reading process begins with the perception of letters and words, followed by cognitive operations for retrieval of word meanings, ending with the relation of new information to previously stored information. In this sequential organization, effects of higher order processes on lower level stages is presumed to be nonexistent. Likewise, no stage in these models can be eliminated, although some processes are viewed as simultaneous when they become automatic (LaBerge and Samuels, 1974). But in general, operations at higher levels are not conceived as influencing those at lower levels (Rumelhart, 1976).

One problem with the view of reading proposed by such models is that when reading meaningful discourse, one is not processing component letters, words and sentences in the same manner as when one reads them in isolation. In reading meaningful material, higher order information does seem to influence lower order processing. Evidence for this assertion can be found in the research relating to processing graphemic input under various conditions. Niles (1974) found that the amount of visual information required for letter recognition is affected by the reader's implicit knowledge of its statistical probability of occurrence in an orthographic pattern as well as by its featural aspects. Studies by Reicher (1969) report that letters become more perceptible when they are embedded in words; Tulving and Gold (1963) and Schuberth and Eimas (1977) found that individual words are recognized more easily when read in the context of meaningful sentences. Wittrack, Marks and Dactorow

(1975) reported that unfamiliar words may be processed more easily if they appear in a familiar story. Thus, the perceptual task of the skilled reader is greatly facilitated by the effects of syntax and semantics on word recognition. Rather than laboriously processing every graphemic detail, the competent reader uses higher order knowledge about the content of a passage to control the amount of lower processing required for comprehension. Not only is ease of processing influenced by expectation related to context, but speed of processing is affected as well. The results of studies by Morton (1964) and Meyer, Schvaneveldt and Ruddy (1974) show that when readers increase their expectations, as when anticipating related words, their speed of processing, as determined by rate of word recognition, also increases.

Further evidence for the influence of higher level processes on sensory input is provided by the research on miscue analysis of oral reading errors. If a reader's expectation, based on the syntax of a sentence, had no influence on the lower level of perceptual processing, then oral reading errors should reflect the graphemic features of a word. Several studies demonstrate that this is not the case. Goodman (1970) found that oral reading miscues are most often syntactically and semantically similar to the text word. Kolers (1970), Weber (1970) and Stevens and Rumelhart (1975) reported similar findings.

Efficient processing by good readers appears to be a simultaneous interaction involving the minimal use of lower order visual information in concert, and dependent upon, the influence of higher order or non-visual information (Smith, 1978). Support for this notion of the differential interaction of lower and higher order information was supplied



by Sawyer (1976). She found that skilled readers recognize constrained, that is, highly predictable grammatical structures under less favorable visual conditions than unconstrained grammatical structures. These results demonstrated that readers rely more on data driven perceptual processing when necessary, as was the case when the structures were less predictable. When the stimulus was predictable, subjects were able to rely on higher order processes in the absence of clear graphemic input.

To summarize, the influence of semantic and syntactic processing on the sensory perceptual aspects of reading greatly complicates the task of analyzing the reading process. The literature examined here suggests that reading may involve more than linear, data driven, hierarchical processes. Input data appear to require a framework which enables the reader to construct meaning through the interaction of lower and higher order processes. While the research on semantic and syntactic constraints in word recognition lends support to the notion of interactive processes in reading, recent investigations into the role of cognitive structures in comprehension and recall provides, perhaps, even more dramatic evidence for an interactive model of reading.

#### Schema Theory and Reading

It is generally accepted that people have knowledge about language and that this knowledge is reflected in the influence of semantic and syntactic processes during reading. A more basic question concerns the type of cognitive processes or structures that function to organize this linguistic knowledge. Through the combined efforts of cognitive psychologists, linguists, and specialists in artificial intelligence,

one possible answer to this question of how linguistic functions are organized has been proposed in the form of a new construct for analyzing language comprehension, schema theory. Some theorists maintain that for the first time, schema theory provides a structure powerful enough to support the interactions among different levels of processing in reading (Adams and Collins, 1979). Schema literature is well established and is growing rapidly. The studies cited here are representative of this body of research.

A schema can be defined very simply as an organized representation of a person's knowledge about some concept, action, or event, or a larger unit of knowledge (Kintsch, 1974). Or, it can be described more extensively. Adams and Collins (1979), for example, define a schema as a description of a particular class of concepts made up of a hierarchy of schemata embedded within schemata. The representation at the top is sufficiently general to include the essential aspects of all members of the class. In their conceptualization, as one descends in the hierarchy, the number of embedded schemata multiplies while the scope of each narrows until, at the bottom level, schemata apply to unique perceptual events. Each schemata at each level in the hierarchy is composed of descriptions of the important components of its meaning and their interrelationships. Adams and Collins (1979) maintain that the power of this structure derives from the fact that the top level representation of any schema simultaneously provides an abstraction of and a conceptual frame for all the particular events that fall within its domain.

A hierarchical view of cognitive structure was reported by Bower in 1970. In his review of the research of organizational factors in

memory, Bower (1970) reported that the preferred strategy of the adult, as demonstrated in the studies he reviewed, is to chunk information into small groups, aggregating the chunks into an organized hierarchy. Bower (1970) does not resolve whether hierarchical structures actually exist in the natural world, or whether the mind's rational reconstruction of nature is predisposed towards projecting hierarchical structure upon the world because they best suit the human capability and limitations of information processing. He does report that the organization of cognitive representations often appears to be hierarchical, representing information as a list of sublists, as in the Adams and Collins (1979) description of a schema.

The function of schemata in processing incoming information has been elaborated by Rumelhart and Ortony (1977) who maintain that comprehension is the process of selecting schemata that can account for the material to be comprehended, and then verifying that the schemata do in fact account for it. This procedure of simultaneous interaction between top-down, or concept driven processes, and bottom-up, or data driven processes, is at the heart of the Rumelhart interactive model of reading.

The predictions a reader can make as a result of his knowledge implicit in schemata facilitate information processing at all levels. Recently, Adams (1979) proposed a model of word recognition involving two kinds of interactive processes that take place at the same time. The first depends on the interconnections between schemata at the letter level, where one letter triggers an expectation for another letter; the second depends on the structure within schemata at the word level, where competing words are looking for letters to fill their respective slots.

This interactive account of word recognition is clearly in terms of schema theory, in that it is based on the assumption that schemata that are repeatedly activated simultaneously become associated such that the activation of one of them triggers the activation of others. Adams (1979) ran a series of experiments that compared the visual processing of words, pseudowords, and orthographically irregular non-words, the results of which supported her hypothesis that recognizing words involves the simultaneous interaction of analysis at both the letter and word level.

At the semantic level, the weight of the research suggests that schemata are powerful influences on comprehension. As was previously noted, Rumelhart and Ortony (1977) assert that comprehension occurs when a set of schemata, matched to incoming information, appears to give a sufficient account of the information. The element within a schema essential to this match can be thought of as a "slot" (Minsky, 1975). A slot can accept any of the range of values represented within the schemata. The comprehension process thus involves the instantiation of certain variables with particular exemplars (Minsky, 1975). In the same way that schemata function in the construction of meaning, they also influence the reconstructive processes in recall. According to Rumelhart and Ortony (1977), just as comprehension uses schemata to assist in interpreting sensory input, memory utilizes schemata to assist in interpreting fragmented storage.

The assistance of schemata in recall was first reported in psychology by Bartlett (1932). In his investigations of the comprehension and recall of stories, Bartlett found that condensation, elaboration and invention are usual features of ordinary remembering. Bartlett maintained

that most reconstruction during recall occurs as a result of people retaining only the gist of a story and inferring the details through the use of the schemata they have available. The fact that recalled stories were more stereotypic than the original stimulus and were sometimes given a meaning or coherence when memory had become quite distorted was further evidence for Bartlett that remembering is schematically determined.

Additional support for the use of schematic macrostructure in the comprehension and recall of prose was provided by Thorndyke (1975). In this experiment, subjects were presented with, and later asked to recall, passages in one of four story conditions, ranging from highly stereotypical to one with very little organization provided by temporal or causal event sequencing. In addition, sentence order for each condition was either normal or random. The results indicated that coherent stories are more easily comprehended during encoding because their structures conform to the reader's predictions. The findings also support the notion that abstract story frameworks (schemata) provide a restrictive set of retrieval cues which are used in generating the recall of story components.

The role of schemata in inferencing during encoding was explored by Frederiksen (1975). In this study, subjects were given a problem relative to a text they were to read. Frederiksen assumed that as the subjects read the passage they would search for solutions, thereby generating plausible inferences and causing the text to be processed selectively. The recall of these subjects was contrasted with those of subjects who simply listened and then recalled the content. Results indicated that the context produced significant effects on the amount of derived information as predicted. The principal long-term change in retention was

the loss of reproduced information; derived information was retained to a greater extent. These results demonstrate the effects of the encoder's own knowledge schemata on the construction of initial comprehension and the later reconstruction of meaning during recall.

In a study of inferential comprehension, Day (1979) presented pre-school children with a group of pictures in a linear sequence and asked them to make up a story; a recall followed. There were two conditions: story normal order in which the pictures were arranged so as to conform to the expected sequence of a story, and a consequence moved condition, where the consequence picture was placed immediately after the first picture. The results indicated that the ordering of the pictures affected the encoding of information and later recall. Children in the consequence moved condition derived more information from certain pictures in an effort to construct a coherent story, one which represented their internal macrostructures. However, those children reported fewer statements in recall. These results indicate once again the adverse effects on comprehension and recall when the schemata of the encoder is at variance with the incoming data. They also reflect the struggle of the encoder to achieve a fit between the bottom-up incoming data and the slots available in schemata. To the extent that the fit is achieved, to that extent the person comprehends.

#### SUMMARY: READING RESEARCH

The research reviewed here supports the simultaneous bottom-up top-down mode of processing in an interactive schema-theoretic view of reading. The findings cited here indicate that the data required to

instantiate or fill out schemata become available through bottom-up processing; top-down processing has been shown to facilitate not only the assimilation of meaningful chunks at the macrostructural level, but also to influence lower level processing at the semantic, syntactic, and perceptual levels. Data driven processing has been demonstrated to alert readers to incoming information that is novel or that is not congruent with their predictions about the content of a text. Top-down processes have been shown to help the reader or listener resolve ambiguities or to select between alternative constructions of the incoming data. Thus the research findings support the theoretical notion that input events are mapped against an internal abstract construct. To the extent that the input is compatible with existing schemata, comprehension and recall are possible (Bobrow and Norman, 1975).

### The Processing of Story Information in Children

#### The Development of Story Grammars

The study of stories as representations of culture has been of interest to anthropologists and linguists for some time. In their complex analyses of stories, researchers in these fields have noted differences relating to values, social customs, and mores. However, they have also reported remarkable consistency in organizational patterns within stories and in the logical relations connecting story parts (Levi-Strauss, 1955; Prince, 1973; Propp, 1958).

None of these investigations addressed the questions of most interest to psychologists and educators: namely, how do preexisting cognitive structures influence the comprehension of simple narratives,

and does the structure of a story reside in the mind of the reader or in the text of the story? This question of the source of story structure intrigued Propp (1958), who noted that the similar form of fairy tales across cultures indicates that they all may originate from a single source. Propp suggests that this unitary source may be a psychological, rather than a geographical one.

Recently, researchers interested in the process of story comprehension set about the task of determining the nature of the relationship between text structure and the cognitive structures used to guide the representation of story material. In order to undertake a systematic study of the comprehension process it became necessary to devise a clear method for defining and quantifying the information contained in prose. In 1975 Kintsch and vanDijk proposed a story grammar based on their study of narratives in Western European cultures and in the same year, Rumelhart (1975) published his grammar based on Propp's (1958) morphology of the folktale. Both of these grammars represented a theoretical model of the strategies, operations, and structures inherent in the processor of story information.

Kintsch and vanDijk (1975) reported that the narratives they analyzed consisted of a setting that specified time and place, plus one or more episodes. Each episode was found to describe an event involving the hero of the story either directly or indirectly. The event itself was composed of a complication followed by a resolution. Kintsch and vanDijk reported that in the simplest type of story, events are connected both temporally and causally. They formulated a tree diagram showing the macrostructure of such a story. According to these authors, the macrostructure is schema based; comprehension involves the cognitive mapping



of incoming data on the reader's existing schema. They hypothesized further that subjects summarize a story by basing their summaries directly on these macrostructure propositions. This hypothesis was supported in an experiment where subjects read and summarized a passage with a familiar structure. Intra-subject agreement as to what was included in a 60 to 80 word summary of an 1800 word story was very high as contrasted to a group of subjects who read and summarized a text with a unfamiliar structure. Summaries for the second group did not reflect the construction of a macrostructure.

In this same study, Kintsch and vanDijk (1975) compared summaries written by subjects who had read stories with randomly arranged paragraphs and other subjects who had read normal stories. It took the subjects in the random order longer to read the stories, but their summaries were not distinguishable from those who had read the normally ordered stories. Thus, although reading a disorganized passage was apparently more difficult, people were able to use their preexisting schemata to reorganize the story to conform to the hierarchy delineated by the story grammar.

An interesting aspect of the Kintsch and vanDijk macrostructure is that the story moral is at the top-level node in the tree structure, indicating it should be highly salient in recall. Later research by Nezworski, Stein and Trabasso (1978) gave direct support for this feature of Kintsch's analysis. The Kintsch and vanDijk grammar does not specify how macrostructure propositions are derived from a text. Rumelhart's 1975 grammar does generate the required kind of inferences that people must make in order to derive many macrostructure propositions from the text.

The Rumelhart (1975) grammar consists of a set of syntactical rules which generate the constituent structure of stories and a corresponding set of semantic interpretation rules which determine the semantic representation of the story. Rumelhart, like Kintsch and vanDijk, developed a graphic representation of a simple story in two dimensions. In the Rumelhart schema, the primary unit of analysis is an informational node or category which is defined by the type of information contained in a story and by its function in the story. Categories (events and episodes) are represented by high level nodes in a hierarchical network with single propositions as terminal nodes. Sentences in a story are parsed and mapped onto the tree structure. Rumelhart believes that some variation of this schema is represented in memory. He maintains that once a schema has been found for a story, the person has, in effect, constructed a structure diagram for the story. Some transformations of the structure diagram constitutes the long term representation of the story in memory (Rumelhart, 1977). The recall process is thus viewed as the locating, in memory, of the stored traces of the originally encoded material and then using the available schemata to reconstruct the original story. Two conclusions follow from this conceptualization: first is that nodes high in the tree structure should be better recalled than lower level propositions; and, secondly distortions will occur in the encoding of stories or in their reconstruction or both. Each of these hypotheses have been supported by the research (Barlett, 1932; Thorndyke, 1975; Rumelhart, 1977).

The Rumelhart (1975) grammar was a theoretically elegant attempt at specifying the underlying cognitive structures used to encode, represent,

and retrieve story information. However, several investigators found it difficult to use in the analysis of many different stories, and, as a result, modified the Rumelhart grammar to account for the underlying representation of a wider variety of stories (Stein and Glenn, 1975; Mandler and Johnson, 1977; Thorndyke, 1977). The Stein and Glenn (1975) grammar has been used in several studies of story comprehension and recall among young children which are reviewed in the next chapter. It also provides the basis for the experimental tasks used in this research. For these reasons, the grammar is discussed here in some detail.

The Stein and Glenn (1975) grammar, like Rumelhart's (1975), makes several assumptions. First, it assumes that story information has some type of internal representation; secondly, that this internal construct can be described as a network of categories and the logical relations which exist between these categories. Finally, it assumes that the internal structural network of informational categories is hierarchical. The logical order to the occurrence of each category is indicated by the hierarchical organization of the schemata. The relations between the categories determine the extent to which a preceding category influences the occurrence of the subordinate categories. These specific categories for relations between, as well as within episodes, represents a refinement of the Rumelhart grammar.

According to the Stein and Glenn (1975) grammar, a simple story can be divided into two parts: a setting category plus an episode structure. The setting includes an introduction to the main character and also typically includes information about the social, physical, or temporal context for the remainder of the story. The episode structure,

which is considered the higher order unit of analysis, is connected to the setting by an ALLOW relation and consists of a sequence of five categories: an initiating event which may be an action; an internal motivation or a natural event which serves to initiate or to cause; an internal response which can be an emotion, cognition, or goal of the main character; an attempt which is an overt action on the part of the protagonist to obtain his goal; a consequence which marks the attainment or nonattainment of the protagonist's goal; and the reaction which is an expression of the main character's feelings relating to his success or failure in attaining the goal. Each category in the episode logically follows the preceding one. According to the grammar, these categories always occur in a specific temporal sequence in a well-constituted story. Although some categories may be omitted in an episode, Stein (1978) maintains that deleted categories are inferred during the encoding process and are therefore represented in the underlying cognitive structure.

Stein and Glenn (1975) note that very few stories can be represented by the structure of a simple episode. Most folktales contain two or more separate episodes, any two of which can be connected by the three relations: AND, THEN, and CAUSE. The most common relations between episodes are the THEN and CAUSE relations. The THEN relation pertains when two episodes occur in a temporal sequence where the first sets up the necessary preconditions for the second but is not a direct cause of the second episode. The CAUSE relation, on the other hand, does imply a direct causal connection between two episodes. The AND relation indicates that one episode is occurring at the same time as another. A fourth type of episode relation occurs in many stories when one episode

begins after a previous episode has begun and the second ends either before or simultaneously with the first. This occurrence is defined as the embedded episode relation (Stein and Glenn, 1975). In order for an episode to be complete, these researchers have described the following as basic requirements which must be met: 1) the sequence must contain some reference to the character's motivation; 2) a goal-directed action must occur; 3) the achievement or nonachievement of the goal must be specified. Therefore, the essential categories in an episode are: 1) the initiating event which reveals the reason for the goal or an internal response which typically includes the goal; 2) an attempt to achieve the goal; 3) a direct consequence. These essential categories will form the basis for the first experimental task in this study which is an assessment of children's metacognitive knowledge of story structure.

#### Quality and Quantity of Story Recall

In their 1975 study of story comprehension and recall among elementary school children, Stein and Glenn used their grammar as a methodological tool for analyzing the way children process story information. They were particularly interested in the following issues: the degree of organization in recall; the developmental changes present in the amount of information recalled or in the pattern of recall; and the degree to which the categories represented in the grammar correspond to the way children chunk information for recall.

To answer these questions the researchers assessed the comprehension and recall of 24 first graders, and an equal number of fifth graders, individually. The experimenters read one of four stories, a counting

task followed, after which the child was asked to recall the story verbally. A second story was then read followed by the same procedure. Delayed recalls, taken a week later, were parsed into the appropriate category specified by the grammar.

With regard to the developmental differences in the amount of information recalled, the data revealed that the fifth graders always recalled more informational categories than the first graders on immediate recall. On the delayed recall measure, the fifth graders maintained their superiority for three of the four stories. When the recall protocols were analyzed according to the seven primary categories occurring in an episode, the only category which showed significant grade level effects on all four stories was the internal response with fifth graders recalling significantly more statements in this category than the younger children. Although the amount of recall demonstrated developmental differences, the pattern of item salience was highly consistent over grade and time conditions. In all stories, the major setting category was the best remembered, followed by initiating events and direct consequences. The attempt category was fourth in all of the ranks except for one story where it was fifth. Internal responses and minor settings were always recalled in the last three positions in the rank order.

The researchers noted that the internal response category contained events, goals, affects, cognitions, and plans and is therefore the most diverse category in the grammar. The types of internal responses that were recalled most frequently were the major goal of the protagonist. On the basis of this finding it was concluded that major goal statements may be remembered differently than other types of

information in the internal response category.

The recall protocols were also examined for transformations. As in previous research with adults (Barlett, 1932) certain types of alterations occurred consistently, including substitution of words, deletions and additions. There was one developmental difference of note; 10% of the first graders had difficulty remembering who the main character was whereas the fifth graders did not. The younger children confused the actions of agents in the story or substituted characters extraneous to the story. These substitutions, however, did not affect the logical coherence of the recall.

Two other investigators (Mandler and Johnson, 1977) interested in story schema acquisition, reported a developmental study of story recall that utilized a grammar of their own creation. Like the Stein and Glenn (1975) grammar, the Mandler and Johnson grammar is based on Rumelhart's (1975) characterization of story structure, and is a description of an idealized internal representation of a simple story and the relations that pertain between story parts. Although differences exist between the Mandler and Johnson and Stein and Glenn grammars, their basic similarity is reflected in the Mandler and Johnson description of an episode. These researchers maintain that the essential structure of a single episode story is that a protagonist is introduced in the setting; there follows an episode in which something happens, causing the protagonist to respond to it, which in turn brings about some event or state of affairs that ends the episode. According to Mandler and Johnson, the simplest story must have at least four propositions, representing a setting, beginning, development, and ending, if it is to be considered

a story (Mandler and Johnson, 1977).

Mandler and Johnson (1977) investigated 21 subjects, including first graders, fourth graders, and university students, who heard and recalled two stories each; one story was recalled after a 10 minute interval, the second 24 hours later. The transcribed protocols were then scored for the presence or absence of each story proposition. The data from the immediate and delay conditions were highly similar and were therefore collapsed. The recall of the first graders formed two clusters: settings, beginnings, and outcomes were well recalled; attempts, endings, and reactions were poorly recalled. Internal reactions and the final ending of the story were omitted by most of the first graders. These findings are entirely consistent with those of Stein and Glenn (1975). Among the fourth graders a similar pattern of recall was observed, although there was no longer a significant difference in their recall of attempts and outcomes. Adults recalled attempts almost as well as settings, beginnings, and outcomes. However, even in the adult protocols, recall of endings and reactions still lagged significantly behind. As in previous studies, developmental differences were noted in the amount of information recalled as well as in the type. Interestingly enough, Mandler and Johnson reported that eight first graders and four fourth graders were unable to recall one or two stories and were replaced. If this situation ever arose in the Stein studies, it was not reported.

Sequential inversions between basic nodes (high level propositions) as identified by the grammar were very rare. The fact that no differences were found between children and adults in sequential ordering contradicted Piaget's (1926) finding that young children jumble the order of a story, as did the earlier, similar investigations of Stein and



Glenn. In this study, story length was not found to be a determiner of recall.

The protocols were also examined for importations which were classified into three categories: emphatic additions, reasonable elaborations, and irrelevant elaborations. Developmental differences were reported on this measure: first graders produced fewer additions than the older subjects and those they did introduce were often irrelevant and fanciful. The embellishments of the first graders seem to represent an attempt at inferencing, but a lack of ability to retrieve meaningful information. The adult subjects produced more emphatic and reasonable elaborations than did the fourth graders.

Mandler and Johnson (1977) provided additional evidence that suggests story schemata differ somewhat at various points in development, resulting in qualitative differences in subjects' recall of well structured stories. Further, the fact that category membership in both studies (Stein and Glenn, 1975; Mandler and Johnson, 1977) predicted the saliency of an item, indicated that listeners make distinctions between types of information and that their distinctions correspond to some degree with the categories delineated by the grammar. Certain categories appear to be more important in recall because of their saliency in the protocols. Whether they are important because of their location in the structure of a story, or because of the information they convey was not addressed in the Mandler and Johnson (1977) study. If schemata are acquired developmentally, it may follow that major settings, initiating events, major goals and consequences form the core of a developing schema because they were critical in the reconstruction of stories among first graders. It may be that schematic slots are acquired early for these categories, are

more stable and flexible as a result, and are thus able to accept a wider range of values.

Character substitutions among the first grade subjects in the Stein and Glenn (1975) study and the fanciful additions of first graders in the Mandler and Johnson (1977) study present an interesting phenomenon. Developmentally less mature schemata may impose fewer constraints on information generated in recall than a mature schemata. In that sense, a young child's schema may be broader than that of an adult; much as a child's concepts are less well defined initially in terms of a featural system than those of an adult. Differences in performance over the course of an academic year on tasks one and three in the present investigation provide insight into the nature of schematic constraints.

It should be noted that Stein and Glenn (1975), in analyzing the recall data, computed a composite score for each subject by combining the total number of accurately recalled statements and then converted this to a proportion score. In reporting the data, mean proportion scores were presented by grade level with no standard deviations provided. Mandler and Johnson (1977) likewise did not report within group differences. One can assume, however, that there was some variation within age groups between the performances of individual subjects. The nature of these differences could provide insight into the developmental acquisition of a story schema. Both between and within group differences will be examined and reported in the present study.

#### Story Recall Among Poor Readers

Only one study reported to date used a story grammar to examine

story comprehension and recall among poor readers. Dickinson and Weaver (1979) investigated the extent to which deficiencies at the story schema level might be contributing or co-occurring with other problems among a sample of severely disabled readers. Subjects for the study were 26 boys, ages nine to 15, who were regarded as dyslexic by the directors of the school they attended, which was a school for students with severe reading or learning disabilities. The subjects were divided into three groups, based on the results of the full scale WISC-R: group one had verbal scores nine points or more higher than their performance scores ( $V > P$ ); group two had a less than nine point difference between their verbal and performance scores ( $V = P$ ) and the third group scored nine points or more lower on the performance measures ( $V < P$ ). These groups were formed on the basis of evidence suggesting that different IQ subscale patterns reflect different types of reading and language difficulties (Mattis, French, and Rapin, 1975).

The stimulus stories were the same four used by Stein and Glenn (1977, 1979). Subjects were instructed to listen carefully while the researcher read two of the stories; a 45 second counting task followed, after which the student was asked to retell the two stories. The procedure was repeated a second time for the remaining two stories. The transcribed protocols were scored using two systems: The Stein and Glenn method for calculating the mean percentage of story grammar categories recalled by each child; and a second scoring system of the researcher's own design which had nine categories for responses, thereby permitting a finer examination of qualitative differences in recall. For the purpose of making a comparison between the story recalls of

good and poor readers, 12 protocols from the Stein and Glenn fifth grade group were also scored using the Dickinson system.

The results of the Stein and Glenn scoring analyses revealed no striking differences between the recall of the Stein and Glenn older children and that of two groups of the reading disabled subjects; in general, the overall rank ordering of categories recalled was the same across the experimental groups and the rank orderings of categories for each story were also well correlated between the normal and disabled readers. The exceptional group among the poor readers proved to be the low verbal subjects (V<P). In every category except one, students in the V<P group recalled fewer propositions than those in the V>P group. Significant differences were observed for the direct consequence category, a remarkable finding, given the salience of this category in the recall of even young children.

A second analysis was computed using the blocking variable of IQ discrepancy. The first comparison between the V>P group and the V<P was significant for minor settings, direct consequences, and total categories, with the V>P and the other two groups, significant differences were found favoring the V>P group for major setting, minor setting, and direct consequence. These findings suggest that certain disabled readers, those in the V<P group, have less effective or less well developed story schemata than those children in the normal reader group.

This finding supports earlier research by Meyer (1977), Smiley, Oakley, Worthen, Campione, and Brown (1977), and Marshall (1977), all of whom reported differences between good and poor readers in the ability to recall important information from a passage. In these investigations,

poor readers appear unable to use the structure inherent in prose as a means of organizing incoming information and, as a result, tended to relate low-level or fragmented details. Whether or not this difference is instructionally induced or reflects a basic processing difference was not determined in these studies. In Rumelhart's terms, however, these disabled readers may be considered to demonstrate deficits in top-down processing which force an increased reliance on bottom-up processing. It should be noted that as story schemata appear to develop over time, the Dickinson and Weaver study does not rule out the possibility that subjects in the other two IQ groups ( $V=P$  and  $V>P$ ) also had ineffective story schemata at the time of initial instruction in reading. Were this the case, the lack of effective schemata could have been a contributing factor at an earlier date to the reading failure of these students. A longitudinal study would be required to investigate this possibility.

The second type of scoring system used in the Dickinson and Weaver study revealed even more pronounced differences in story processing between good and poor readers. Their system, as was previously mentioned, had nine categories which enabled the nature of the information supplied in recall to be evaluated. For example, the first three categories are: verbatim recall (VB); minor inferences (MNINF); and major inferences (MAJINF). In all nine categories, except that of added information, significant differences were noted favoring the normal readers. The three categories with the most notable differences were: minor inferences, with normal readers making more than the disabled readers; less coherence, with disabled readers omitting temporal and causal markers more often; and verbatim recall, with normal readers producing

more information than poor readers. These findings reflect earlier research reporting developmental differences in inferencing ability (Paris and Lindauer, 1976), understanding of causal relationships (Stein and Glenn, 1979), and superior recall among older readers (Stein and Glenn, 1975, Mandler and Johnson, 1977).

The researchers concluded that poor readers, like normal readers, appear to have and use story schemata with the exception of the V<P group. They did not address the question of whether a schemata was well formed three to seven years earlier when students in the V=P and V>P groups first began to receive instruction in reading.

They also assert, on the basis of their findings, that poor readers have a limited ability to recall details verbatim and make few inferences that help to increase the coherence of the story (Dickinson and Weaver, 1979); a problem they consider to be a "difficulty with efficient processing of verbal information" as opposed to evidence of an "ineffective schemata." This interpretation reflects a narrow definition of story schema. If one accepts the Adams and Collins (1979) definition of a schema or the Shank (1975) conception of the function of schemata, then the Dickinson and Weaver observation that, "In general, the disabled readers seem to be constructing less informative representations of the stories than do good readers," points to the ineffective functioning of schemata.

Dickinson and Weaver (1979) equate story schema with the Stein and Glenn grammar. However, Stein and Glenn (1977) assume that schemata facilitate recall and to a degree control the generation of information, although their grammar does not specify the types of acceptable or

expected inferences than can be made. Whether or not poor readers have ineffective schemata or difficulty with efficient processing of verbal information appears to depend on how schemata is defined and how its function is conceptualized. In a schema-theoretic view of reading the observed differences between good and poor readers may be accounted for in terms of the functioning of schemata. That is, well developed schemata provide for the generation of inferences and a degree of verbatim recall. It would seem that a developmental analysis of the types of inferences made by both good and poor readers, and the degree of verbatim recall evidenced by both groups at various points in the acquisition of story schemata (as delineated by the story grammars), would shed light on the relationship between the structural and processing aspects of story schemata. Task three in this investigation examines developmental differences in verbatim recall across age groups and for both good and poor readers at the first and second grade levels; task four examines developmental differences in the ability to infer causal relationships.

#### Judgments of Importance and Causality

In a second follow-up experiment, Stein and Glenn (1979) investigated aspects of story processing that could not be assessed by recall measures. They were interested in the types of information children judge to be important in each story and in children's comprehension of causal relations both within and between episodes. Half of the 24 subjects were first graders, half were fifth graders. The same four stories were used as in their (Stein and Glenn, 1975) previous experiment. The researcher read the story individually to each child, a 20 second delay followed, then the child was asked for the one thing that happened that

was most important to remember. Probe questions followed to determine the types of causal relations children perceived between categories.

Several developmental differences were noted in the protocols. Fifth graders produced more statements per importance judgment than did the first graders and they often connected their statements with causal or temporal connectors, whereas the first graders almost never did. Grade differences were also found in the types of information children considered most important: first graders mentioned direct consequences proportionately more than any other category; internal responses and initiating events were second and third in order of mention. The older subjects gave proportionately more internal responses than any other category in their first judgments. Initiating events were mentioned second and third.

The statements given in the three importance judgments were compared to the information that was most frequently recalled in their earlier experiment. A slight grade difference was apparent in the degree of overlap between the two tasks. Approximately 60% of all items mentioned in the fifth grade importance judgments appeared in the top one-third of the recall items, whereas 76% of all first grade judgments appeared in the top one-third of the recall items. The fact that internal responses were mentioned proportionally more in the importance judgments than in recall accounted for the difference in the two measures. In addition, settings which were almost always found in the top of the recalls were rarely mentioned in the importance judgments. The researchers concluded that the discrepancies between the two measures showed that neither recall nor importance judgments alone indicates the structural importance



of a category in the organization of stories. Although subjects may initially organize story information in a consistent fashion, Stein and Glenn (1977) hypothesized that the task demands at recall alter the type of information retrieved by subjects at both grade levels. Support for this notion of reorganization at retrieval due to a task demand was also supplied by Anderson and Pichert (1978) in their study with adult subjects.

There may be alternative explanations for the salience of items in recall versus importance judgments. One explanation might be inherent in a schema-theoretic view of reading. According to Rumelhart (1975), what is recalled reflects the reconstructive processes which are directly influenced by existing schemata. Therefore, in selecting an item as most important, a person can only choose from what he or she can recall or reconstruct. The results of the Stein and Glenn (1975) study indicate that many first graders may lack a schematic slot for the internal response category, or may process information in that category differently. In the immediate recall condition less than half of the first graders in that 1975 study included an internal response in their verbal retellings of three of the four stories. For one of the stories, 55% of the first graders did include internal responses in their recall protocols. The exceptional performance on this one story may have been due to the fact that their schemata were very congruent with the incoming data: the story in question was about a birthday party, a common occurrence among white, middle-class youngsters. The schematic slot of the first graders could, in this instance, instantiate the information because it (the information) was within a familiar range

of values. Categories acquired late may require time to become as flexible as those acquired first. Based on these data, if Rumelhart is correct, many of the first graders in the second study may not have been able to select the internal response in their importance judgments because they could neither recall nor reconstruct this category, or, because their existing schemata, when functioning at free retrieval, do not access encoded material in this category. Experimental task three in the present study examined processing differences in recall and retrieval of story information in each grammatical category.

The responses given by the children to the probe questions designed to determine the types of causal relations children perceive between categories in the Stein and Glenn (1979) study were classified into three types: non-responses, errors, and correct responses. Nineteen percent of the first grade responses were classified as either non-responses or errors, whereas only six percent of the fifth grade responses were in these categories. Another developmental difference was noted: all fifth graders gave correct responses to the probe questions designed to test their perception of causality between nonembedded episodes in the stories. The majority of first grade children saw no causal link between the episodes and those who did perceive a causal relationship based their interpretation on incorrect data. Experimental task four in this study examines developmental differences among young children in recognizing causal relationships both between and within episodes in a story.

The studies reviewed here, Stein and Glenn (1975, 1979), Mandler

and Johnson (1977), Dickinson and Weaver (1979) present partial evidence for the story grammars as representations of cognitive structures and for the developmental acquisition of story schemata. If the theory inherent in the grammars is correct, that incoming information is encoded in terms of an already existing psychological structure, then subjects listening to a story can be expected to anticipate certain patterns of information, and attend to these patterns while simultaneously seeking a match between the incoming data and their inherent schemata. Reorganizing incoming information can be expected to occur when it does not conform to these preexisting cognitive structures. If the grammars correspond to the internal structures used by subjects during encoding, and if the acquisition of schemata is a developmental process, several predictions concerning both the organization of incoming material and the generation of new information can be made.

The first prediction is that if the temporal organization within an episode corresponds to the structure reflected in the grammar, subjects should have little difficulty organizing incoming information and recalling it in the same sequence. A second prediction flowing from the grammar is that any deviation from the prototypical structure of a story should require subjects to reorganize the incoming data. If schemata are developmentally acquired, this reorganization should present more of a challenge for young children whose schemata may not be as elaborate or as flexible as older subjects. In his study with adult subjects Thorn-dyke (1977) found support for the two predictions cited above, as did Stein and Glenn (1978) in their study with children to be discussed next.

### Organization and Reorganization of Story Information

Stein and Glenn (1978) postulated that two factors may affect all types of story reorganization. One may be the availability of cognitive processes necessary to perform the transformation of encoded data. The second may be the individual's ability to engage the appropriate strategy, given that the person has the cognitive operations available to transform the information. Piaget (1959) and Brown (1970) have presented evidence that the preoperational child lacks operational reversibility. That is, the child younger than seven or eight is unable to reverse a logical sequence. Brown (1970) argued that preoperational children cannot construct a logical sequence in a reverse order, that is, from effect to cause, even though they can construct logical sequences in forward order, from cause to effect, for example. If Brown and Piaget are correct, then any temporal disorganization in the structure of a story should result in a decrement of recalled information for preoperational children. Older children who have the operational structures to proceed through a logical sequence in a reverse order should be able to restructure incoming information with no decrease in recall. According to Brown, the type of logical relations between story categories as well as the child's operational level will influence recall significantly.

There may be, however, an alternative explanation for the decrement in recall among young children when story information is not well organized. If schemata are developmentally acquired, as some researchers believe (Adams, 1979), this reorganization should present more of a challenge for younger children whose schemata may not be as well defined

as that of older subjects. Developmentally, mature schemata may be more a function of experience and the accumulated corresponding knowledge than of a qualitatively different mode of cognitive operations.

The stories used as stimulus materials in the Stein and Glenn (1975) study did not conform exactly to the structure specified by the grammar. In order to test the validity of the grammar, Stein and Glenn (1978) gave seven and eleven year old children 12 sentences from a well-formed story, one that conformed to their grammar. The researchers were interested in obtaining support for their hypotheses that: 1) internal schemata represented by the grammar should result in the spontaneous organization of story material corresponding to the structure of the grammar, and 2) stories that deviate from the expected sequence should undergo reorganization so that they are recalled in a sequence reflective of the structure inherent in the grammar. Once again, developmental differences were evident. While the recall protocols from both groups showed a significant positive correlation when compared to the order in the Stein and Glenn grammar, the mean correlation for the eleven year olds was .77 and only .44 for the seven year olds.

In accounting for this difference, the researchers rejected the possibility that young children have not acquired a consistent prototypical story schema. Rather, they hypothesized that some of the errors made by the young children indicated problems associated with defining category membership. Since the semantic content of a statement is not sufficient for classifying a statement into a particular category in the story grammar, the researchers did not find it surprising that children reordered some of the story statements. The question can be

raised in response to their interpretation that if a child does not have an implicit knowledge of the types of statements that define a category within a schemata is this not evidence that the child's schemata is not fully developed? In other words, if the older children were more successful at restructuring the stories, does this not suggest that their internal cognitive representation of story structure is, if not qualitatively different, then somewhat more defined than those of the young child. Stein concluded by saying that the variation in reconstruction in the second grade data remains unexplained. It would seem that research designed to identify the possible causes of these developmental differences would contribute to an understanding of the acquisition of story schemata.

Children's skill at recalling stories which contained inverted sequences of information, thereby not conforming to the rules specified by the grammar, was investigated in two studies (Stein and Glenn, 1978; Stein and Nezworski, 1978). The first study (Stein and Glenn, 1978), examined recall of stories where information was moved within the story to another position without the addition of any new semantic information. The results of the study strongly supported the first hypothesis; that a reorganization would occur resulting in recalls more similar to the expected sequence of a story than to that presented by the stimulus. Partial support was found for the second hypothesis that the recovery of accurate information would be more difficult for an untypical story as compared to recall of an expected story sequence. The amount of accurate information recalled decreased significantly in comparison to the control group when either the initiating event or the

consequence was placed in a different location. This finding lends support to the idea of these two categories contributing to the core of a story schema. Again, for each condition, the young children recalled less than the older children. One unexpected finding was that the internal response category could be placed anywhere without decreasing the amount of accurate recall. The researchers hypothesized that there may be more variability in positioning this information than a strict reading of the grammar would allow. An alternative explanation might be that rules for comprehending inverted internal response information may be acquired at a fairly early age. Still another possibility might be that the internal response is very often intimately associated with the moral of the story. Nezworski, Stein and Trabasso (1978) in a subsequent experiment found an implied moral to be uniformly well remembered no matter where it occurs in a story.

In the Stein and Glenn (1978) study, deviations from an expected story sequence were unmarked. The Stein and Nezworski (1978) investigation examined the effects on recall of marked temporal inversions. In this experiment, the position of each of three categories: the internal response, consequence, and reaction were systematically varied by placing each category in a different location in the story. It was hypothesized that the presence of rhetorical markers would serve as a signal to the reader that a transformation was required during encoding. Thus, the presence of markers could serve to compensate for the deviation from the expected sequence, resulting in no decrement to recall when compared to the recall of expected sequences.

Quantitative differences were evident in the results across

groups. The fifth grade subjects recalled all the experimental passages as well as stories which conformed to the expected structure. Moreover, three marked inversions were recalled significantly better than the expected story sequence. The first graders, however, recalled some of the stories with marked inversions as well as normal stories but none were recalled better than the expected sequence. In fact, the majority of deviations significantly decreased recall when compared to the recall of normal stories. Thus, a significant developmental difference was observed when the influence of marked inversions on recall were examined. Young children could not remember deviations from the prototypical story sequence as well as older children. The researchers account for this difference by speculating that young children may not have developed a set of operations or rules to guide them in retrieving as much of the original story as the older children. Young children may thus be more dependent upon the story following the structure described in the grammar than older, more mature children.

Stein (1978) notes that Mandler and De Forrest (1977) offer this explanation for developmental differences. Based on the results of their study, Mandler and De Forrest postulate that young children are less familiar with deviant structures. They are thus more apt to suffer decrements in recall when they are presented with any type of deviation from the expected sequence. All of these studies required children to recall stories with structural deviations. The ability to recognize that a story contains a structural deviation would seem to provide an even more sensitive measure of this dimension of story schema function.

Task number two in the present study, which required children to



differentiate between scrambled and normal story sequence, represented such an assessment.

### Generation of Story Information

In addition to studying the effects of deviating the expected structure of a story, Stein and Glenn (1977) investigated the effect on recall of deletions. In as much as a story schema specifies the kind of information and the sequence in which it will occur, stories not containing all the anticipated categories should be transformed in recall so that the reconstructed story more closely resembles the prototypical story than the encoded version. In stories read by first and fifth graders, a "gap" was created by the systematic deletion of each episodic category. The researchers hypothesized that the reader's internal story schema would generate new information in order to construct a logical sequence of events. They hypothesized further that when the exact nature of the missing information could not be discerned the encoding would be disrupted, resulting in a decrease in recall of the remaining story information. The two categories which were felt to represent an exception to this hypothesized processing were the internal response and reaction categories. These two categories have been shown by previous research to be the least well recalled and in fact often don't appear in simple narratives. Therefore, it was hypothesized that subjects may have rules which allow for the deletion of these categories without disrupting the ongoing processing of the story.

The results of the experiment showed that when initiating events, attempts, and consequences were deleted, the amount of new information included in recall significantly increased in comparison to the control

group. Moreover, most of the generated information matched the type of information deleted from the story. Once again the saliency of these categories in schemata was demonstrated. A second finding of note was that for both grades, when the initiating event was expunged, recall decreased significantly. Recall also decreased significantly in the first grade protocols when the consequence was deleted.

The investigators offered the following explanation for the decreased recall: in their opinion, the information loss in these conditions indicated that children had difficulty generating new information that was compatible with the rest of the story. In an effort to make the story more coherent, some of the original story information was transformed to conform to the generated information.

An alternative explanation might be that certain categories in the schemata are essential in activating other categories. Initiating events and consequences have repeatedly been shown to be of central importance in recall. It may be that for both groups the initial event is highly significant in engaging the entire schemata. In the case of young children, if schemata is developmentally acquired, the deletion of a core category, in this case the consequence, could result in the decrement of recall recorded in the protocols. Experimental tasks two and three, which systematically vary position and deletion of story categories, furnish additional information on the relative saliency of categories.

### Story Production

There has been little research to date examining the structural

and semantic features of young children's written stories and even less investigating the influence of cognitive processing on early writing (King and Rental, 1979). Most research on student writing has been done with older children (Hunt, 1965; O'Donnell, Griffin and Norris, 1967; Lobon, 1976). One notable exception is the work of Graves (1975) who examined the writings of seven year old children for theme, type of writing, number of words, use of accompanying art, and teacher comments. Despite the current dearth of investigations focusing on the writings of young children, there is a good deal of evidence in related areas of language study to suggest that early production processes are greatly influenced by the child's own cognitive structures, independent of other factors.

The work of Cazden (1972), Halliday (1975), McNeill (1970), and Slobin (1973) demonstrates the role the young child plays in his or her own oral language acquisition. Durkin (1966) and McKenzie (1974) offer evidence that some children teach themselves to read; Read's (1975) research on children's invented spellings indicates that children create spellings reflecting identifiable abstract principles. Hildreth (1936) defined five sequential developmental writing stages in children three to six years of age from aimless scribbles to units resembling letters. Wheeler's (1971) research indicates kindergarten children can teach themselves to write letters and words when supplied with examples of writing.

The weight of the research suggests that young children have the ability to abstract information about the written language and that many begin to do so in kindergarten and first grade. Further, analyses of

young children's writing indicate a consistent developmental progression toward more complex and cohesive modes of expression (Vygotsky, 1962; Clay, 1975; Applebee, 1978). King and Rentel (1979) maintain there are four factors that appear to be crucial in enabling children to make the transition from fragmentary messages to producing written discourse with textual features. The four factors are: the ability and opportunity for sustained speech (Moffett, 1968; Britton, 1970); the ability to supply cohesion between propositions (Halliday, 1973; Olson, 1977); the role of context as a motivator and sustainer of writing behavior (Halliday, 1973); and the representation of story structure in memory (Brown, 1977; Stein and Glenn, 1977; Rubin and Gardner, 1977; Applebee, 1978).

Stories produced by young children, two years, 11 months of age to five years, 8 months, were examined by Vygotsky (1962) for structural features. He identified six sequential, developmental stages in children's production of narratives which he labeled: heaps, sequences, primitive narratives, unfocused chains, focused chains, and narratives. Applebee (1978) also analyzed original stories written or dictated by children two to five years of age. A strong developmental progression of particular story conventions and narrative structures was evident. Pradl (1979) reported similar findings. The first convention Applebee (1978) noted was the development of the past tense followed by story beginnings like, "Once upon a time..." and later the use of formal endings. Structure progressed from temporally related events to complex narratives. Stories produced by older children were characterized by: 1) a deliberate point or moral, 2) a consistent goal, 3) a main character, 4) abstract and conceptual rather than concrete and perceptual

cohesion within the story.

Vygotsky's (1962) and Applebee's (1978) findings are consistent with those of Stein and Glenn (1977) who reported the only study to date that attempts to validate story grammars as representations of psychological constructs. The basic hypotheses of the Stein and Glenn (1977) experiment was that if children have knowledge about the kinds of information that belong in stories, then this knowledge should be reflected in their constructions of stories. The children in the experiment, kindergarten, third and fifth graders, were provided with story settings and asked to complete the story. The resulting protocols were classified according to their structure, which ranged from simple descriptions through complex episodes. Purposive behaviors and increasingly well specified motives and goals were found to characterize the more highly structured stories. Only about one-half of the kindergarten stories contained purposive behaviors, while two-thirds of the third grader's did, and almost all of the fifth graders. Thus, there was a clear developmental progression in the complexity of the stories, presumably reflecting increasing knowledge of the components of a well formed story. These findings may also be considered evidence not only for the developmental acquisition of a story schema, but also of the child's increasing access to the schema. Leondar (1977) and Sutton-Smith (1977) also report high correlations between age and structural complexity in stories constructed by children three to twelve years of age.

Stein and Glenn (1981) have used their own research in designing a production model for use in the analysis of stories produced by children. While children's narratives have been examined for various

features, i.e. themes, conventions, syntax, types of cohesion, and evidence of sensitivity to story structure, there has not been available to date a systematic discourse analysis procedure comprehensive enough to assess the structural as well as the semantic features of children's stories. The Stein and Glenn (1981) procedure assesses story complexity on the basis of both semantic and structural features. The present study attempts to identify the influence of preexisting story schema on the production of written stories using the Stein and Glenn (1981) procedure to analyze children's stories.

### Summary

#### The Processing of Story Information in Children

The studies cited here provide evidence for the existence of schemata in young children, which guide the encoding and retrieval of story information. The research further suggests developmental differences in the processing of story information, attributable to differences in the internal representation of story structure across age groups. Specifically, differences were observed between the performance of young children (five to six years of age) and those of older children (eight to ten years of age) in the following aspects of processing: the amount and accessibility of information at recall; the saliency of story categories in recall; the reorganization of stories; the understanding of causal relationships within stories; the degree of structural complexity within constructed stories; the generation of inferences and importations; and the type of importance judgments made about stories. The present investigation examined these same aspects of processing with

the exception of the last two. Different experimental procedures, younger subjects spanning four age levels, and two data collection points in this study yield additional information concerning these manifestations of cognitive processing in children.

In addition to the processing effects of schemata, the weight of the research reviewed in this chapter seems to support the notion of a developmental acquisition. Over time, schemata appear to become more flexible; that is, they enable the encoder to store and retrieve information from a wider variety of stories with a range of structures. At the same time, schemata in older children seem to evidence a more highly defined featural system than that of younger children. These more highly developed schemata function to limit the types of importations, substitutions, and inferences a processor generates, while providing for greater complexity and variety in the production of stories. Well developed or accessible schemata seem to facilitate the reorganization of story information, and to provide for the generation of hypotheses and expectations essential to the construction and reconstruction of meaning. When schemata are engaged during encoding, information is instantiated or mapped against the existing internal cognitive constructs rendering it accessible at retrieval. Metacognitive operations dependent upon stored information are then possible.

One limitation in all the studies cited is that, in an attempt to describe the cognitive processes in the typical child, intra-group differences were obliterated. In none of the investigations, for example, were standard deviations given. Thus, it is impossible to determine how great the variation is between the performance of children within the same age group. A second limitation of the research discussed

is the fact that the subjects in the experiments constituted a relatively homogenous population. All were white, middle-class children. Thus, caution must be used in generalizing the results to other populations with generally recognized differences in academic performance. While the present study examined intra-group differences, the population studied was once again rather homogeneous, being composed of white, lower-income children from rural Appalachian backgrounds.

A final limitation in the studies reviewed is that the methodology used in measuring the influence of schemata was exclusively that of free recall, in some cases followed by questioning. This mode of measurement with young children has disadvantages: the linguistic abilities of young children may not give a clear indication of their comprehension; and secondly, it is impossible to discern whether information was truly forgotten or simply not reported. The procedures used in the present study may represent more sensitive measures of the same phenomena.

An unanswered question posed by recent research is the relationship between a child's schemata at the time of initial instruction in reading and his or her subsequent achievement in reading. If, as Kintsch (1975) maintains, schemata are essential in the comprehension of even insignificant material, the developmental level of a child's story schema would seem to be an important aspect of achievement in beginning reading. Support for this assumption was provided in the Dickinson and Weaver study (1979) and in the McDonell (1978) study, both of which focused on the performance of poor readers relative to story schemata. Therefore, the developmental level of a child's schemata as he or she undertakes the task of learning to read and the influence of such



schemata on the processing of story information would seem to be areas worthy of investigation.

The following section examines the research relative to factors believed to be important to success in beginning reading.

### Prediction of Reading Achievement

Downing and Thackary (1971) define reading readiness as the range in development when, either through maturation or through previous learning, or both, the individual child is able to learn to read easily and profitably. The concept of accommodating instruction to the developmental stage of the child dates back to the early writings of such philosopher educators as Rousseau (1762), and Pestalozzi (1898). Nevertheless, the role of development in learning did not gain widespread support in this country until the first quarter of this century when Dewey's influence on education was felt. In an article published in 1898, Dewey stressed the necessity of a child's readiness for language instruction in the primary grades, without actually mentioning the term "readiness." The term itself appeared in the "Report of the National Committee on Reading," Twenty-fourth Year Book of the National Society for the Study of Education (1925). Other influences, in addition to those of Dewey, which shaped the foundations of readiness as an educational principle, included the work of experimental psychologists such as Thorndike (1913) and Terman (1919) whose experimental procedures, measurement instruments, and statistical techniques made possible the systematic study of development. About this same time, one of the first professional books on the teaching of reading appeared: Huey's (1908) The Psychology and Pedagogy

of Reading and was quickly followed by others. The 1920s and 1930s saw the significant influence of psychologists G. Stanley Hall and later his student, Arnold Gesell, who emphasized heredity and maturation rather than experience and practice as factors in learning. Their ideas were so persuasive that many educators were led to credit poor achievement in reading to developmental factors alone. The proposed solution was to postpone instruction until the child matured and was ready (Durkin, 1970). From 1925 onward, research and application in methods of diagnosing and in remediating deficiencies in readiness increased rapidly.

One of the earliest and most influential attempts at predicting when a child is "ready to read" was the study conducted by Mabel Morphett and Carlton Washburne (1931) in Winnetka, Illinois. Although their investigation had several serious limitations (the sample was limited to one school population, only one set of reading materials was involved, the criterion for "success" was arbitrary, etc.) the results of the study exerted a profound impact on American education for years to come. One of their conclusions, that reading instruction should not occur until the child has reached a mental age of 6.5, was highly instrumental in establishing the American tradition of teaching reading in first grade.

Interest in early assessment and predicting first grade reading performance spurred other investigators, who attempted to determine the most important factors in predicting reading achievement. The primacy of the mental age as the most important criterion in predicting first grade success was indicated by other researchers as well: Dean (1939) and Gates, Bond, and Russell (1939). Based on this belief, kindergartens became a place for programs that featured reading readiness.

Until recently, such programs were typically unsupervised or unstructured, left to the discretion of the teacher (Durkin, 1970).

In the 1960s the work of psychologists again influenced the schooling process. The child's potential for learning before the age of five or six and the importance of such learning was reported by researchers such as Piaget (1959), Bruner (1960), and Bloom (1965). The political and social climate of the 1960s supported the interest in early childhood learning inspired by these writers. Reading readiness once again became a topic of much study and debate (Wilson, 1974),

Investigations of reading readiness since the 1930s have expanded in scope to consider the influence of many factors, in addition to mental age, on success in beginning reading. Generally researched and discussed in the literature are: physiological factors, such as general maturity and growth, cerebral dominance, and laterality, neurological considerations, vision, hearing, speech; environmental factors, such as linguistic background and social experiences; emotional, motivational and personality factors; intellectual factors, such as general mental ability, perceptual abilities of visual and auditory discrimination; and general thinking abilities (Downing and Thackary, 1971).

The results of the many investigations undertaken to determine the relationship of these factors to reading achievement have been disappointingly inconclusive and contradictory in many cases (Ross, 1974; MacGinitie, 1969). According to MacGinitie (1969), in spite of the considerable volume of research on all kinds of prediction measures, to date there is not a very clear understanding of the specific roles and the interaction of the various predictors; neither has success in

predicting reading performance been particularly good.

Given the lack of hard evidence in support of specific predictors of reading readiness, most schools today rely on three main methods for determining when a child can succeed in learning to read: the use of a readiness test, intelligence tests, and teacher observations (Downing and Thackary, 1971). Although the research has examined many potential sources of influence on reading achievement, assessment instruments have been heavily influenced by the traditional data-driven sequential model of the reading process. Nowhere is this more evident, perhaps, than in the examination of readiness factors measured by standardized readiness tests. The following analysis (see Table 1) of five reading readiness tests was reported by Rude (1973).

The median correlation between reading success and reading readiness tests has been found to be .50; between intelligence test scores and reading achievement .51 and between teacher's rating scales and reading success about .62 (Spaulding, 1956; Bremer, 1959; Thackary, 1965). The fact that teachers' own predictions correlate more highly with subsequent success in reading raises the interesting question as to what abilities are discerned by teachers that are not measured by the commercially prepared instruments. These statistics indicate that there is still a good deal of variance unaccounted for in predicting reading achievement.

In summarizing the research, MacGinitie (1969) observes that in general, the findings of past reading readiness research indicate that the best predictors tend to be those tasks that are most similar to the criterion; the tasks that are similar to reading itself. If the predictor

TABLE 1  
 PREREADING SKILLS AS MEASURED BY FIVE  
 READING READINESS BATTERIES\*

	Metropoli- tan	Murphy- Durrell	Clymer- Barrett	Gates- MacGinitie	Harrison- Stroud
grapheme perception	alphabet (matching)	letter names (learning rate)	recogni- tion of letters (matching words) (copy-a- sentence)	letter recogni- tion (visual discrimi- nation) (visual- motor co- ordina- tion) word (word re- cognition)	giving the names of the let- ters (using symbols) (making visual discrimi- nations)
left-to- right visual scan	(matching)	(learning rate)	copy-a- sentence (matching words)	(visual discrimi- nation) (word recogni- tion)	(using symbols) (making visual discrimi- nations)
grapheme- phoneme relation- ships		phonemes (learning rate)		(word recogni- tion)	
phoneme blending		(learning rate)		auditory blending (word re- cognition)	

\*Parentheses indicate subordinate subtests measuring skills in a limited manner.

task is similar to reading, the abilities required for success in reading are measured by the predictor, even if it is not clear precisely what those abilities are. MacGinitie believes that it is important to emphasize the need for continuing to search for new, less obvious, and more basic types of prediction tasks.

Since reading in the elementary grades requires the encoding, comprehension and recall of stories, children's ability to process story information would seem to be closely related to their subsequent achievement in reading. Therefore, children's performance in processing story information may qualify as one of the new, less obvious, more basic types of prediction tasks called for by MacGinitie.

### Conclusions

There appears to be sufficient research to support an interactive-schematic model of the reading process. The available evidence, although not conclusive, suggests that abstract cognitive constructs are used in the encoding, comprehension, and recall of written discourse. Moreover, the research suggests that such schemata are acquired developmentally. If in fact schemata are essential to comprehension, as an interactive-schematic model of reading indicates they are, then their existence and stage of development becomes a critical question in regard to beginning reading. The areas investigated in this study, then, were the characteristics of children who seem to have well developed story schemata and those who don't; the range of intra-group differences in the developmental acquisition of story schemata; and the predictive value of schemata in subsequent reading achievement.

## Chapter 3

### PROCEDURES

#### Introduction

The purposes of this study were: to identify the within and between group differences that exist among young children in their acquisition of story schemata and in their processing of story information; to describe the developmental changes in story schemata that occur over the course of the school year; and to assess the value of story schemata as a predictor of success in beginning reading. Previous research indicates that story schemata are developmentally acquired by average learners. Poor readers have been observed to evidence the same type of story schemata and processing patterns as younger normal readers. Therefore, an analysis of story schemata and selected aspects of the corresponding processing of story information in young children was examined relative to subsequent success or failure in beginning reading.

To investigate these relationships, the acquisition of story schemata and selected aspects of story processing were measured through the use of five experimental tasks, four of which were administered to all subjects at the beginning of the school year and again at the end. The fifth task was completed by the first and second graders in the spring. For these children, findings on all the experimental tasks were correlated with an estimate of each child's progress in reading over the course of the year. In addition, an estimate of each

participant's verbal IQ was also obtained in an effort to determine what relationship, if any, exists between the verbal IQ and a child's developmental acquisition of story schema.

To provide a complete description of the methodology utilized in this investigation, this chapter includes an explanation of the sample, the commercially available tests used in the study, the research procedures, hypotheses, and statistical analyses. Stimuli used in the experimental tasks and the scoring system developed for each are also presented.

### Sample

A sample of 156 participants comprised of 24 four year old children and 132 elementary school children were studied. The four year old participants attended a Head Start pre-school program in a rural area of southwestern Virginia. The 132 elementary school children attended a public school in the same community. Of the 132, 44 were in kindergarten, 44 in first grade, and 44 in second grade. The elementary school children at each grade level were randomly selected by means of a stratified sampling procedure. The total population at the first and second grade levels were stratified according to scores achieved on the Metropolitan Readiness Test (1976). The three levels of stratification were high, medium and low academic performance using the cut-off points suggested in the Teachers' Manual to identify each category of achievement. A representative proportional sample was randomly selected from each ability level. The same procedure was followed in selecting the kindergarten participants, this time using scores achieved on the Epic Readiness Test (1972). These tests were used as sorting devices to assure,



in so far as it was possible, a range of variability in the academic potential of the subjects.

The majority of the participants were from rural Appalachian backgrounds. The percentage of children in the elementary school from which the sample was drawn who received free lunches, or lunches at a reduced cost under the federal ESEA program, was 21%; the percentage of children within the sample receiving this type of assistance was 17%.

### Commercially Available Tests

#### Utilized in the Study

The Gates-MacGinitie Reading Tests Primary-A (1972) were administered to all first grade participants and the Gates-MacGinitie Reading Tests Primary-B (1972) to all second grade participants at the start of the academic year. At the end of the school year, a second form of the same test was again administered to all participants in a group format. The Peabody Picture Vocabulary Test (1959) was individually administered in the fall to each participant to gain an estimate of each child's verbal intelligence.

### Research Procedures, Hypotheses

#### and Statistical Analysis

Previous research indicates developmental differences across age groups in both the acquisition of story schemata as delineated by story grammars, and in the way story information is processed. In order to ascertain a level of development in both these cognitive operations, which are presumed to be interactive in this research, experimental tasks designed to test specific hypotheses were completed with

participants. These tasks were chosen on the basis of past research suggesting both their reliability as indicators of developmental levels and their usefulness as indicators of how story information is processed. Hypothesized differences in levels of performance for each age group were based on Stein and Glenn (1979), who suggested that story schema is present to a degree in first graders and is well developed by the fifth grade.

The following is organized in this manner: the rationale for each task is provided first, followed by a description of the procedure itself. Next, the hypotheses tested by the procedures are stated. The statistical tests employed in the analyses of the resulting data are then described, followed by a time schedule used for data collection.

### Hypotheses

1. The mean scores achieved by children in pre-school, kindergarten, first and second grade will increase at each grade level on experimental tasks designed to measure:

- a) metacognitive knowledge of story structure
- b) the ability to detect structural variations in a story
- c) the ability to recognize that information is missing in a familiar story and to supply it
- d) the ability to infer causal relations
- e) the degree to which story schema is present in written stories (first and second grade participants only).

2. The mean score achieved by children in pre-school,

kindergarten, first and second grades at the end of the school year on the experimental tasks will increase as compared with the same measure taken at the beginning of the year.

3. Performance on the experimental tasks will be related to success in beginning reading for first and second grade subjects.

#### Experimental Task 1: Metacognitive Knowledge of Story Structure

Rationale. Recognition as a cognitive operation is generally regarded as a simpler process than is recall (Tulving, 1976). Therefore, a procedure which requires children to recognize instances of story structure and non-stories would seem an appropriate measure of metacognitive knowledge of story structure. In addition, the research suggests that in language acquisition processes, comprehension precedes production (Foss and Hakes, 1978). Since the ability of young children to construct coherent stories and to recognize unstructured information into story form has already been demonstrated in earlier research (Stein and Glenn, 1978), a recognition task of the type to be implemented here may provide a more sensitive measure of children's understanding of story structure than has been used before. The recognition task may be a more sensitive measure than a recall or construction task because it may tap understanding that is believed to develop before the child has acquired the more sophisticated cognitive abilities required to recall, reorganize, or construct stories.

A pilot study based on these assumptions was conducted. Six good readers in first grade, six average readers and six poor readers were each exposed to four stimuli and asked to tell whether each was a

story. One stimuli was a list of unrelated nouns, the second was a simple description of a child, the third described two children and included a goal, the fourth came closest to being a story: it included a protagonist, a setting, an initial incident, and a resolution. A trend was observed in the responses of the subjects: the poor readers tended to identify the non-stories as stories, the good readers tended to reject the non-stories, and the average readers' responses fell between these two extremes. On the basis of this pilot study, the same basic procedure was implemented in the present investigation.

Description. Each participant was tested individually; all responses were recorded and transcribed. First, the experimenter established whether or not the child could generate an exemplar of a story by asking, "Do you have a story you like?" If the child responded "Yes." the experimenter said "What is it?" If the child responded negatively, the experimenter said, "Have you ever heard of Three Little Pigs or Cinderella?"

Next, the experimenter established that some things are stories and some are not by asking, "If I asked you to stand up, would that be a story?". "If I asked you to sit down, would that be a story?". Subjects responses to these questions were recorded and are also reported in the next chapter.

The experimenter then said, "OK, some things are stories and some are not. I'd like you to listen to some things I have recorded and tell me if you think they are stories or not stories. Now, what do I want you to tell me?" The participant then repeated the directions

with the help of the researcher if necessary. A recording of the stimuli was used. After the child made a judgment the researcher asked why the stimulus was a story or was not a story. The reasons supplied by the participants were categorized and treated as descriptive data. The four stimuli were controlled for word length (30 words each) and increasingly approximated an actual story. The selection of the set of stimuli to be presented to a subject and the order of presentation was determined using a random assignment procedure. If a participant was tested with Set #1 of the stimuli in the fall of the school year he or she received Set #2 in the spring and vice versa. The sets of stimuli were constructed to be syntactically and structurally comparable. They were also as semantically similar as possible.

#### Task #1

#### Set #1

Stimulus 1: an unrelated list of nouns:

apples	shirts	rings	bikes	flowers	rope
cats	wood	dogs	games	rocks	boxes
spiders	pots	brushes	hands	desks	cards
houses	grapes	cars	colors	pencil	shoes
candy	toys	paper	peaches	lunch	pumpkins

Stimulus 2: a description of a child:

"Mary is six years old. She has brown hair, blue eyes, a little nose, lots of freckles, and a big smile. She wears dresses and a bow in her hair."

Stimulus 3: a description of a child and a goal statement:

"John is a tall boy with blond hair and brown eyes. He is in the third grade. John likes football. When he grows up John wants to fly airplanes."

Stimulus 4: a setting, protagonist, initial incident, goal, attempt, and consequence:

"Last Saturday, Bobbie got lost in the park. He really wanted to find his way home so he decided to follow his dog, Spot. Sure enough, Spottie led him home."

Set #2

Stimulus 1: an unrelated list of nouns:

pears	skirts	pins	coaches	string
rabbits	paper	hampsters	jars	present
roaches	pans	combs	feet	chocolate
schools	cherries	trucks	paint	slippers
cake	wagons	pens	bananas	beans

Stimulus 2: a description of a child:

"Cindy is seven years old. She has blond hair, brown eyes, a little mouth, pink cheeks, and a friendly voice. She wears jeans and a belt with a big buckle."

Stimulus 3: a description of a child and a goal statement:

"Mark is a nice boy with brown hair and blue eyes. He lives in an old house. Mark likes baseball. When Mark gets big he wants to be a policeman."

Stimulus 4: a setting, protagonist, initial incident, goal, attempt and consequence:

"Yesterday, Mary saw a pretty dress in the store. She really wanted it, so she ran home and emptied her piggy bank. With her seven dollars, Mary bought the dress."

Scoring. The warm up questions were scored using a system that accorded more points to responses reflecting a knowledge of stories than to those that did not reflect story knowledge.

<u>Warm up question</u>	<u>Points per response</u>
"Do you have a story that you like?"	0 = no response 1 = no 2 = yes
"What is it?"	0 = no response 1 = comment offered 2 = non-story title offered 3 = story title offered
"If I asked you to stand up, would that be a story? If I asked you to sit down, would that be a story?"	0 = no response 1 = yes to both 2 = no to one question, yes to one question 4 = no to both

The scoring system for task one gave maximum credit to those children who displayed an understanding of story structure and a minimum to those who experienced difficulty in discriminating between the stimuli. Four points was accorded a perfect pattern of responses, no points were given where a child failed to reject stimulus A, the unrelated list of

nouns, as a story. If a child's responses included a rejection of stimulus A, the unrelated list of nouns, an acceptance of stimulus D as a story, and a correct response to either stimulus B or C, the overall score was a three. Fair responses, those that scored a two, were assigned to those children whose concept of story structure appeared to be too broad, indicated by an acceptance of stimuli B, C, and D as stories, or too narrow, indicated by rejection of B, C, and D as stories. Poor responses, assigned one point, included patterns where stimulus A was rejected but also stimulus D with B and C answered with varying degrees of accuracy.

	<u>Words</u>		<u>Story</u>		<u>POINTS</u>	
Stimuli:	#1	#2	#3	#4		
						N = Not a story
Perfect response:	N	N	N	Y	= 4	Y = Yes, a story
Good responses:	N	N	Y	Y	= 3	
	N	Y	N	Y	= 3	
Fair responses:	N	Y	Y	Y	= 2	
	N	N	N	N	= 2	
Poor responses:	N	Y	N	N	= 1	
	N	N	Y	N	= 1	
	N	Y	Y	N	= 1	
All other responses:					= 0	

Descriptive Data: Following a response of "yes" or "no" to the question of whether the stimulus was a story, each child was asked why it was or was not a story. These responses were recorded verbatim. The experimenter read through all the responses, four per subject per data collection period, and identified six categories for subjects' judgments.



Each response was then assigned a number representing one of the six categories. Assignment to a particular category was made on the basis of the criteria for the decision, not on the basis of whether the decision was affirmative or negative. In other words, if a child said yes a stimulus was a story, or no it was not, because it was too long, the criteria fell into the number two category of length as the basis for judgment. Interrater reliability was calculated for each stimulus using the Spearman rank-order coefficient and is reported in Chapter four.

The categories are as follows:

<u>Category No.</u>	<u>Criteria for inclusion:</u>
0	Child 's response: silence, "don't know", "cause".
1	Child's judgment was based on the mode of presentation of the stimuli.  "cause I heard it" "cause she read it" "cause it was a tape" "cause they talked"
2	Judgment based on length only.  "too long" "too short" "too many words" "not long enough"
3	Basis for judgment reflected a sensitivity to cohesion or coherence, either the lack or presence thereof.

"cause its just sayin things"

"it didn't say one word at a time -

it had sentences in it"

"because all the words were kinda hooked  
together"

"cause it didn't make sense"

- 4 Judgment made on basis of stimuli content exclusive of a protagonist's goal, desire or action carried out in service of a goal.

"it was tellin about a girl"

"it don't tell about things"

"because it was about roaches"

"because it was talkin about football"

- 5 Response reflected a comparison in the child's mind between the stimulus and in implicit criteria of a story. If a story feature was explicitly mentioned, it was neither an aspect of semantic content nor goal related.

"stories usually have beginnings and endings"

"that wasn't like a story"

"cause it was true"

"it didn't sound like a story"

- 6 Judgement made on presence or absence of a protagonist's goal, intent, desire and/or action carried out in service thereof.

"it told you what the boy was gonna do"

"it just says rabbits and squirrels -

it don't tell you what they did"

"because it was about a little girl who

wanted to buy a dress"

"told what he wanted to be when he growed  
up"

### Experimental Task 2: Detection of Structural Variations

Rationale. Developmental differences in children's ability to deal with disruptions in the logical structure of a story have been reported by several researchers (Stein, 1976; Stein and Nezworski, 1977; Mandler, 1978; Poulson, Kintsch, Kintsch, and Premach, 1979). In these investigations, older children consistently demonstrated greater competence in processing disorganized story information than younger children. These studies also provide evidence that skill in understanding how and why ideas are interconnected in a story develops early, perhaps before the first grade. Thus previous research suggests that children with well developed story schemata will detect when the cohesiveness of a story is disrupted. Children who do not have an expectation of what constitutes a well constructed story or who do not engage their story schemata in the encoding of a story are less likely to notice disruptions in the cohesiveness of a story. Based on these earlier research findings, an experimental task was completed with each participant designed to measure the child's ability to detect structural variations in a story. Performance on this task provided an indication of the developmental level of story schemata and of the child's understanding of the relationship between ideas in a story.

Description. Each child was tested individually. The experimenter gave the child the following directions: "I'm going to tell you the same story in different ways; sometimes it might sound mixed up, sometimes it will sound OK. You must listen carefully to hear if the story is mixed up or if it sounds all right. After each time I read the story, I'd like you to tell me if it was OK or if it sounded scrambled. Do you understand?" The child was then asked to repeat the directions to the experimenter.

The experimenter then read the same story six times including three normal versions and three with structural variations. Presentation order of the six stimuli was random. In one variation, the consequence was moved to the initial event position; in another the initial event was moved to the consequence position; in the third, the setting was moved to the consequence position. The setting, initial event and consequence were chosen as the deviating categories because of their salience in comprehension and recall in previous research (Stein and Glenn, 1976; Mandler and Johnson, 1977). The two stories selected for use in this task were fables that were rewritten by Nezworski, Stein and Trabasso (1979) to conform to the Stein and Glenn grammar (1975). They are therefore structurally similar. During the fall testing, the two stories were presented randomly across subjects. If a participant heard the Fox and the Bear story during the initial testing, he or she was presented with the Tiger's Whisker story in the spring and vice versa.

## Task #2

StimuliNormal Version of the Fox and Bear Story

Setting	Once there was a fox and a bear. The fox and the bear were friends.
Initiating Event	One day they were walking on the edge of the woods and they saw a pretty lady carrying a big chocolate cake.
Internal Response	They remembered how delicious chocolate cake tasted and wanted to have some of it.
Attempt	The fox and the bear asked the lady if they could help carry the cake.
Consequence	Before she answered, the fox and the bear took the cake from her hands and ran into the woods.
Reaction	They were glad that their trick had worked and had a good laugh.

Consequence Moved Version of the Fox and Bear Story

Consequence	Before she answered, the fox and the bear took the cake from her hands and ran into the woods.
Setting	Once there was a fox and a bear. The fox and the bear were friends.
Initiating Event	One day they were walking on the edge of the woods and they saw a pretty lady carrying a big chocolate cake.

Internal Response	They remembered how delicious chocolate cake tasted and wanted to have some of it.
Attempt	The fox and the bear asked the lady if they could help carry the cake.
Reaction	They were glad their trick had worked and had a good laugh.

Initial Event Moved Version of the Fox and the Bear Story

Setting	Once there was a fox and a bear. The fox and the bear were friends.
Internal Response	They remembered how delicious chocolate cake tasted and wanted some of it.
Attempt	The fox and the bear asked the lady if they could help carry the cake.
Initiating Event	One day they were walking on the edge of the woods and they saw a pretty lady carrying a big chocolate cake.
Consequence	Before she answered, the fox and the bear took the cake from her hands and ran into the woods.
Reaction	They were glad their trick had worked and had a good laugh.

Setting Moved Version of the Fox and Bear Story

Initiating Event	One day they were walking on the edge of the woods and they saw a pretty lady carrying a big chocolate cake.
------------------	--

Internal Response	They remembered how delicious chocolate cake tasted and wanted to have some of it.
Attempt	The fox and the bear asked the lady if they could help carry the cake.
Setting	Once there was a fox and a bear. The fox and the bear were friends.
Consequence	Before she answered, the fox and the bear took the cake from her hands and ran into the woods.
Reaction	They were glad their trick had worked and had a good laugh.

Normal Version of the Tiger's Whisker Story

Setting	Once there was a woman who lived in a forest.
Initiating Event	One day she was walking up a hill and she came upon the entrance to a lonely tiger's cave.
Internal Response	She really wanted a tiger's whisker and decided to try to get one.
Attempt	She put a bowl of food in front of the opening of the cave and she sang soft music.
Consequence	The lonely tiger came out and listened to the music. The lady then pulled out one of his whiskers and ran down the hill very quickly.
Reaction	She knew her trick had worked and felt very happy.

Consequence Moved Version of the Tiger's Whisker Story

Consequence	The lady then pulled out one of his whiskers and
-------------	--

ran down the hill very quickly.

Setting	Once there was a woman who lived in a forest.
Initiating Event	One day she was walking up a hill and she came upon the entrance to a lonely tiger's cave.
Internal Response	She really wanted a tiger's whisker and decided to try to get one.
Attempt	She put a bowl of food in front of the opening of the cave and sang soft music.
Reaction	The lonely tiger came out and listened to the music. She knew her trick had worked and felt very happy.

Initial Event Moved Version of the Tiger's Whisker Story

Setting	Once there was a woman who lived in a forest.
Internal Response	She really wanted a tiger's whisker and decided to try to get one.
Attempt	She put a bowl of food in front of the opening of the cave and she sang soft music.
Initiating Event	One day she was walking up a hill and she came upon the entrance to a lonely tiger's cave.
Consequence	The lady then pulled out one of his whiskers and ran down the hill very quickly.
Reaction	She knew her trick had worked and felt very happy.

Setting Moved Version of the Tiger's Whisker Story

Initiating Event	One day she was walking up a hill and she came upon the entrance to a lonely tiger's cave.
------------------	--



Internal Response	She really wanted a tiger's whisker and decided to try to get one.
Attempt	She put a bowl of food in front of the opening of the cave and she sang soft music.
Setting	Once there was a woman who lived in a forest.
Consequence	The lonely tiger came out and listened to the music. The lady pulled out one of his whiskers and ran down the hill very quickly.
Reaction	She knew her trick had worked and felt very happy.

Scoring. Maximum credit was given for responses that indicated the ability to detect variations in story structure and a minimum given to responses indicating an inability to detect a disruption in the cohesiveness of a story or to responses given at random. A perfect pattern of answers across the six presentations was scored four. Good patterns, scoring a three, were those in which the child erred in only one of the stimuli. Fair patterns, accorded two points, included those reflecting two errors, one given in response to a story normal presentation and the other error in response to either the setting or the initial event moved condition. Poor responses were those patterns wherein the child failed to recognize that the consequence had been moved, or, recognizing that the consequence had been moved, indicated that the other two structurally deviated stimuli were correctly ordered. Response patterns in the poor category also contained two errors over the six presentations.

## Task #2

## Scoring System:

Stimuli:	Normal	Normal	Normal	Con- sequence Moved	Setting Moved	Initial Event Moved	Points
Perfect response:	Good	Good	Good	Poor	Poor	Poor	4
Good responses:	G	G	G	P	P	G	3
	G	G	P	P	P	P	3
	G	P	G	P	P	P	3
	P	G	G	P	P	P	3
	G	G	G	P	G	P	3
	G	G	G	G	P	P	3
Fair responses:	P	G	G	P	G	P	2
	G	P	G	P	G	P	2
	P	G	G	P	P	G	2
	G	P	G	P	P	G	2
	G	G	P	P	G	P	2
	G	G	P	P	P	G	2
Poor responses:	G	G	G	G	P	G	1
	P	G	G	G	P	P	1
	G	P	G	G	P	P	1
	G	G	P	G	P	P	1
	G	G	G	G	G	P	1
	P	G	G	P	G	G	1

All other  
responses:

No Credit

G = Normal order; P = Scrambled

### Experimental Task 3: Recognition and Retrieval of Missing Information

Rationale. Several investigations (Bartlett, 1973; Thorndyke, 1975; Stein and Glenn, 1976; Mandler and Johnson, 1977) have supported the notion that when story schemata are engaged during encoding, information is instantiated or mapped against the existing internal cognitive construct rendering it accessible at retrieval. In a schema-theoretic view of reading, the recall process involves locating, in memory, the stored traces of the originally encoded stimulus and then using the available schemata to reconstruct the original story (Rumelhart, 1976). To the extent that a schema is available at encoding and engaged at retrieval, probability of recall increases.

If a person can recall story information it is assumed in this model that the information was instantiated and retrieved through the functioning of the schema. If, on the other hand, salient story material cannot be retrieved, or if there is a failure to recognize that essential information was deleted from a familiar story, a lack of schemata or the failure to engage a schema might be indicated. Although other factors such as interference during the retention interval can account for the failure to recognize the loss of elements of a particular stimulus, or the failure to recall elements of a stimulus (Lockhart, Craik, Jacoby, 1976), several studies have provided evidence for the remarkable saliency of certain story categories. They are: the setting, initiating event, and consequence in both immediate and delayed recall for children and adults (Stein and Glenn, 1979; Mandler and Johnson, 1977). One consistent developmental difference observed in these studies, however, is the type of importations produced in recall. The inferences of adults

tend to be logical whereas those of first graders tend to be fanciful. Therefore, the type of information produced in recall can provide insight into developmental processing differences.

Based on this earlier research, it would seem that the recognition that information was deleted from a familiar story would be an appropriate indication that a corresponding slot exists for the missing information in the person's schema; otherwise, there could be no recognition that the information was missing. A degree of sensitivity can be achieved in attempting to measure the developmental level of a story schema in this way through the systematic control of which categories of information are expunged. Previous research (Stein and Glenn, 1976; Mandler and Johnson, 1977) has indicated that young children recall some types of information very well and others almost never; thus the ability to recognize when information has been deleted might well be developmental corresponding to the level of story schemata. An analysis of responses given in answer to the request that the missing information be supplied provided additional insight into the way story information is processed within and between age groups.

Description. Each participant was tested individually. The experimenter gave the following directions: "I'd like you to listen very carefully to two stories I'd like to read to you. In a few minutes, I'm going to ask you a question about the stories to see if you remember them." The four stories selected for use in this task conform to the Stein and Glenn grammar (1979) and are of similar length. Albert the Fish and The Secret Trip Story were written by Nezworski, Stein and Trabasso (1979) for use in their research. The Dog Story, a version

of which was used by Mandler and Johnson (1977) in their study, and Harold the Mouse, based on Melvin, the Skinny Mouse a story provided by Stein and Glenn (1979) as an example of a simple episode, were both rewritten by the experimenter.

Following the reading of one of the four stories, a 20 second delay occurred, the first and second graders were asked to count to 20, the younger children were asked to complete a 20 second counting task. Following the delay, the experimenter read the same story over again with one category of information missing. The child was asked if the story was the same as the first time he heard it or if some part was missing. All responses were recorded and transcribed. In condition #1, one of the three most salient categories in recall (a setting, initiating event, or consequence) was deleted; in condition #2, one of the three least salient categories in recall (an attempt, an internal response, or a reaction) was missing. All subjects received both treatments counterbalanced across stories and subjects. The two stories that the child did not hear in the fall testing were presented during the spring testing.

In the event that a participant responded by saying that the story was complete, a probe question was asked, designed to determine whether or not the participant could recall the missing information. These data were treated in a separate analysis.

## Task #5

StimuliAlbert the Fish

Setting	Once there was a big grey fish named Albert who lived in an icy pond near the edge of a forest.
Initiating event	One day, Albert was swimming around the pond when he spotted a big juicy worm on top of the water.
Internal response	Albert knew how delicious worms tasted and he wanted to eat that one for his dinner.
Attempt	So he swam very close to the worm and bit into him.
Consequence	Suddenly, Albert was pulled through the water into a boat. He had been caught by a fisherman.
Reaction	Albert felt sad and wished he had been more careful.

The Secret Trip Story

Setting	Once there were two kids named Peter and Mary who lived across the street from one another.
Initiating event	One morning, Peter called Mary and asked Mary to come over and play.
Internal response	But Mary wanted to go shopping and she didn't want to tell Peter where she was going.
Attempt	So Mary told Peter she was sick and couldn't come over to play.

- Consequence Then Mary went shopping and bought a brand new skateboard.
- Reaction Mary thought it was a special toy and she was glad she had kept her shopping trip a secret from Peter.

### Harold the Mouse

- Setting Once there was a cute brown mouse named Harold who lived in an old dead tree near a farmhouse.
- Initiating event One day Harold saw a box of cereal in the kitchen. He knew it tasted sweet; he wanted some for breakfast.
- Attempt He climbed up on the table and into the cereal box. Then he began to eat the cereal. Harold ate and ate.
- Consequence He got so fat that he couldn't climb out of the small hole in the cereal box.
- Reaction Harold felt sad; he knew he had eaten too much.

### The Dog Story

- Setting One sunny day a dog found a piece of meat and was carrying it home in his mouth.
- Initiating event He had to walk across a bridge on his way home. As he was crossing the bridge, he looked down in the river and saw his shadow reflected in the water.
- Internal response He thought it was another dog with a piece of meat. He decided that he wanted that piece of meat too.
- Attempt The dog snapped at his shadow in the water.

Consequence	But when he opened his mouth, the meat fell out into the river and was gone.
Reaction	The dog felt badly that he lost the piece of meat he had.

Scoring. A weighted scoring system was used to differentiate responses that previous research (Stein and Glenn, 1979) suggests reflect the influence of story schema.

<u>Response:</u>	<u>Points</u>
Missing information supplied verbatim or with minor changes, e.g. pronoun substitutions or synonyms.	7
Missing information supplied generated by the participant in the same category but semantically different from the actual missing information.	5
Information generated by the subject plausible but in another category.	3
Information generated fanciful.	2
Participant recognizes that information is missing but has no idea what it might be.	1
Participant responds by saying that the story is complete.	0



Probed Recall Response:

Entire information correct.	2
Correct but partial information.	1
Incorrect or no recall.	0

Experimental Task 4: Inferring Causal Relations

Rationale. In previous research (Stein and Glenn, 1979) the majority of first grade children saw no causal link between nonembedded episodes in a story; those who did perceive a causal relationship based their interruptions on incorrect data. These children were somewhat more successful at perceiving causal relationships within episodes. By contrast, all the fifth graders in that study gave correct responses to probe questions designed to test their understanding of causality between episodes. In general, they were more successful than the younger children at perceiving intra-episode cause and effect relations also. Mandler and Johnson (1977) reported similar developmental trends in the ability to draw logical inferences.

Thus, the understanding of causal relationships, especially between episodes in a story, seems to reflect developmental differences in the processing of story information. In terms of schema theory, these findings suggest that schemata become more flexible and extensive with experience. That is, as the expectations and knowledge inherent in a schema increase, the schemata enable the encoder to construct more elaborate representations of meaning.

Task four required children to respond to questions designed to assess their comprehension of causal relations, which either connect statements within an episode or between two episodes. The task thus provided the opportunity to analyze processing differences, related to the perception of causality, that exist between and within age groups. These processing differences may reflect developmental levels of a story schema.

Description. Each participant was tested individually; all responses were recorded and transcribed. The experimenter gave the following directions: "I have a story to read to you. I'd like you to listen very carefully so that you can answer some questions about it for me afterward." Immediately following the reading, the experimenter asked the child eight questions designed to assess the child's understanding of implied causal relationships within the story.

The two stories selected for this task were used by Stein and Glenn (1979) for the same purpose. The questions in the present study were written by the experimenter. Since the stories are neither structurally nor semantically similar, all participants were presented with the same story in the fall testing. A second story was given to all participants in the spring. Failure to use the same story with all children would have resulted in different scores on the experimental task possibly reflecting the difficulty of the stimuli rather than variations in the performance of the participants. This was not a consideration in the other experimental tasks because story structure was controlled, resulting in structurally identical stories.

## Task #4

## Stimuli

Story #1: The Fox, the Bear and the Chickens

<u>Category type</u>	<u>Statement</u>
Major setting	1. There was a fox and a bear
Minor setting	2. who were friends.
Internal response	3. One day they decided to catch a chicken for supper.
Internal response	4. They decided to go together
Internal response	5. because neither one wanted to be left alone
Minor setting	6. and they both liked fried chicken.
Attempt	7. They waited until night time.
Attempt	8. Then they ran very quickly to a nearby farm
Internal response	9. where they knew chickens lived.
Internal response	10. The bear, who felt very lazy
Attempt	11. climbed upon the roof
Internal response	12. to watch.
Attempt	13. The fox then opened the door of the henhouse very carefully.
Attempt	14. He grabbed a chicken
Direct consequences	15. and killed it.
Initiating event	16. As he was carrying it out of the henhouse
Initiating event	17. the weight of the bear on the roof caused the roof to crack.

- |                    |     |  |
|--------------------|-----|--|
| Initiating event   | 18. | The fox heard the noise                                      |
| Internal response  | 19. | and was frightened   |
| Minor setting      | 20. | but it was too late  |
| Internal response  | 21. | to run out.  |
| Direct consequence | 22. | The roof and the bear fell in                                |
| Direct consequence | 23. | killing five of the chickens.                                |
| Direct consequence | 24. | The fox and the bear were trapped in the<br>broken henhouse. |
| Attempt            | 25. | Soon the farmer came out                                     |
| Internal response  | 26. | to see what the matter was.                                  |

Questions on the Fox, the Bear and the Chickens

The questions were designed to assess understanding of causal relationships that are implied in the story. They were asked in the order indicated so as to require retrieval of information beginning with what was encoded last.

1. Why did the farmer think something might be wrong? (causal relationship between episodes)

Answer: He heard a noise; he heard the roof cave in.

2. Why was the fox frightened when he heard the roof crack? (causal relationship between an episode)

Answer: He knew it might cave in on him.

3. Why couldn't the fox and the bear get out of the henhouse after the roof caved in? (causal relationship within an episode)

Answer: There must have been stuff blocking their way;  
they were trapped.

4. Why was the bear on the roof? (causal relationship within an episode)

Answer: He wanted to watch from there; he felt lazy.

5. Why did the fox kill the chicken? (causal relationship between episodes)

Answer: He wanted to have him for dinner.

6. Why did the bear feel lazy? (causal relationship between episodes)

Answer: Because he had run so fast to the farm; it was night time.

7. Why did the fox open the door so carefully? (causal relationship within an episode)

Answer: He wanted to sneak in because he wanted to kill one; he didn't want the farmer to hear him.

8. Why did they wait until night? (causal relationship within an episode)

Answer: They didn't want to be seen going out to steal chickens; they knew the farmer would not be around.

Story #2: Epaminondas

Category Type

Statement

Minor setting

1. Once there was a little boy

Minor setting

2. who lived in a hot country.

- Initiating event 3. One day his mother told him to take some cake to his grandmother.
- Initiating event 4. She warned him to hold it carefully
- Initiating event 5. so it wouldn't break into crumbs.
- Attempt 6. The little boy put the cake in a leaf under his arm
- Attempt 7. and carried it to his grandmother's.
- Direct consequence 8. When he got there
- Direct consequence 9. the cake had crumbled into tiny pieces.
- Reaction 10. His grandmother told him he was a silly boy
- Reaction 11. and that he should have carried the cake on top of his head
- Reaction 12. so it wouldn't break.
- Initiating event 13. Then she gave him a pat of butter to take back to his mother's house.
- Internal response 14. The little boy wanted to be very careful with the butter
- Attempt 15. so he put it on top of his head
- Attempt 16. and carried it home.
- Minor setting 17. The sun was shining hard
- Direct consequence 18. and when he got home
- Direct consequence 19. the butter had all melted.
- Reaction 20. His mother told him that he was a silly boy
- Reaction 21. and that he should have put the butter in a leaf

Reaction

22. so that it would have gotten home safe and sound.

Questions on Epaminondas

1. Why did his mother tell him that he should have put the butter in a leaf? Why would that have helped him get it home safe and sound? (causal relationship within an episode)

Answer: The butter would have had protection from the sun.

2. Why did his mother tell him he was a silly boy? (causal relationship within an episode)

Answer: Because he carried the butter on his head in the sun.

3. Why did the butter melt? (causal relationship within a statement)

Answer: Because the sun was shining; it was hot.

4. Why did he put the butter on top of his head? (causal relationship within an episode)

Answer: To keep the butter safe.

5. Why did he want to be careful with the butter? (causal relationship between episodes)

Answer: His grandmother made him realize that he had not been careful enough with the cake.

6. Why did the grandmother tell him he was a silly boy? (causal relationship within an episode)

Answer: Because he crumbled the cake.

7. What made the cake crumble into pieces? (causal relationship within an episode)

Answer: He must have carried it too tightly; he wasn't careful enough.

8. Why did the boy put the cake in a leaf? (causal relationship within an episode)

Answer: To protect it; to keep it safe.

Scoring. Each correct answer received one point. Answers were considered correct if they reflected causal inferences that could be drawn from the text.

#### Experimental Task 5: Story Production

Rationale: Story schema, by definition, is a processing mechanism. The majority of research supporting the facilitative function of schemata has demonstrated its effects in aspects of processing. But, as vanDijk (1980) observed in his recent review of research in discourse, language users must be able to recognize a story when they hear/read one, to discriminate between a story and a non-story, and to produce a story. VanDijk goes on to say that these competencies entail language users' implicit knowledge of the categories, rules and constraints that define narratives and the ability to strategically use this knowledge in the processes of production and comprehension.

That young children do in fact bring their understanding of story structure to bear in the production of stories has been demonstrated in previous studies (Vygotsky, 1962; Applebee, 1977; Stein and Glenn, 1977). There are several reasons for including a generation task as an indicator of story schema. As the studies cited indicate, story structure has been observed to increase in complexity as a function



of the child's growth in language, in knowledge of the world, and, presumably, in acquisition of story schema. In creating a story children are free to impose any structure they wish. Through an examination of the resulting protocols, the schema available to the child in production becomes evident. Thus, a story a child produces may reflect his implicit knowledge of what a "good story" is at his or her particular stage of development.

Finally, in examining stories children produce there is the opportunity to verify current theoretical models and to refine them in terms of the data. The goal, of course, being a closer approximation of what it is the model attempts to delineate. In this procedure the model used for the analysis of story structure is the Stein and Glenn (1980) story generation algorithm.

Researchers interested in the writing processes and products of young children (Calkins, 1978; Graves, 1980) have documented that children in the early grades are capable of far more complex writing, including multiple revisions, when provided with the appropriate environment, than was previously believed to be the case. Context as a highly influential variable in children's writing behavior has been demonstrated in such research (Calkins, 1979; Graves, 1974). The experimental approach of extrapolating children's writing competence from one or two samples of writing collected under artificial conditions has been criticized (Graves, 1980). The intent in this study was not to draw conclusions as to the best stories the subjects are capable of producing based on the stories they did write in this fifth procedure; but rather, to chart a developmental progression of story structure, produced under

the conditions of the experiment. Every effort was made to provide writing conditions as natural and as open-ended as possible.

It is generally recognized that children's oral stories are more complex than written stories due to the additional production demands writing imposes. However, the decision was made to analyze written rather than oral stories because writing is a school task whereas the production of oral narratives usually is not. Only one data collection occurred because first graders could not write well enough in the fall to produce usable protocols.

In the Stein and Glenn (1977, 1981) studies of story production, subjects were supplied with a stem which was essentially setting information and were asked to complete the story verbally. In this procedure pictures were selected as story starters in a deliberate attempt to determine the influence of setting versus non-setting information on the quality of story produced. The pictures chosen were selected as stimuli on the basis of their familiarity to young children.

One of the pictures was that of a fire truck parked outside of a fire station. Even though there were no people in the picture, it was hypothesized that this picture would stimulate more stories with motive resolution sequences than the other picture because a goal could be easily inferred, putting out a fire. The other picture was a playground scene depicting numerous children engaged in various kinds of physical activity. While this picture supplied many possible characters for a story, no goal was suggested in the picture. Therefore, while one picture supplied characters it suggested no playful activity for them; the other picture suggested playful activity but provided no characters.

It was hypothesized that young children would find it easier to supply a protagonist to carry out an implied goal than they would to generate a goal and select a protagonist from the picture to carry it out.

Description. Following the administration of the second experimental procedure, the subject, a first or second grader, was shown a picture of a fire truck and asked to pretend the picture was on a page in a storybook. The child was asked to write "a good story," to go with the picture, "Just like you might read in a storybook, or that your teacher might read to you." Subjects were told they could take as long as they liked to write their stories; they could make them as long as they wished (there was an unlimited supply of paper available) and that they could include anything they wanted in their story. The writing was done in an empty classroom, which many of the children had occupied at an earlier grade. Each child wrote his or her story for this picture individually while the experimenter administered the second experimental task to the next subject in the back of the room.

The other picture was presented at another time in a small group situation. Which picture a child wrote about first was randomly determined. Five or six children, classmates, sat at individual desks in the same empty room as was used for the fire truck story. The experimenter showed the children the picture (a playground scene), which was large enough to be viewed by the group; the picture remained on display as the children wrote. They were free to examine it closely if they wished. However, no discussion was permitted about either picture prior to or during the writing so as not to influence the production process. In neither case did the experimenter supply correct spellings for words;

children's questions were answered with encouragement. The experimenter read each story as it was completed. If a story was not readable, the experimenter asked the child to read it to her and she wrote what the child intended to say above the child's writing. There were only a few times when this was necessary.

Scoring. Each story protocol was logged for:

- number of words and thought units. Thought units were generally defined by phrases, clauses, and simple sentences.
- conventional beginnings and endings, i.e. once upon a time, the end.
- settings, i.e. the introduction of a protagonist plus one or more statements about the physical, social, or temporal environment in which the remainder of the story occurs.
- degree of structural complexity.

The structural analyses was completed using the Stein and Glenn (1981) story-generation algorithm. This procedure allows for the identification of a generated story as representative of a particular level of complexity in a developmental taxonomy of structural variation in children's stories. The algorithm assumes a knowledge of the Stein and Glenn (1975) grammar, on which it is based.

The scoring system itself is complex; the determination of category membership requiring the interpretation of both higher and lower order information in protocols. Attention is paid to semantic content in ascertaining type of propositions present as well as the nature of

connectors. However, the final category decision is made on the basis of the structure present or absent in the story.

Readers are referred to Stein and Glenn (1981) for an explication of their model and procedure. The following brief description of the salient characteristics of each structural level is not meant to be exhaustive. It is presented here to give a general idea of the type of output included in each category. Figures to the left indicate the number assigned to a child's story if it represented that level of complexity.

<u>Points</u>	Stories not organized around a motive resolution sequence:
0	<u>No Structure</u> : Stories with only one or two statements.
1	<u>Descriptive Sequence</u> : Statements describe habitual feelings, personality traits, typical goals, with no temporal or causal relations.
2	<u>Action Sequence</u> : Statements describe habitual, stereotypical, everyday actions or protagonist temporally arranged, not necessarily causally connected.
3	<u>Reactive Sequences</u> : Events have a beginning and an end, are causally related, but are out of the control of the protagonist. No planful behavior on the part of the protagonist occurs.
	Stories based on a single motive resolution sequence:
4	<u>Incomplete Episode</u> : Protagonist's goal statement and consequence but no means whereby goal was brought about, or an attempt, but no consequence.
5	<u>Simple Episode</u> : Initiating event and/or an internal response, attempt and consequence. No reaction.

- 6 Complete Episode: Setting, initial event, attempt, consequence, reaction.
- 7 Multiple Episode Stories: contain more than one motive resolution sequence.

### Statistical Analysis for Each of the Experimental Procedures

The following analyses were completed for experimental procedures one through four. The fifth procedure required a different analysis since it was administered at only one of the two data collection points.

The first hypothesis, pertaining to the between group differences:  $H_0: u_1 = u_2 = u_3 = u_4$ ;  $H_a: u_1 \neq u_2 \neq u_3 \neq u_4$ , was tested using a one-way analysis of variance. Where appropriate, post hoc multiple comparisons were made using the Tukey HSD ( $p < .05$ ) procedure to determine which means or combinations of means differed significantly.

The second hypothesis, regarding the developmental change in story schema over the course of the academic year:  $H_0: D = u_1 - u_2 = 0$ ;  $H_a: D = u_2 - u_1 > 0$ ; was tested using the appropriate procedures for dependent samples, that is, a Student's paired t-test.

The third hypothesis, the prediction of reading achievement:  $H_0: D = u_2 - u_1 = 0$ ;  $H_a: D = u_2 - u_1 > 0$ ; was tested using an analysis of covariance procedure that calculated the residualized gain scores from the two administrations of the Gates-MacGinitie Reading Tests while holding the IQ constant, then tested whether or not there was a statistically significant difference in reading achievement between those children who performed well on the experimental tasks and those who did not at the start of the school year.

The same series of statistical tests just described for tasks one through four were completed for task five with one difference. Since there was only a spring score, it entered into the analysis rather than using residualized gain scores.

Analysis of variance was selected as the main method of hypothesis testing for each of the experimental procedures because it was judged to be robust enough to handle the various levels of measurement, including ordinal through ratio data, represented in the study (Wolfle, 1978).

Pearson's product-moment correlations were computed to determine the degree of correlation between performance on the experimental tasks and the IQ and mental age.

#### Testing Schedule

Each participant was interviewed four times for approximately 20 minutes each. The experimental tasks administered at each meeting were balanced in terms of time and difficulty required for their completion.

Time #1: Peabody Picture Vocabulary Test

Experimental task #4

Time #2: Experimental task #3

Experimental task #1

Time #3: Experimental task #2

one written story

Time #4: Experimental task #5

one written story

The Gates-MacGinitie Reading Tests was administered in October in a group situation and again in May.

## Chapter 4

### RESULTS

#### Introduction

Two data collection periods occurred in this study of story schema acquisition: one in the fall of the year, the second in the spring. In the fall there were 156 subjects: including 24 four year olds enrolled in a Head Start program and 44 children each in kindergarten, and first and second grade. Through normal attrition over the school year, sample size was reduced in the spring to 18 Head Start subjects, 40 in kindergarten, 41 and 40 in grades one and two respectively, for a total of 139.

Four experimental procedures were completed with each subject at both data collection points; a fifth procedure was carried out in the spring with the two older groups of participants. In addition, the first and second graders were administered the Gates-MacGinitie Reading Tests, Primary A and Primary B at the start of the year and a second form of the same test at the end of the school year. Each child in the sample was given the Peabody Picture Vocabulary Test (1969) in the fall.

In this chapter, the results of each experimental task are presented in the following manner: for each task a brief restatement of the procedure is provided followed by any preliminary analysis specific to the task. Then the quantitative data for research hypotheses one and two, which predicted within and between group differences in scores, is presented along with any other qualitative examinations relative to



variations in performance. Pearson product-moment correlations between IQ, mental age, and task scores are provided next. Finally, each section concludes with findings relative to the third research hypothesis, that of a relationship between level of story schema acquisition as measured by the experimental procedure, and subsequent achievement in reading.

#### Task 1: Metacognitive Knowledge of Story Structure

In this task subjects were exposed to four stimuli ranging from a list of nouns to an actual story. Each pupil responded to the first warm up question for this task, "Can you tell me the name of a story you like?" Their responses were analyzed using a Student's t-test to determine if the mean scores achieved at each grade differed significantly between the fall and spring administrations. The only group to demonstrate a significant difference on this question was the Head Start population ( $p < .01$ ). Since no response was scored a zero, and a comment scored a one, the Head Start means, .958 for the fall and 1.421 for the spring apparently reflect overall language development rather than an increasing familiarity with stories. A slight decrease in scores among the kindergarten and second grade children, while unexpected, was not statistically significant. Children who were able to produce the name of a story they liked scored a three. Performance by these children is reflected in Figure 1. As is evident, the increasing proportion of these students at each grade level indicates a progression in children's ability to identify and to discuss stories. By fall of the kindergarten year half of the subjects were able to produce the name of a favorite story.

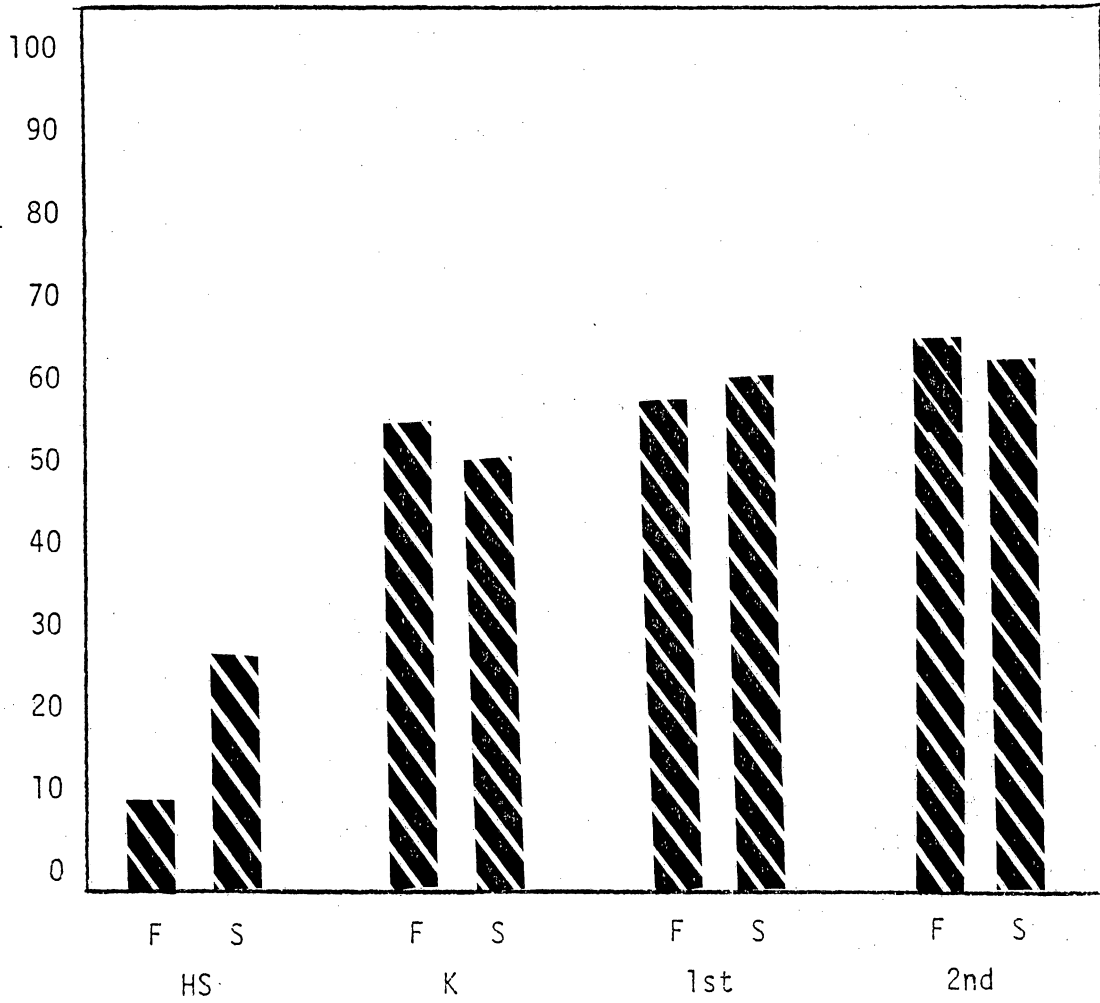


Figure 1. Percentage of subjects who could identify a favorite story task 1: fall and spring.

Figure 2 illustrates the proportion of children at each grade level who responded with two negatives to the second warm up question: "If I asked you to stand up, would that be a story? If I asked you to sit down, would that be a story?" Here the data reflect a clear developmental trend, this time in the ability to reject directions as stories. Half the subjects at the start of the kindergarten year gave correct responses. Significant growth in this simple measure of story schema was observed in the Head Start population ( $p < .05$ ) and among the kindergarten subjects ( $p < .05$ )

Research hypotheses numbers one and two predicted that scores achieved by children at each grade level and within grades would increase across the two administrations of the task. In general, the data support these hypotheses. Gains achieved by subjects in each of the four groups on the task measuring metacognitive knowledge of story structure are presented in Figure 3. Performance in children's ability to identify instances of stories and non-stories increased significantly over the course of the academic year in each group, with the exception of the second graders who exhibited only a slight gain: (Head Start  $p < .09$ ; kindergarten  $p < .000$ ; first grade  $p < .02$ ; second grade  $p < .10$ ). These results are presented in Table 2.

As anticipated, the means were increasingly higher at each grade level across the two administrations of the task. Post hoc multiple comparisons using the Tukey-HSD procedure revealed significant differences between the following adjoining grades in the fall of the year ( $p < .05$ ): kindergarten and first grade; first and second grade. In the spring of the year, the same procedure indicated that the Head Start and

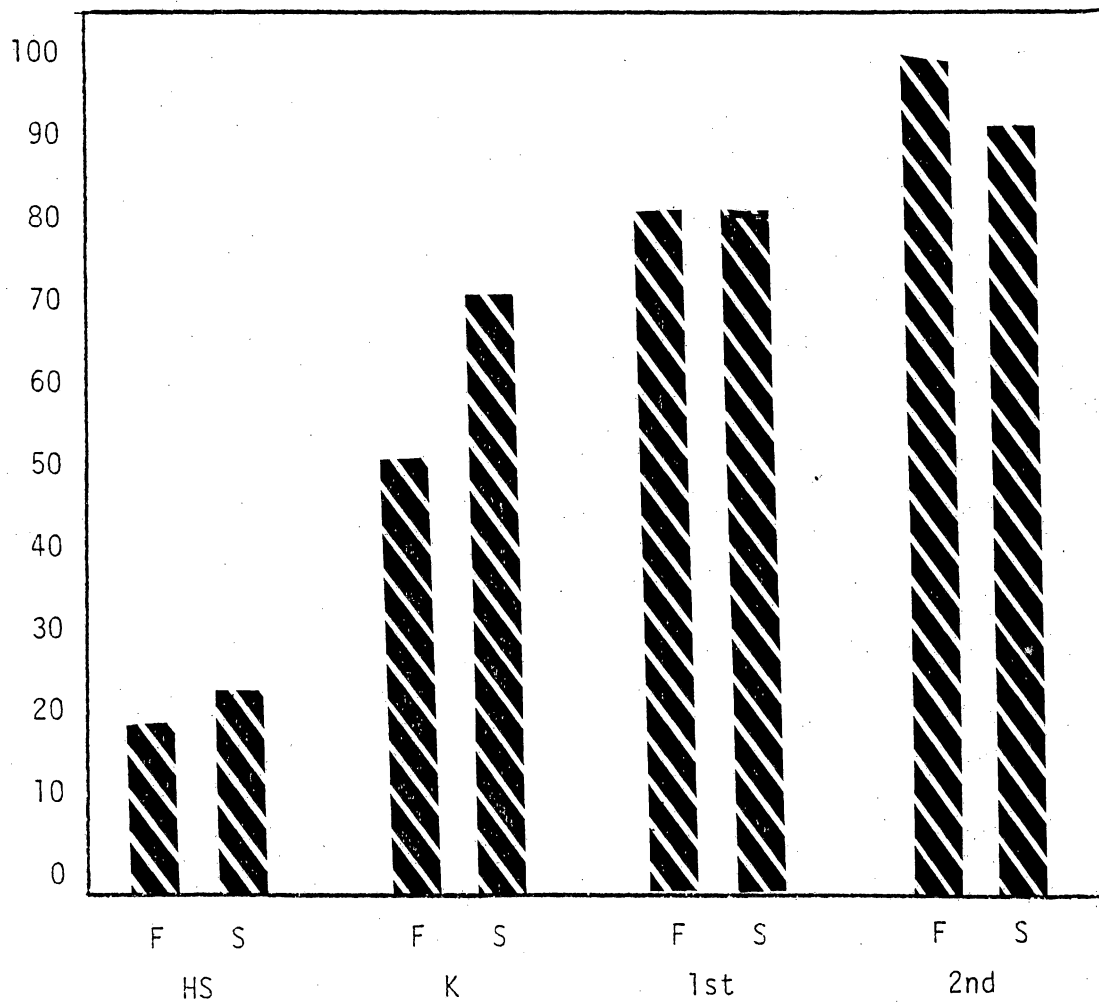


Figure 2. Percentage of subjects who rejected directions as examples of stories task 1: fall and spring.

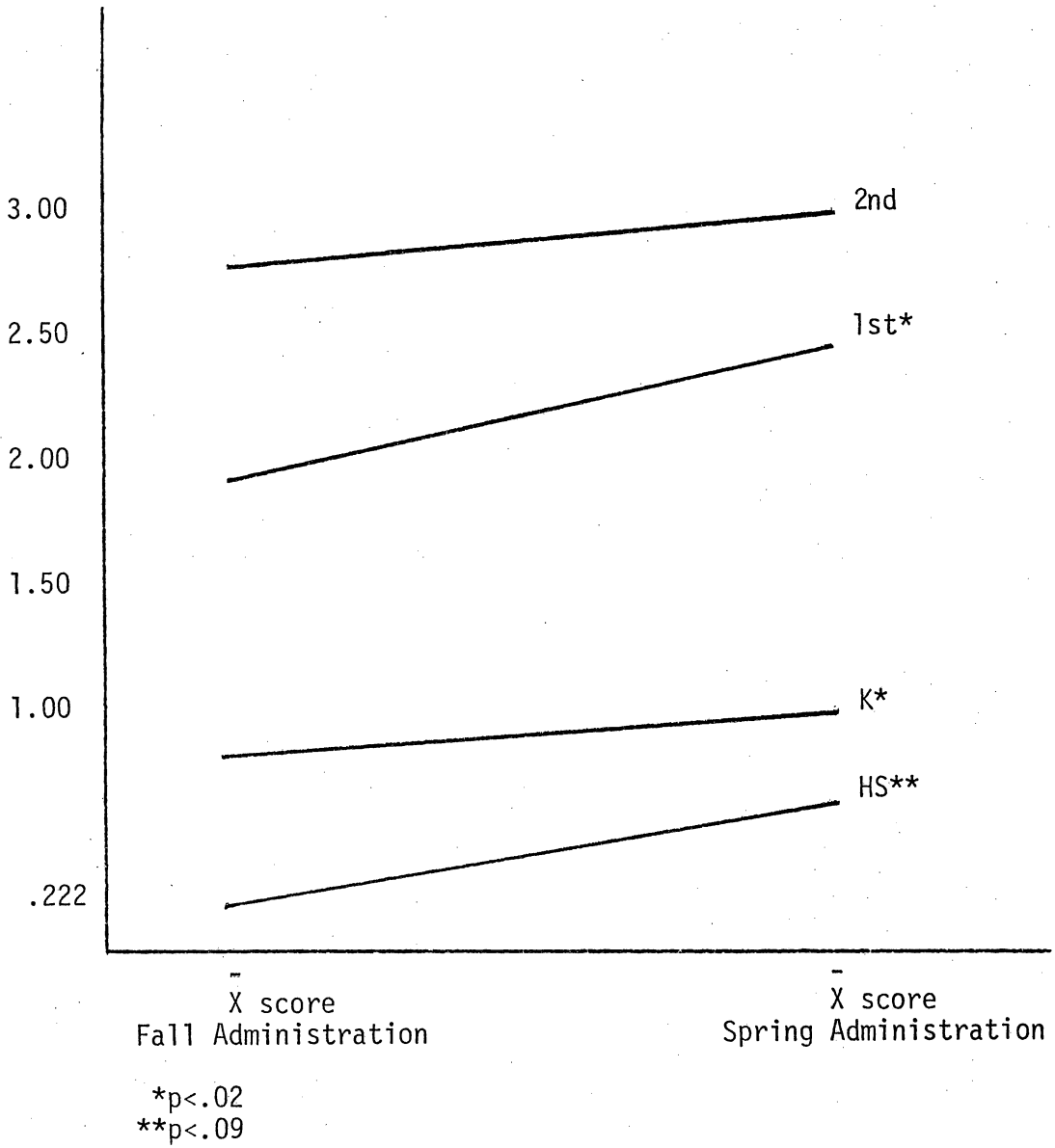


Figure 3. Mean scores on task 1: metacognitive knowledge of story structure.

kindergarten means were different ( $p < .05$ ).

Table 2  
Means and Standard Deviations by Grade Level  
for Task #1: Metacognitive Knowledge of  
Story Structure

	HS*		K*		1st*		2nd	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
$\bar{X}$	.22	.56	.78	.95	1.86	2.37	2.55	2.70
SD	.65	.92	.17	.20	.22	.18	.13	.15

\* $p < .09$

In terms of raw score gains the data suggest a developmental progression in young children's metacognitive knowledge of story structure. The first grade children exhibited the most growth with an average gain of .51; the Head Start children were next with an average increase of .33 points followed by the kindergarten children (.16 points). The second grade sample demonstrated the least increase (.15 points).

In order to test hypotheses regarding performance on each of the four stimuli, an analysis was completed using a Student's t-test examining children's responses. These results appear in Figures 4 through 8. First examined were the overall responses (Figure 4). It was anticipated that children would find stimuli A, the unrelated list of nouns, the easiest to reject as a story. Hence, it was assumed that scores on this stimulus would be as high as compared to the others. Stimulus D, containing an episode, was considered the only complete story and it was hypothesized that overall performance would be high for D also.

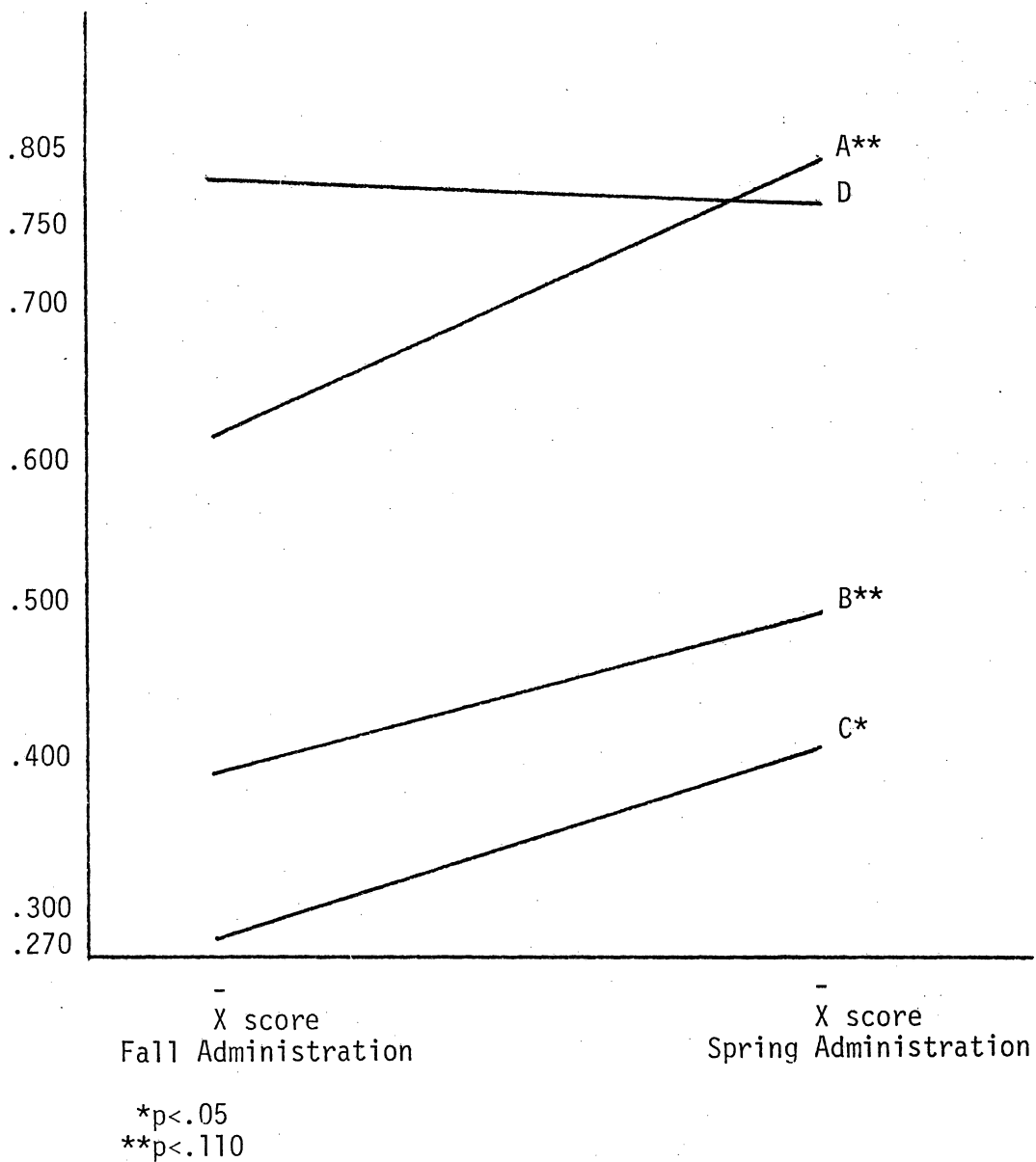


Figure 4. Mean responses to stimuli A, B, C, D collapsed across groups.

Stimuli B and C only approximate a story as defined by story grammars. They do, however, present the type of structures young children produce when asked to tell a good story. Therefore, it was hypothesized that overall performance would be less for these stimuli, with C receiving a greater proportion of incorrect responses because it more closely approaches the structure of a complete story. In general, the data support these hypotheses. One unexpected finding, relative to this analysis, was the fact that in the fall of the year, the average response was higher for the story than for the unrelated list of nouns ( $p < .05$ ). By the spring, performance on stimulus A was higher, ( $p < .08$ ).

Figure 5 represents mean group responses to stimulus A, the random list of nouns. At each grade level with the exception of second grade, there was a significant improvement in the participants' ability to reject the stimulus (A) as a story. (Head Start,  $p < .09$ ; kindergarten,  $p < .001$ ; first grade,  $p < .001$ ). Among the second graders, performance decreased slightly ( $p > .10$ ) over the course of the academic year. The greatest amount of growth was exhibited by the kindergarten subjects (.30 points) followed by the first graders (.25 points).

A similar pattern of performance occurred relative to stimulus B, (Figure 6) the simple description of a child. An increase in mean scores was observed across groups with the exception of the second grade. The kindergarten and first graders' performance increased significantly over the academic year ( $p < .06$ ;  $p < .10$ ) reflecting their raw gains on stimulus A. The Head Start increase was not statistically significant.

In response to stimulus C, (Figure 7) the description of a child plus a goal statement, the Head Start subjects' performance increased



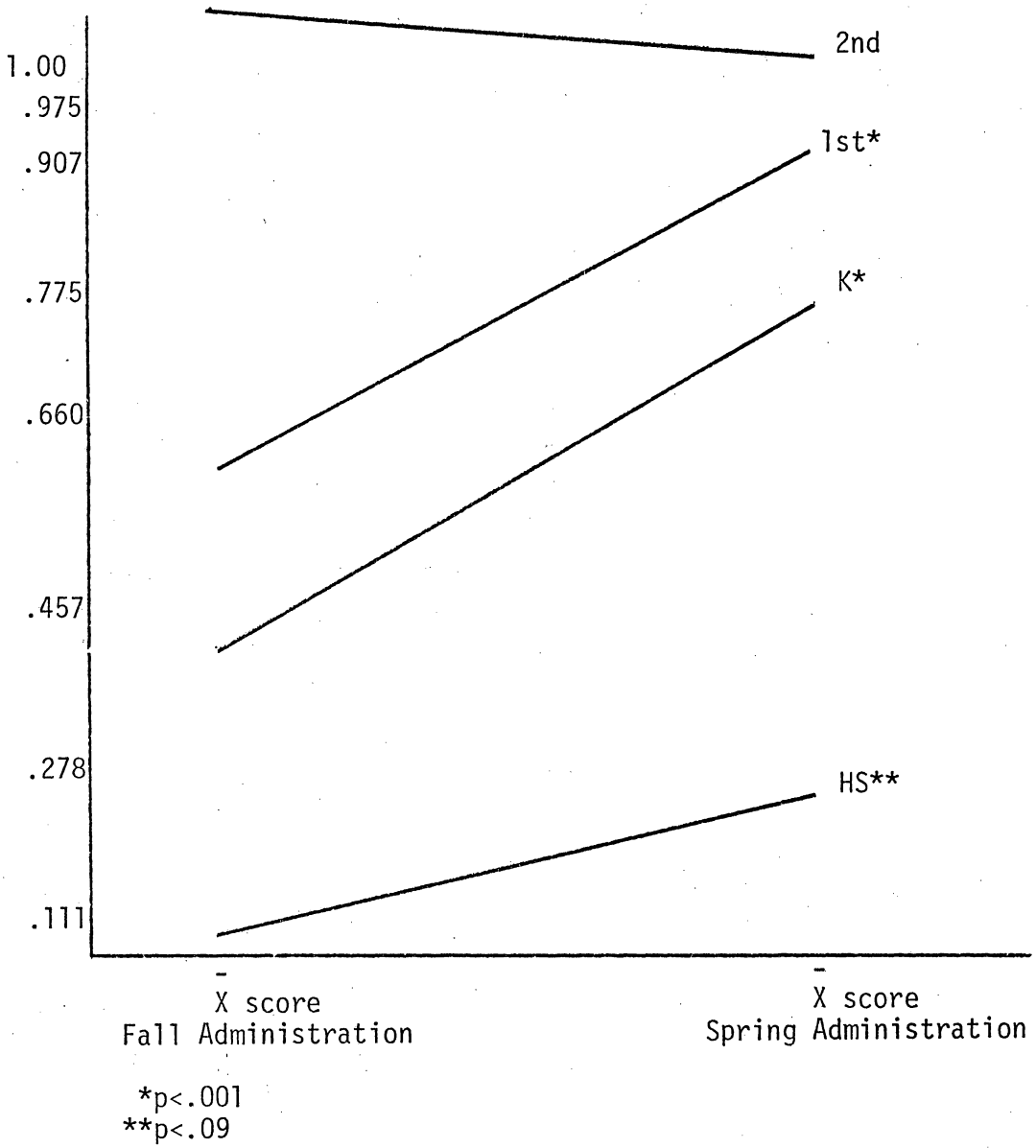


Figure 5. Mean responses to stimulus A: the random list of nouns.

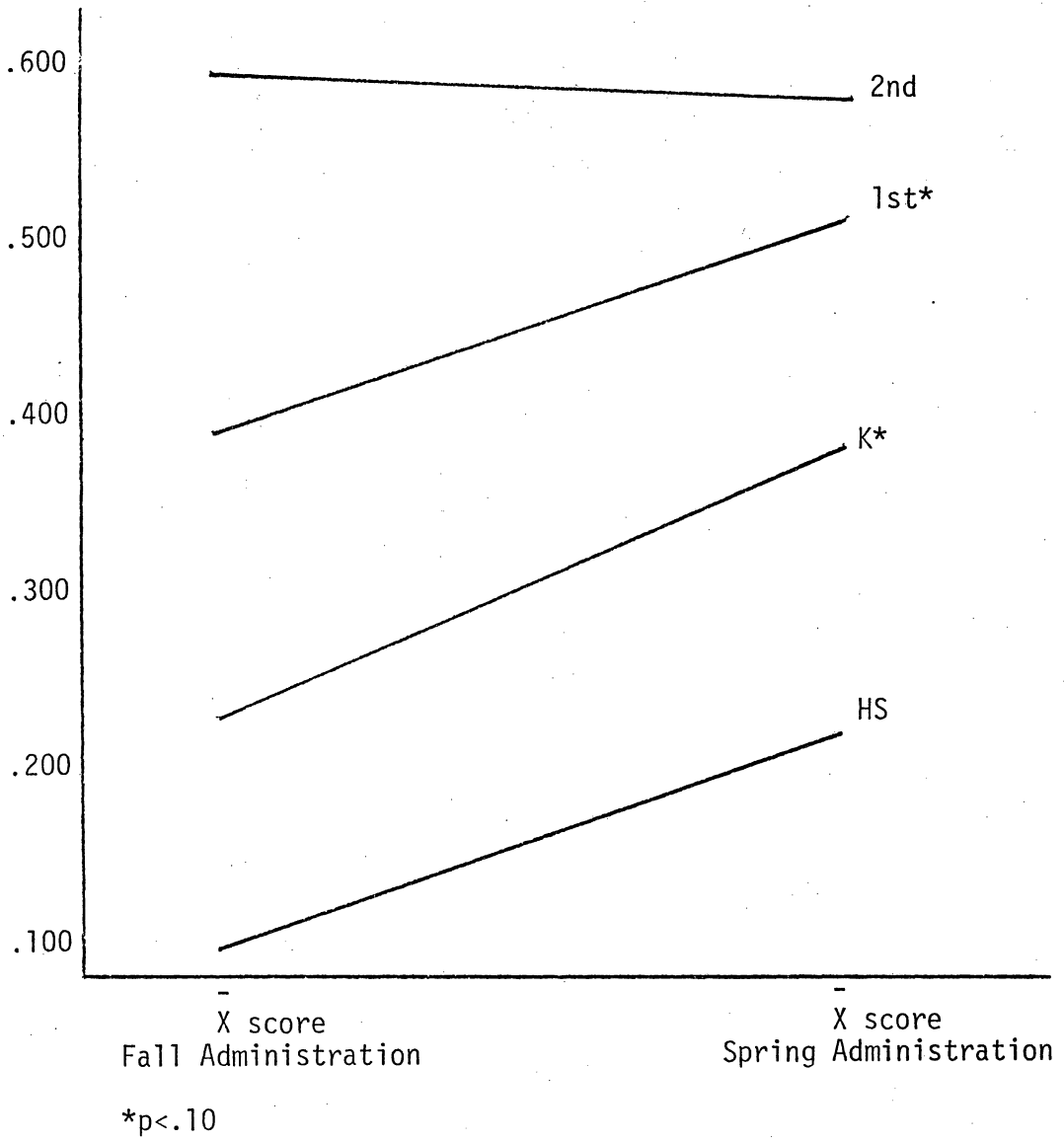


Figure 6. Mean Responses to stimulus B: a description of a child.

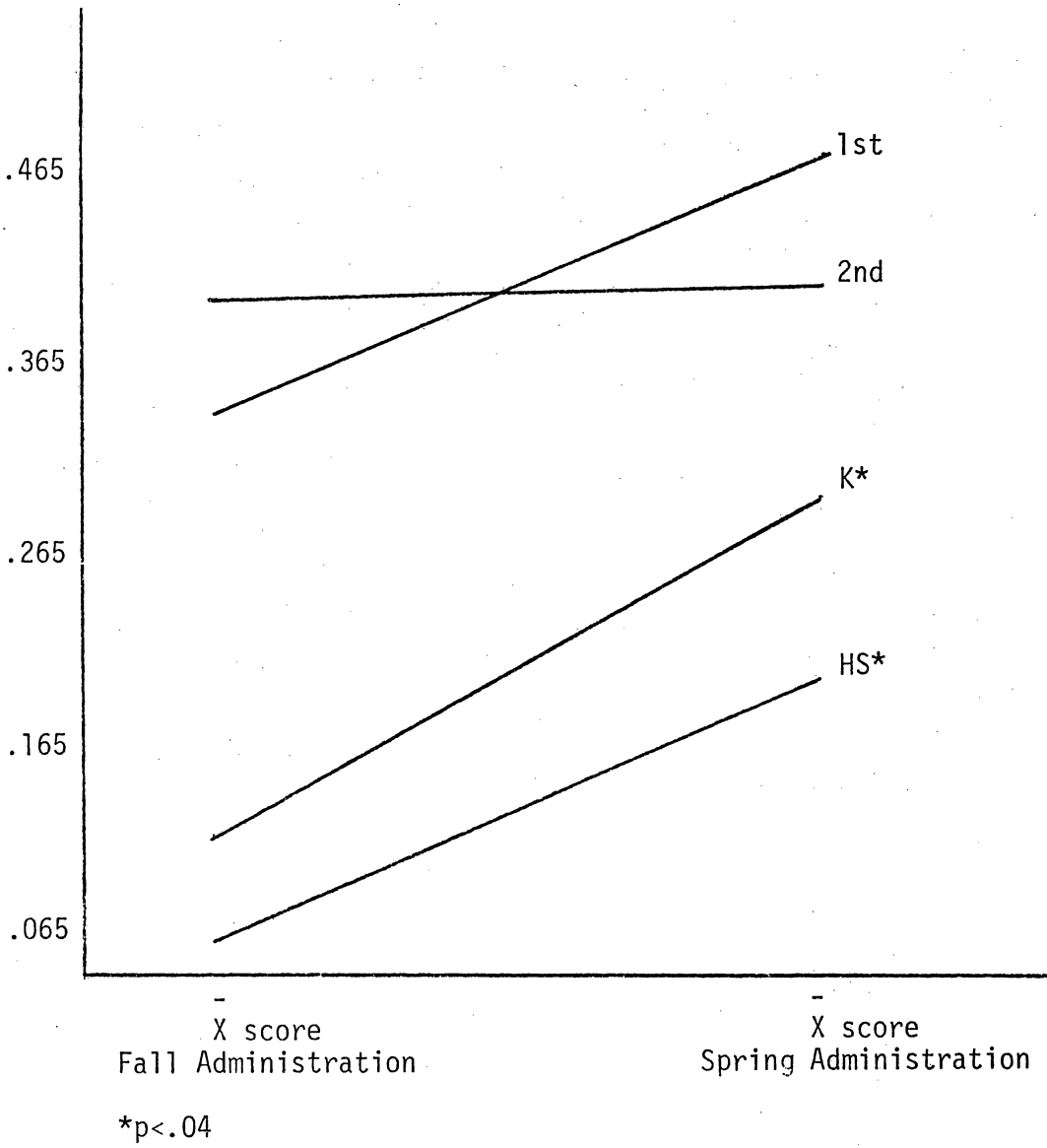


Figure 7. Mean responses to stimulus C: a description of a child and a goal.

significantly ( $p < .04$ ) as did that of the kindergarten subjects ( $p < .01$ ). While first graders showed some improvement, it was not significant and in general, the 2nd graders remained stable. For each group, the mean scores were lower than for stimuli B, as anticipated. Since stimulus C more closely approximated a story, a finer degree of discrimination was called for.

There were no significant differences in the responses of the kindergarten, first and second graders from the beginning of the year to the end for stimulus D, a story ( $p > .10$  in each case). However, mean scores showed a decline which was significant ( $p < .08$ ) for the Head Start population. In the fall of the year, there were more second graders who said stimulus D was not a story than there were first graders or Head Start children who failed to identify stimulus D as a story. This pattern of responses for the story stimulus was not as anticipated (Figure 8).

The metacognitive knowledge task yielded a significant amount of descriptive data which were also analyzed in an effort to determine whether any developmental trends were evident. Following each subject's affirmative or negative decision as to whether the stimulus was a story, each child was asked the reason for his or her answer. An analysis of participant's responses revealed six categories for children's judgments. To ease interpretation of data presented in tables below, a key descriptor for each basis precedes the explanation provided here. Examples of responses forming each category were given in chapter three.

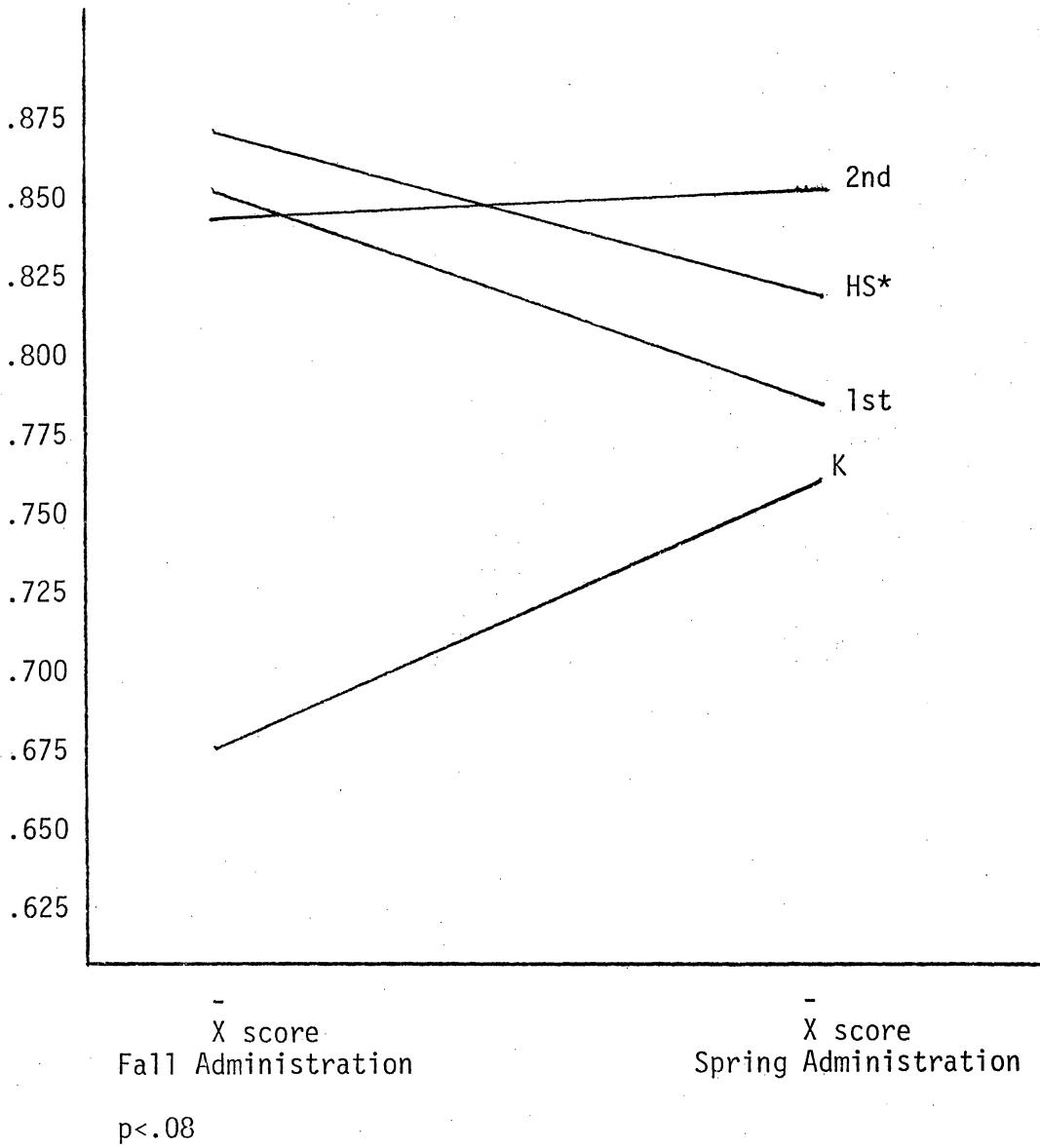


Figure 8. Mean responses to stimulus D: a setting, initial incident, goal, attempt, consequence.

<u>Category</u>	<u>Number</u>	<u>Descriptor</u>	<u>Criteria for Inclusion in Category</u>
	0	Don't know	Child's response was one of silence, "Don't know," or "Cause."
	1	Presentation	Judgment based on the mode of presentation of the stimulus.
	2	Length	Judgement based on length only.
	3	Cohesion	Basis for judgment reflected a sensitivity to cohesion or coherence, either the lack or presence thereof.
	4	Content	Judgment made on basis of stimuli content exclusive of a protagonist's goal, desire, or action carried out in service of a goal.
	5	Storylike	Response reflected a comparison of the child's mind between the stimulus and an implicit criteria of a story.
	6	Goal	Judgment made on presence or absence of a protagonist's goal, intent, desire, and/or action carried out in service thereof.

A trend was noted in the criteria for children's judgments. The older participants more frequently articulated reasons having to do with an aspect of content, the presence of a goal in the stimulus when there was one, or a featural criteria of a story. The younger children less

frequently articulated a reason, or tended to cite the mode of presentation or an aspect of content as the basis for their decision. A Chi Square analysis was performed to determine whether a systematic relationship exists between grade level and basis for judgment. In each case, that is, for each group of responses to the four stimuli, the relationship was significant ( $p < .000$ ). Data from the analysis of fall responses are presented in Tables 3 through 10 in Appendix A. The analysis of student responses for the spring data revealed a similar pattern.

Spearman correlation coefficients were calculated to determine interrater reliability for the assignment of student responses to categories. Twenty-five percent of the total responses for both fall and spring administrations were entered into the analyses. The resulting correlations for the fall data were as follows: for stimuli A, .76; for stimuli B, .77; for stimuli C, .87; for stimuli D, .90.

Correlations were also calculated between IQ, mental age, and the developmental level of story schema as measured by the metacognitive task. As Table 11 illustrates, the degree of correlation tended to increase as grade level decreased. Overall, the correlations were not strong with the possible exception of the Head Start mental age figure (.56).

The third research hypothesis postulated a relationship between performance on the first task and success in beginning reading. To determine whether a child's developmental level of story schema, as measured on this metacognitive task, was a significant contributor to reading achievement in first and second grade, mean raw scores from the fall and spring administrations of the Gates-MacGinitie Reading Test

were entered into an analysis of covariance. The spring reading score (comprehension plus vocabulary) was the dependent variable, fall reading scores and the IQ covariates. For the first grade subjects, knowledge of story structure was a significant contributor to the variance in total reading gain: comprehension and vocabulary ( $MS=621.19$ ,  $F=2.13$ ,  $p .09$ ). Performance on the metacognitive task for second grade subjects did not appear as a significant contributor to the variance in reading achievement.

Table 11

Task #1: Metacognitive Knowledge of  
Story Structure  
Pearson Product-Moment Correlations

	HS	K	1st	2nd
IQ	.34*	.37*	.06	.26*
MA	.56*	.26*	.07	.08

\* $p < .05$

#### Task 2: Detection of Structural Variation

In this procedure, subjects listened to the same story repeated six times: three times the story was heard in a story-normal condition and three times with the parts of the story systematically scrambled. Order of presentation was random. Therefore, some subjects heard the three normal story order conditions first followed by three mixed up renditions. An analysis of variance determined whether order of presentation resulted in systematic differences in performance. It was



reasoned that if children heard the story correctly two or three times in a row they might identify the scrambled versions more readily. Similarly, a normal/scrambled pattern over the six exposures might have resulted in higher scores. Neither proved to be the case, however. One way analyses of variance (score on the task by story order) revealed no significant differences between those who heard the normal conditions first or in an alternating pattern and those who did not.

Research hypotheses one and two relating to within and between group differences were, in general, supported by the data. As expected, the mean scores of performance were increasingly higher at each grade level across the two administrations of the task. Post hoc multiple comparisons using the Tukey-HSD procedure revealed significant differences between the following adjoining groups in the fall of the year ( $p < .05$ ): kindergarten and first grade; first and second grade. At the second administration of the task in the spring of the year, the same procedure indicated significant differences ( $p < .05$ ) between the kindergarten and first grade subjects. It was anticipated that by the end of second grade the majority of children would successfully differentiate between normal ordered and scrambled stories. This did not occur as evidenced by the mean second grade response in the spring of a three rather than a four.

Within each grade level, some growth in sensitivity to structural deviations was demonstrated over the course of the year and is reported on Table 12. For the Head Start children the amount of improvement was not significant ( $p = .19$ ). However, it was for the other three groups: kindergarten ( $p < .02$ ); first grade ( $p < .006$ ); second grade ( $p < .10$ ). The kindergarten and first grade subjects demonstrated the most gain

over the academic year, averaging almost a point each (.8). As in the first task, the second graders evidenced less growth than the children at the two earlier grades, with a raw score gain of only .4 (See Figure 9).

Table 12  
Means and Standard Deviations by Grade Level  
for Task #2: Detection of Structural Variation

	HS		K		1st		2nd	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
$\bar{X}$	.25	.44	1.05	1.86	1.80	2.60	2.60	3.00
SD	.19	.25	1.50	1.70	1.68	1.59	1.58	1.45

\* $p < .02$

A question of interest in this task related to subjects' ease in identifying the three types of deviations from a normal story order. It was hypothesized that the consequence moved condition, wherein the child heard the consequence first, would be the most readily recognized as a scrambled story because stories so rarely begin with consequence information. As the results displayed in Figure 10 illustrate, this assumption was not borne out. In the fall of the year, the four year olds identified the initial event moved condition as a mixed up story significantly more often ( $p < .01$ ) than the other two conditions. But for the other grades, differences in recognition levels were not significant across conditions.

There were significant differences ( $p < .05$ ) between age groups

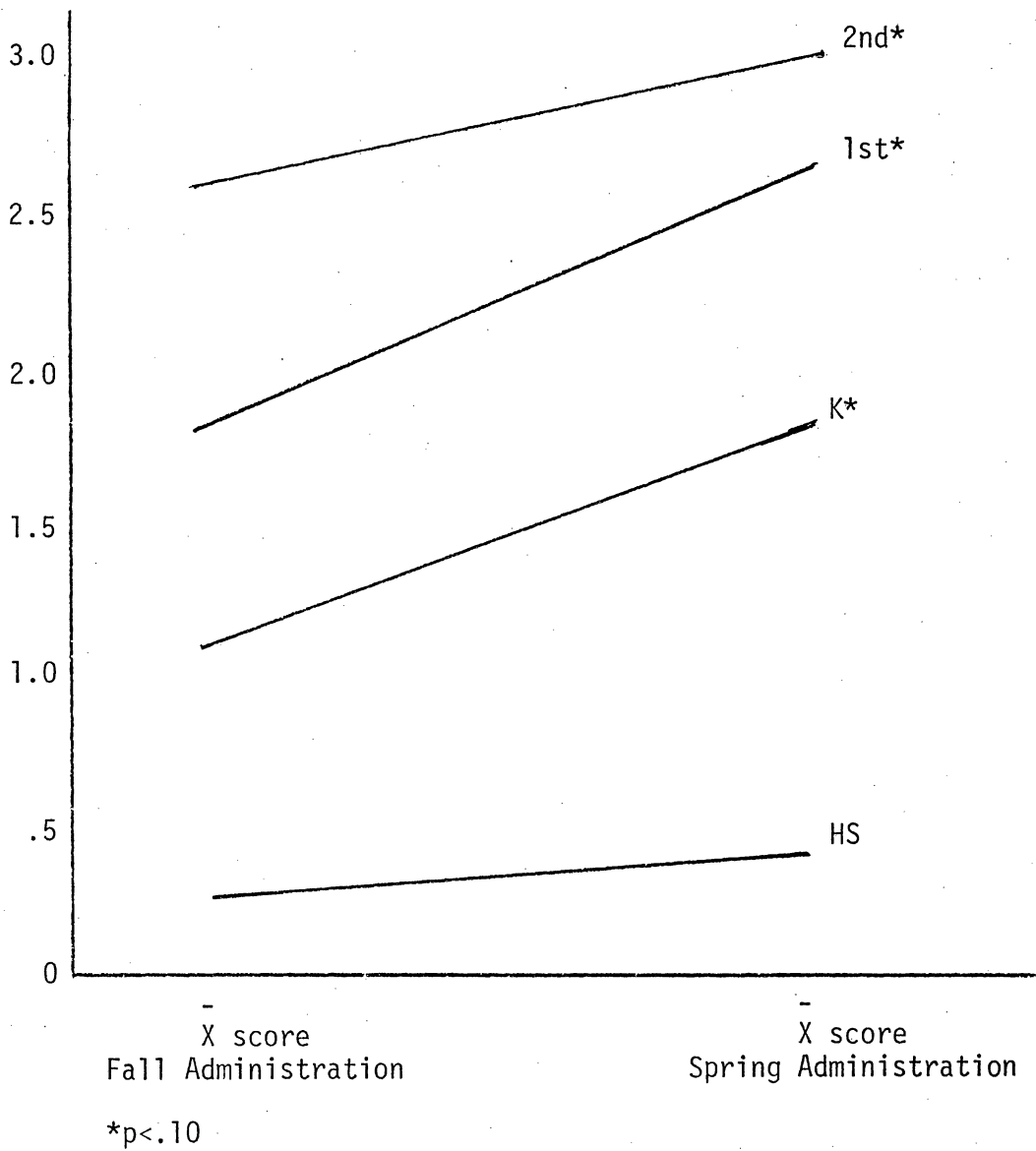


Figure 9. Mean scores on task 2: detection of structural variation.

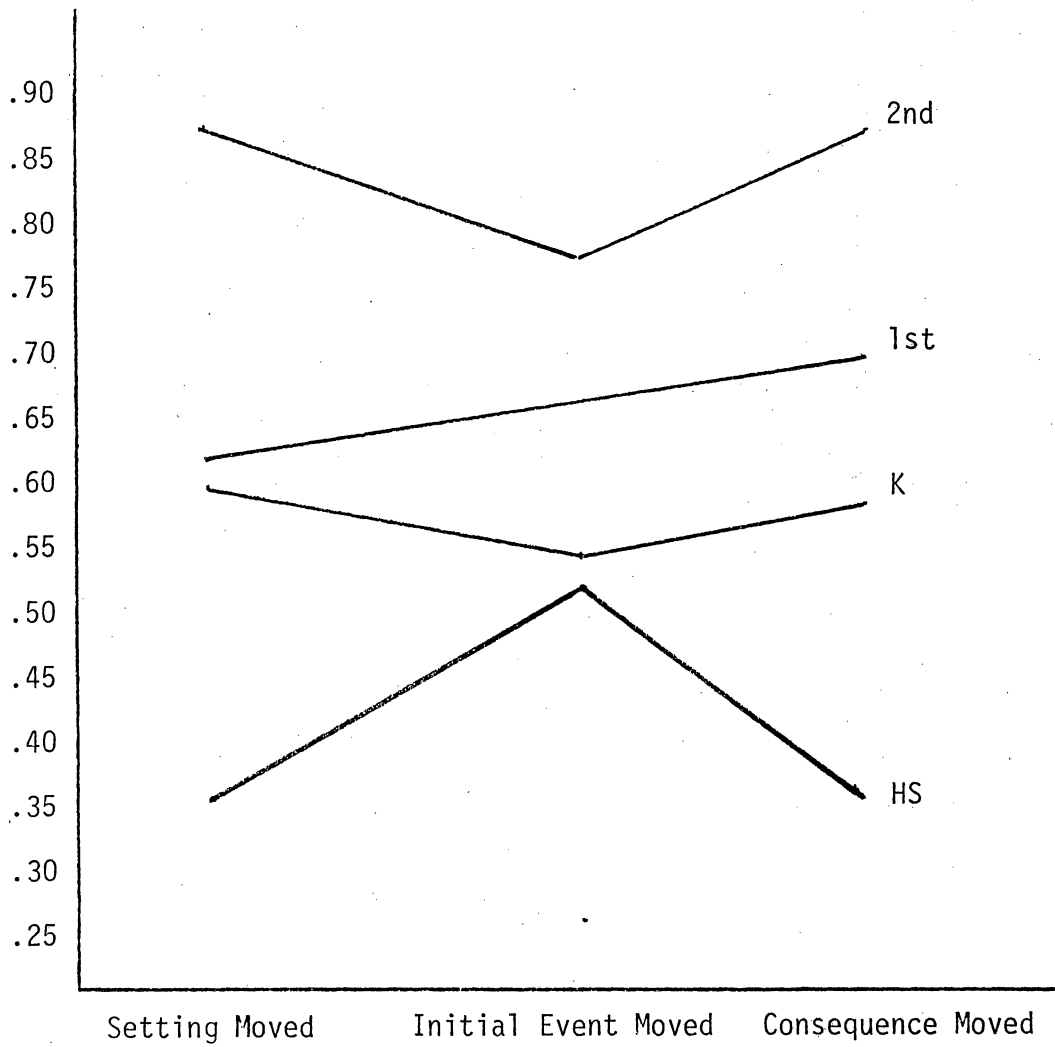


Figure 10. Mean scores on recognition for each type of structural deviation task 2: fall administration.

in the ability to identify each structural deviation. In general, the Head Start and kindergarten children performed significantly below the second graders. There was not a significant difference between the performance of the first and second graders except for the setting moved condition. This finding is interesting in light of the fact that the misplacement of the setting probably caused the least disruption in the coherence of the story thereby requiring the finest degree of discrimination. In this instance the second grade sample did perform qualitatively better than the younger children. One anomaly in these data is apparent on Table 13. The second grade students declined in their ability to identify each type of structurally deviated story between the fall and spring administrations of the task. This regression among the second grade group was evidenced elsewhere also and will be discussed in Chapter 5.

To assess the relationship between performance on this task and IQ, Pearson Product Moment Correlations were calculated. Correlations were also calculated for the mental age. The results from these analyses are presented in Table 14. The strongest correlation that appears is that between the mental age and task performance for the Head Start children ( $r=.44$ ;  $p=.03$ ). The other correlations are weak and not statistically significant.

Hypothesis number three predicted a relationship between performance on this task in the fall and subsequent achievement in reading. An analysis of covariance procedure that calculated residualized gain scores from the pre-and post-administrations of the Gates-MacGinitie Reading Test while holding the IQ constant revealed that a significant

Table 13  
 Proportion of Children Who Recognized  
 Stories Were Scrambled  
 Task #2: Both Administrations

Grades	Initial Event Moved		Setting Moved		Consequence Moved	
	Fall	Spring	Fall	Spring	Fall	Spring
HS	.41	.38	.29	.42	.29	.29
K	.63	.50	.59	.59	.57	.59
1st	.53	.62	.62	.71	.71	.73
2nd	.77	.70	.87	.77	.86	.84

amount of the variance in total reading growth, vocabulary plus comprehension, over the course of the year was attributable to the ability measured in this procedure for the first grade subjects ( $MS=398.61$ ,  $F=2.24$ ,  $p<.08$ ). The ability to recognize that the setting, consequence, and initial incident were moved in a story did not account for a significant amount of the variance in reading achievement for the second grade subjects alone ( $p<.15$ ).

Table 14

Task #2: Detection of Structural Variation  
Pearson Product Moment Correlations

	HS	K	1st	2nd
IQ	.21	-.19	.16	.03
MA	.44*	-.01	.05	-.01

\* $p<.03$

Task 3: Recognition of Deleted Information

In this procedure subjects listened to a story, a counting task followed, then the same story was presented a second time with a category of information deleted. The child had to specify whether he or she thought a story part was missing and if so, to supply it. A probe followed if the subject was unable to give the missing information spontaneously. There were two conditions: in the first, either the setting, the initial incident, or the consequence was deleted. In the second, either the attempt, the internal response, or the reaction was

missing. It was hypothesized that performance in the second condition would be inferior to that in the first. This was the first question examined in the analysis.

A Student's t-test for dependent measures was computed at each grade level comparing the mean scores from conditions one and two. As was suspected, the information in condition two categories proved to be significantly more difficult for all the subjects to spontaneously produce with the exception of the Head Start children (See Figure 11). The Head Start participants did not differ in their performance between the two conditions because it was uniformly poor across conditions. Their low means scores reflect their inability to retrieve any information in the absence of the probe.

Since conditions one and two evidently tap different aspects of story schema, further analyses proceeded to treat each condition separately rather than collapsing across conditions. Research hypotheses one and two concerned the expected increase in performance across the school year within each group and between groups. The findings reported in Table 15 relate to these hypotheses. The only statistically significant gains within grade levels between the two administrations of the task were evidenced by the second grade participants under both conditions, ( $p < .003$ ;  $p < .000$ ). In condition one the scores of the Head Start children and the first graders showed a slight decrease, as was the case for the Head Start youngsters and the kindergarten subjects in condition two. However, in no cases were these declines significant. Under condition two the first graders improved in performance over the year, but their gain was not statistically significant ( $p < .14$ ) (See Figures 12 and 13).



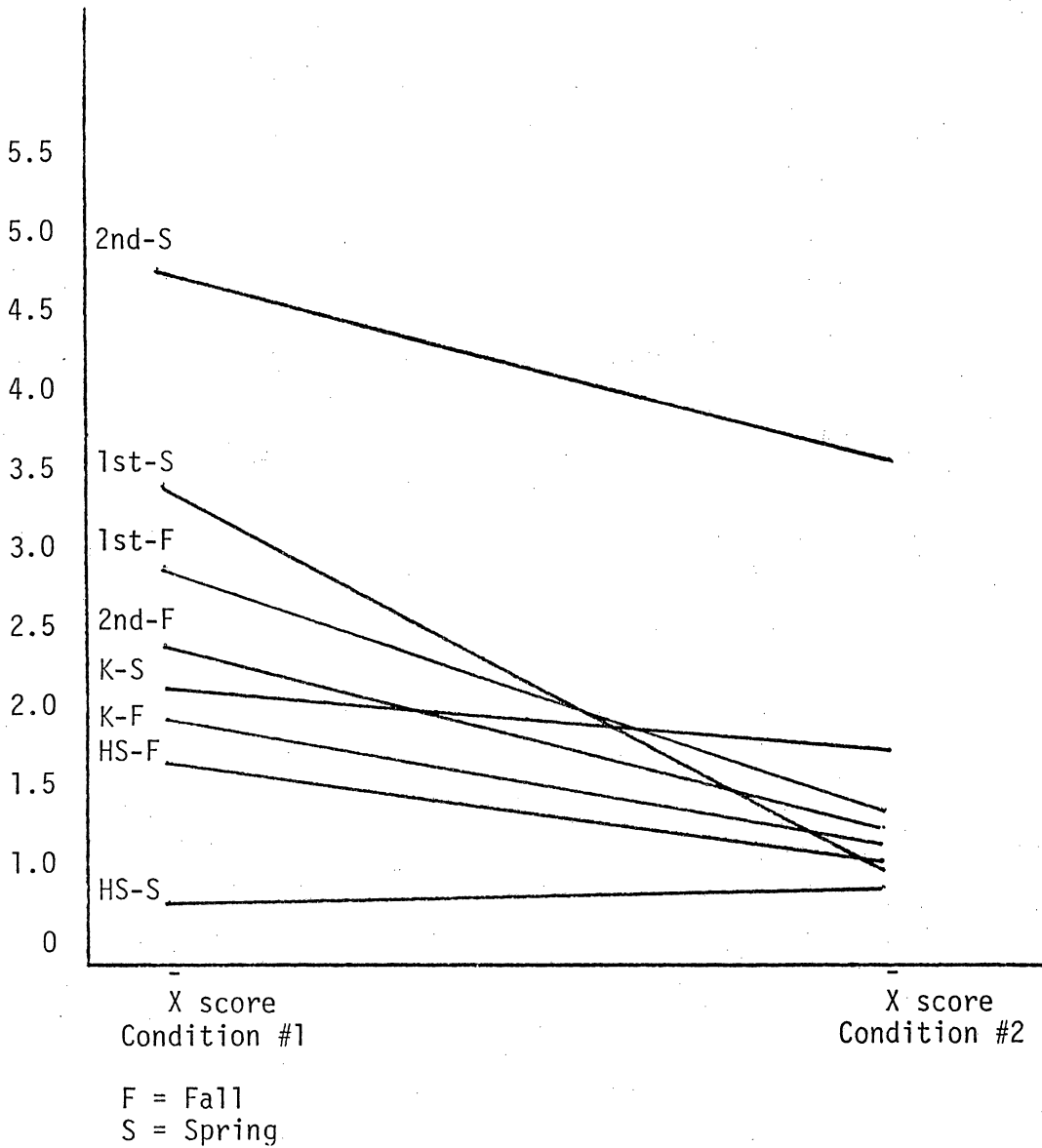


Figure 11. Performance differences between conditions one and two  
task 3: recognition of deleted information.

Table 15  
Means and Standard Deviations By Grade Level  
For Task #3: Recognition of Deleted Information

## Condition 1

	HS		K		1st		2nd *	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
$\bar{x}$	1.30	1.00	2.27	2.52	3.29	3.21	2.70	4.60
SD	2.02	1.59	2.80	3.00	3.12	2.98	3.03	2.98

$p < .003$

## Condition 2

	HS		K		1st		2nd *	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
$\bar{x}$	1.18	1.06	1.62	1.17	.93	1.51	1.17	3.37
SD	2.00	1.39	2.54	2.46	1.88	2.70	2.65	3.56

$p < .000$

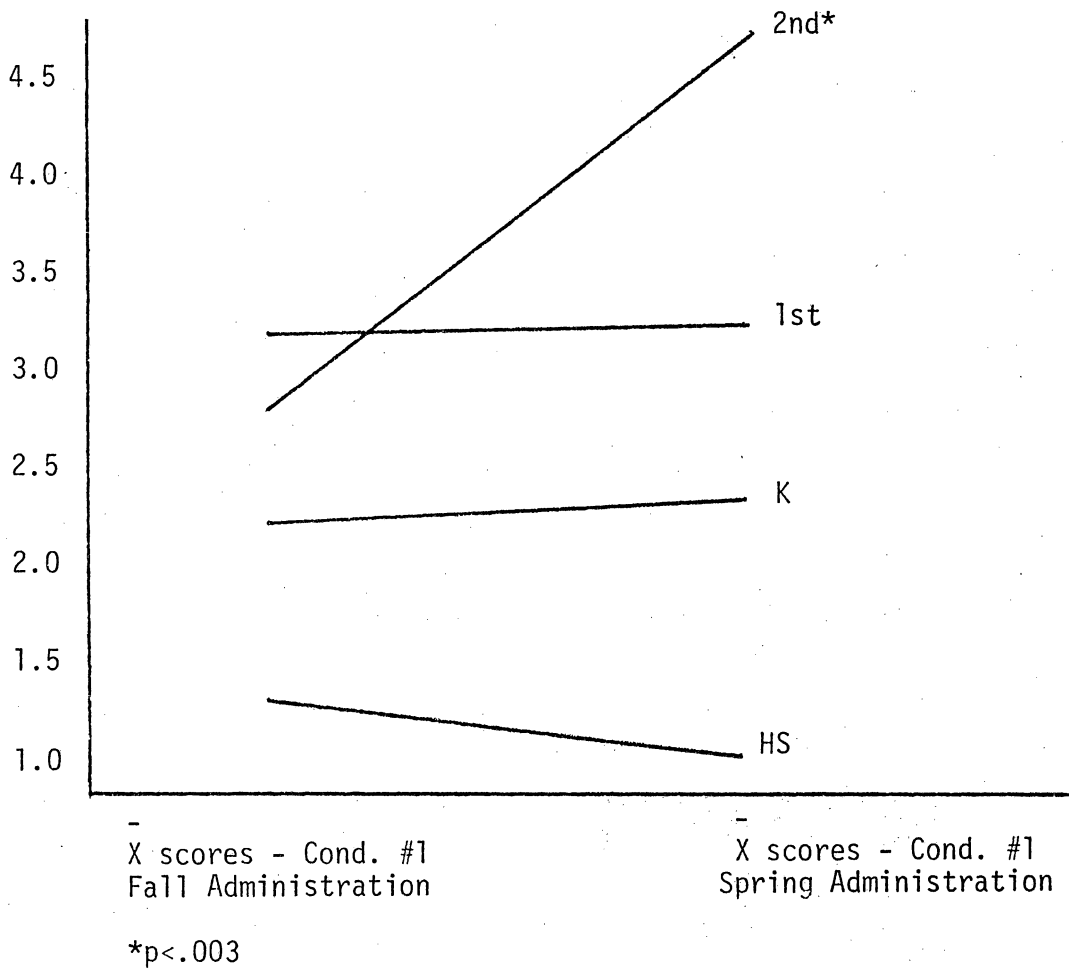
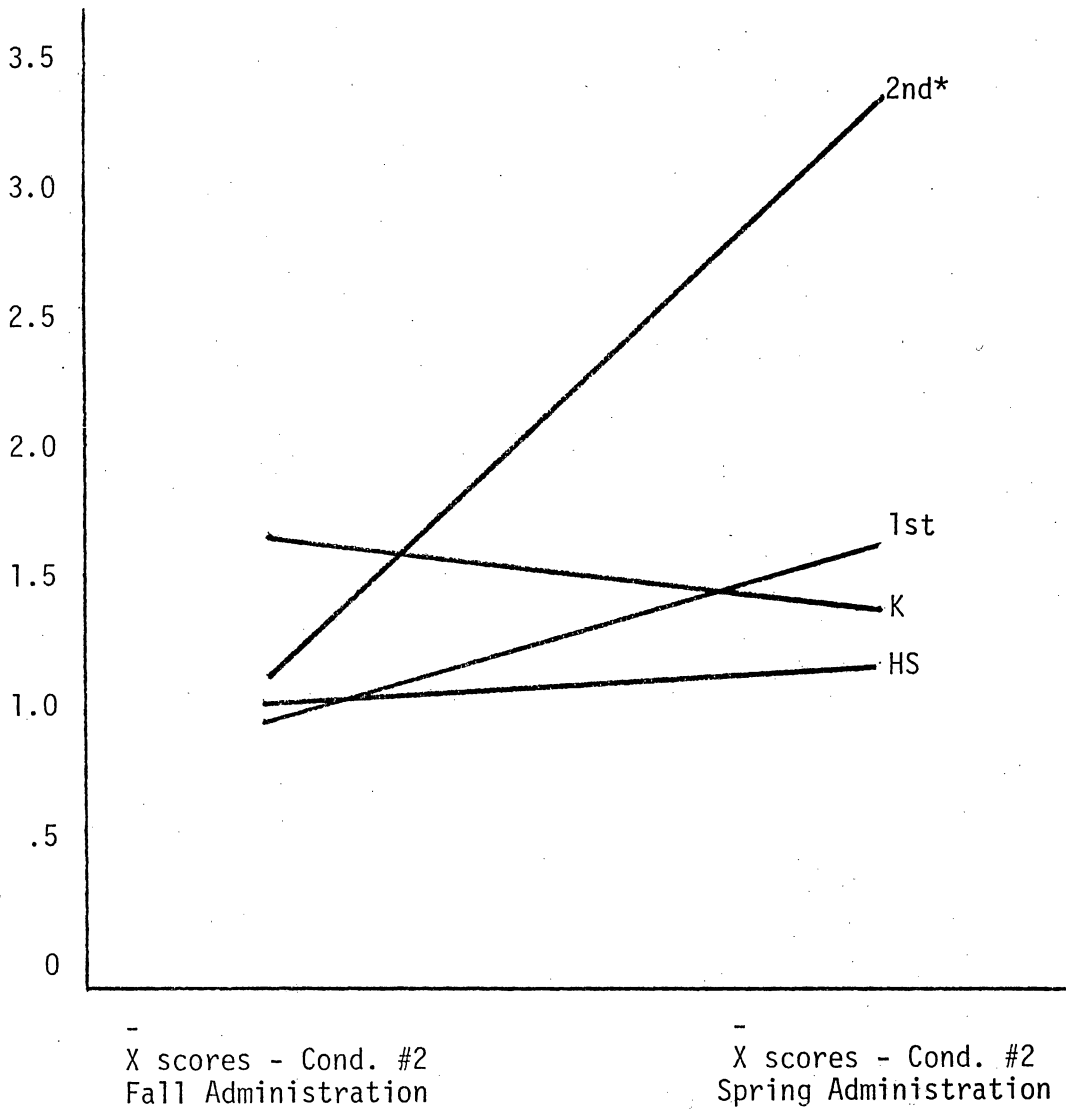


Figure 12. Mean scores task 3: condition 1 recognition of deleted information.



\* $p < .000$

Figure 13. Mean scores task 3: condition 2 recognition of deleted information.

Between grade level differences were examined using the Tukey HSD procedure ( $p < .05$ ). An unexpected finding in this analysis was that no significant differences were found between group means for either conditions in the fall of the year ( $p < .05$ ). By the spring some did appear: Head Start children differed from first and second graders and kindergarten children from second graders in condition one. In condition two, there were the expected differences between the older and younger subjects but first graders were observed to differ from second owing to the relatively good performance by the second graders on this task in the spring. Contrasted with the finding of no difference on fall scores for the free retrieval, probed recall means did evidence some significant differences in the fall: Head Start subjects were observed to differ from first and second graders in condition one; Head Start and kindergarten in condition two ( $p < .05$ ).

In addition to the quantitative analysis of scores on this procedure, an examination of the type of responses offered at the various grade levels provided another index of story schema functioning. Tables 16 and 17 reflect these descriptive data. Several patterns are evident in the findings in Table 16. Under both conditions there were a large number of subjects who did not recognize that any information had been deleted. There was another substantial group who, while recognizing that information was missing, were unable to retrieve it. The number who could recollect verbatim was uniformly small across conditions and grades with the exception of the second graders in the spring where verbatim recall was possible for 30 percent of the subjects. Fanciful information was generally not produced by the older subjects. In the

Table 16

Proportion of Responses in Each Category To  
Questions: "Was Anything Missing? What Was It?"

Task #3 - Condition #1 - Both Administrations

Information Missing Was:

	HS		K		1st		2nd	
	Fa11	Sp	Fa11	Sp	Fa11	Sp	Fa11	Sp
Supplied verbatim	.04	0	.11	.16	.20	.18	.16	.30
In same category but semantically different	.08	.04	0	.16	.31	.22	.21	.32
Plausible but in another category	0	.04	.07	0	.04	.04	.05	.02
Fanciful	.21	.04	.02	.02	0	0	0	.02
Unretrievable by subject	.08	.25	.12	.18	.04	.22	.09	.14
Not noticed. Subject said story was complete	.42	.37	.50	.41	.48	.24	.43	.11

Task #3 - Condition #2 - Both Administrations

	HS		K		1st		2nd	
	Fa11	Sp	Fa11	Sp	Fa11	Sp	Fa11	Sp
Supplied verbatim	.04	0	.12	0	.14	.07	.19	.35
In same category but semantically different	0	.04	.02	.09	.02	.07	.05	.05
Plausible but in another category	0	.04	.11	.07	.02	.02	0	.06
Fanciful	.17	.08	.06	.02	.02	.07	0	0
Unretrievable by subject	.17	.25	.09	.11	.16	.09	.07	.02
Not noticed. Subject said story was complete	.46	.33	.60	.63	.69	.60	.77	.43

Table 17

## Proportion of Responses to Probe

## Task #3 - Condition #1 - Both Administrations

Category of Response:	HS		K		1st		2nd	
	Fall	Sp	Fall	Sp	Fall	Sp	Fall	Sp
No need to ask probe	.08	0	.12	.09	.25	.11	.14	.21
Complete information given	.04	.33	.37	.50	.42	.18	.48	.41
Partial information given	.25	.17	.21	.18	.18	.56	.14	.18
No information offered	.46	.25	.27	.16	.16	.07	.21	.12

## Task #3 - Condition #2 - Both Administrations

Category of Response:	HS		K		1st		2nd	
	Fall	Sp	Fall	Sp	Fall	Sp	Fall	Sp
No need to ask probe			.07	.09		.07	.07	.21
Complete information given	.34	.34	.44	.50	.60	.56	.64	.41
Partial information given	.13	.17	.21	.18	.29	.18	.25	.18
No information offered	.38	.25	.28	.16	.11	.11	.03	.12

salient categories, condition one, children were more likely to generate information in the same category when they were unable to recall what they had actually heard than they were to infer plausible information belonging to another category. By contrast, in condition two where the categories are less salient, generated information did not appear to be as categorically constrained as in condition one. The results in Table 17 illustrate that the majority of participants who were asked a probe were able to supply partial or complete information. A developmental progression in children's ability to retrieve encoded material is evident.

Once again as on the other tasks Pearson product-moment correlations were calculated to ascertain the relationship between performance on this task and IQ and mental age. Statistically significant correlations appeared for kindergarten and second grade subjects for condition one: kindergarten,  $r=.25$ , ( $p<.05$ ) with IQ;  $r=.39$ , ( $p<.005$ ) with MA. For the second grade population the correlation with IQ was  $r=.27$  ( $p<.04$ ) and with the MA:  $r=.25$  ( $p<.05$ ). Performance on condition two was significantly correlated with MA ( $r=.29$ ,  $p<.02$ ) for the kindergarten subjects but not with the IQ (See Table 18).

Experimental hypothesis number three predicted that a significant amount of the variance in reading achievement for grades one and two would be attributable to performance on this task. An analysis of covariance was executed holding IQ constant. Separate analyses were completed for each condition. In both computations total reading achievement was entered into the procedure, that is, comprehension plus vocabulary residualized gain scores. Condition one proved not to be a



Table 18

## Task #3: Recognition of Deleted Information

## Condition 1

## Pearson Product Moment-Correlations

	HS	K	1st	2nd
IQ	-.05	.25*	.09	.27*
MA	-.09	.39*	.15	.25*

## Condition 2

IQ	-.16	.26	-.19	.15
MA	-.16	.29*	-.14	.27*

\*p&lt;.05

significant contributor to the variance in beginning reading. However, condition two was a significant contributor for the first grade subjects ( $MS=363.39$ ,  $F=2.13$ ,  $p<.07$ ). The second grade performance was not a statistically significant contributor to reading achievement ( $p<.14$ ) for those subjects.

#### Task 4: Inferring Causal Relationships

Subjects were asked to respond to a series of eight questions in this procedure following the reading of a story by the experimenter. To answer the questions required inferring causal relationships between and within episodes. The first analysis undertaken examined within grade differences in performance from fall to spring. The data supported the experimental hypothesis of statistically significant gains within each level represented in the sample. In terms of raw scores, the kindergarten subjects progressed the most in the ability to infer causal relationships over the year, achieving a two point gain. The second grade group followed with a gain of .7 points (see Figure 14).

Table 19

Means and Standard Deviations by Grade Level  
for Task #4: Inferring Causal Relationships

	HS**		K*		1st*		2nd*	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
$\bar{X}$	.71	1.53	3.20	5.15	4.44	5.61	4.70	6.42
SD	.85	1.54	1.56	1.31	1.48	1.16	1.28	1.46

\* $p<.000$

\*\* $p<.02$

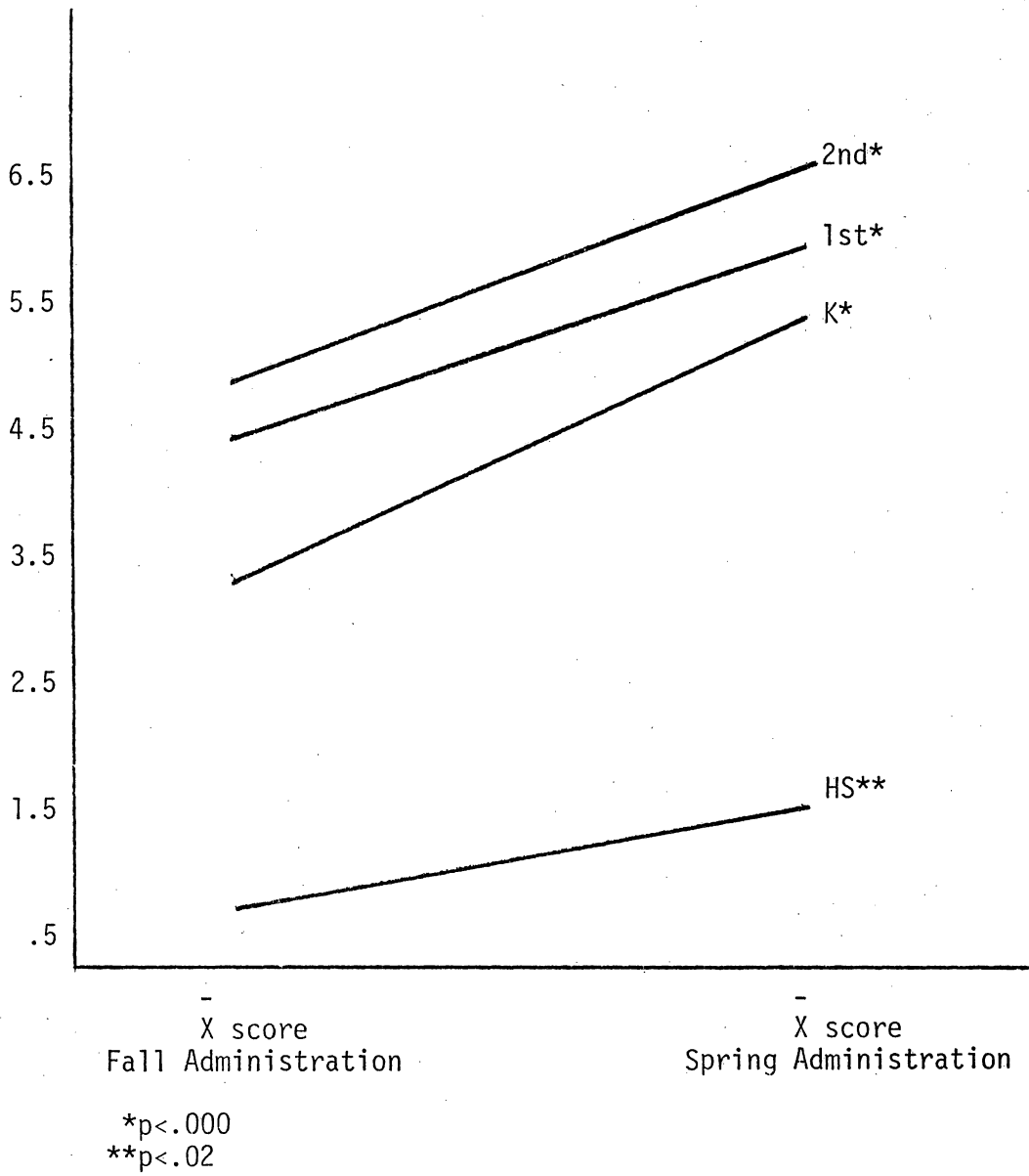


Figure 14. Mean scores on task 4: inferring of causal relationships.

Next, the differences in performance across grade levels at the the fall administration were examined through a oneway analysis of variance. Multiple comparisons of group means were performed using the Tukey HSD procedure ( $p < .05$ ). Significant differences were observed between all the adjoining grades with the exception of first and second. Thus, experimental hypotheses one and two were, basically, supported by the findings.

The questions children answered in this procedure measuring the inferring causal relationships were of two types: those that called for an inference within an episode and others that required an inference between episodes. It was hypothesized that between episode inferences would be more difficult for subjects to make, requiring a more highly developed story schema to answer successfully. In order to test this assumption, questions on each of the stories were divided into two types: between and within episode inferences. Scores on both were summed and averaged. A Student's t-test comparing these means was computed at each grade level for each story. The predicted pattern emerged as is evident in Figures 15 and 16. In the fall, the kindergarten, first and second grade children averaged higher mean scores on questions requiring an inference within an episode than on those requiring an inference between episodes. For the first and second graders, the differential was significant ( $p < .000$ ). The Head Start subjects' scores did not demonstrate the same pattern as the other groups in the fall. However, in the spring, all four grade levels showed significant gains on within versus between episode inferences ( $p < .02$  for Head Start sample;  $p < .000$  for the three others). These findings do not reflect improvement over time or

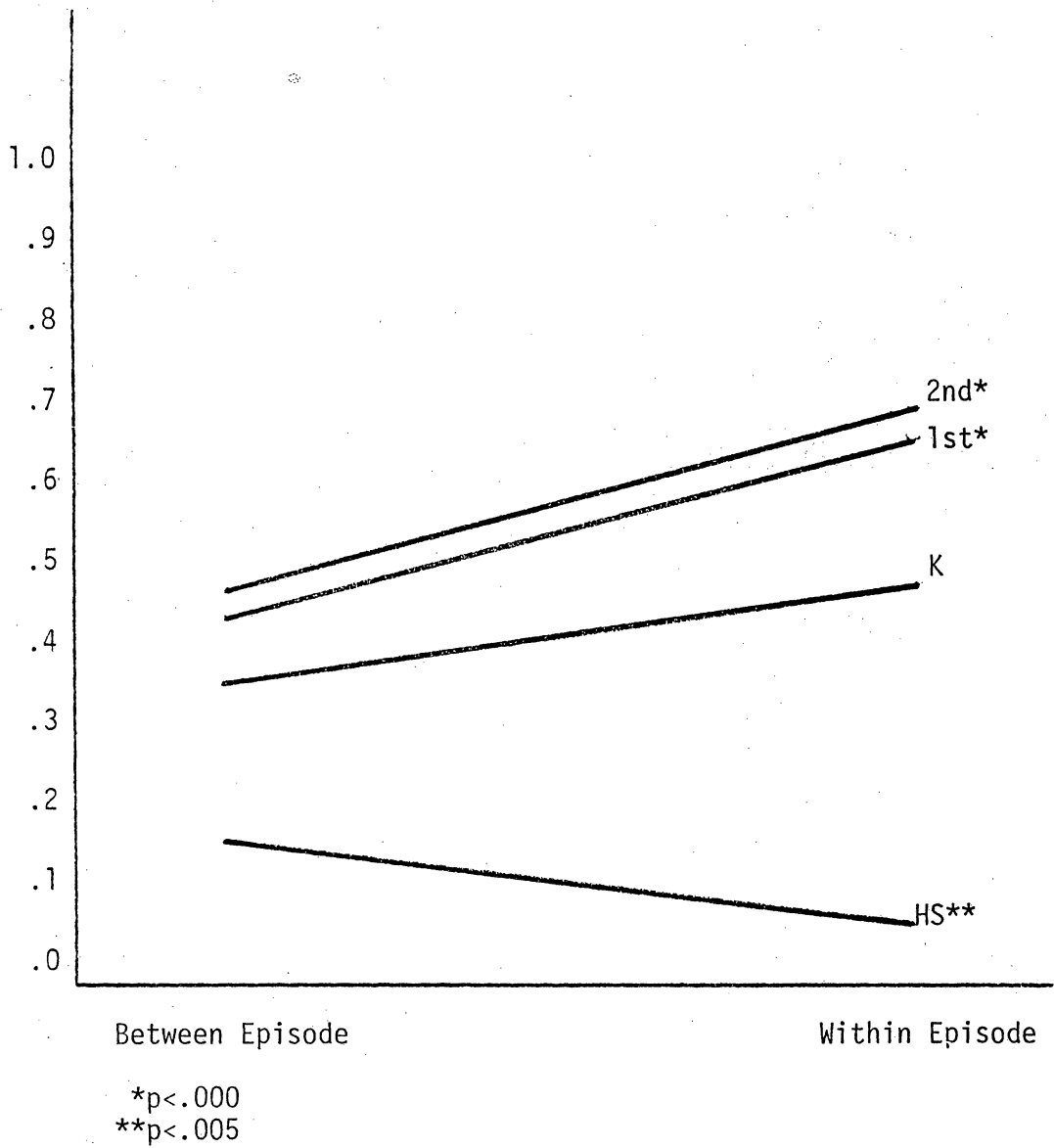
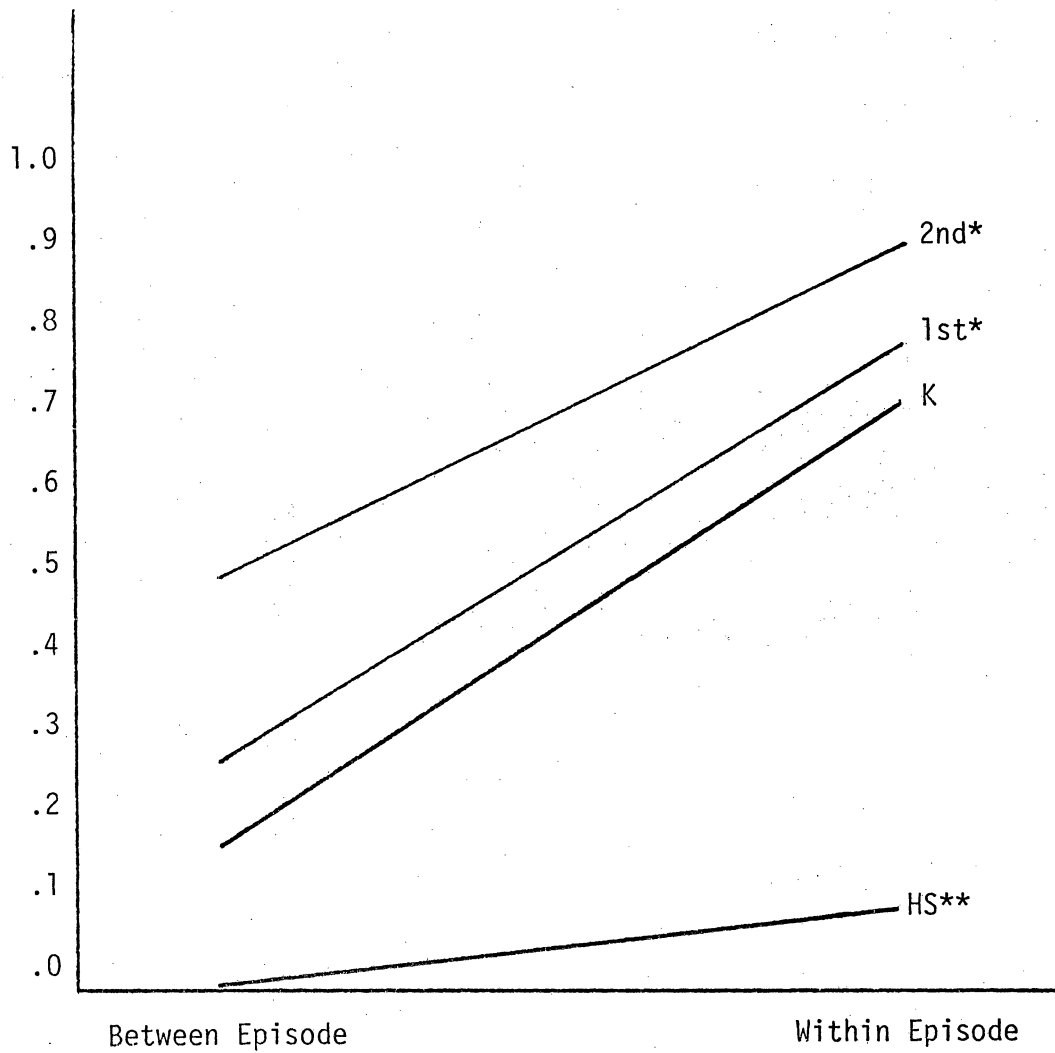


Figure 15. Mean responses to fall questions requiring within vs between episode inferences task 4: inferring causal relationships.



\* $p < .000$

\*\* $p < .02$

Figure 16. Mean responses to spring questions requiring within vs. between episode inferences task 4: inferring causal relationships.

across age levels, although the mean scores did increase at each successive grade. Rather, the data from this analysis reflect differences in performance by the same subjects at the same point in time attributable, presumably, to differences in cognitive demands within one task. Multiple comparisons between grade levels in performance were examined using the Tukey-HSD procedure ( $p < .05$ ). At both administrations, significant differences were noted between the kindergarten and Head Start subjects on the ability to infer causal relationships within episodes. Significant differences between other adjoining grades were not observed for the fall Fox and Bear story. In the spring, second grade participants performed significantly better than first grade participants on inferencing both between and within episodes.

A closer examination of scores achieved by the Head Start group on the fall story was conducted to determine a possible cause for their unexpected performance. This examination revealed that no question was answered successfully by more than two children except for question number five which was answered correctly by ten subjects. Question five called for a between episode inference thus accounting for the unexpected decline in mean scores for this group. This fifth question related to the protagonist's goal, a category of information generally regarded as the most salient in a story. In this instance, the type of category information proved to be a greater determinant of comprehension on this task than the structural location of the category.

Performance by all subjects on individual questions was also examined. The data in Table 20 below reporting the percentage of subjects at each grade level who were unable to answer the Fox and Bear

Table 20  
 Proportion of Subjects Who  
 Answered Fox and Bear Questions  
 Incorrectly

Task #3: Inferring Causal Relationships

Question:	1	2	3	4	5	6	7	8
Grade HS	.90	.95	1.00	.95	.54	1.00	.95	1.00
K	.54	.91	.68	.38	.11	.93	.36	.57
1st	.31	.84	.38	.53	.09	.93	.11	.42
2nd	.34	.77	.43	.50	.07	.89	.14	.16



questions correctly reveals that questions two and six were the most difficult for most children while question five was the easiest to answer. Questions two and six both required an inference on the basis of characters' internal responses. Question five, as previously mentioned, related to the goal in the story. The third question was considerably easier for the older children than for the younger. It, too, dealt with information in the internal response category but the inference required was that of physical causality rather than a character's reaction. The same situation was true in question seven which was answered correctly by the majority of older subjects. The two last questions asked, numbers seven and eight, related to information that was supplied at the beginning of the story. These questions were answered correctly more often than some previous ones.

Table 21 reports the same data for the story heard in the spring, Epaminondas. Questions four and five which proved to be the most difficult for the majority of children to answer once again pertained to information in the internal response category. Questions one and three, the two easiest, required inferences of physical causality.

Pearson product-moment correlations were computed to determine the degree of relationship between IQ, mental age and the ability to infer causal relations. As the values in Table 22 illustrate, the correlations were fairly strong for the younger subjects ( $r=.65$ ) and statistically significant ( $p<.001$ ). For the older subjects the correlations were weaker and not significant at the  $p<.05$  level.

Table 21  
 Proportion of Subjects Who  
 Answered Epaminondas Questions  
 Incorrectly

Task #3: Inferring Causal Relations

Question:	1	2	3	4	5	6	7	8
Grade HS	.61	.83	.50	1.00	1.00	.72	.94	.95
K	.02	.15	0	.80	.85	.10	.50	.40
1st	.07	.05	0	.80	.73	.07	.34	.32
2nd	0	.02	.05	.30	.50	.10	.20	.28

Table 22

Task #4: Inferring Causal Relationships  
Pearson Product-Moment Correlations

	HS	K	1st	2nd
IQ	.65*	.56*	.12	.23**
MA	.65*	.51*	.23**	.22**

\*p&lt;.001

\*\*p&lt;.10

Finally, an analysis of covariance procedure that held the IQ constant was undertaken to test the third hypothesis: that of a relationship between the ability to infer causal relations and subsequent reading achievement. For the second grade sample, performance in the fall in this task was shown to account for a significant amount of total reading growth (vocabulary plus comprehension) over the course of the year ( $MS=92.99$ ,  $F=2.22$ ,  $p<.07$ ). For the first grade subjects, there was not a significant relationship.

Task 5: Written Stories

In the spring of the year, first and second grade participants were asked to write, "A good story, just like you might read in a story-book or that your teacher might read to you." Each child wrote a story on two different occasions, based on picture stimuli. The stories were analyzed for structural complexity using a procedure developed by Stein and Glenn (1981). Interrater reliability for the scoring of story

protocols on this dimension was established based on twenty-five percent of the stories using a Spearman correlation coefficient statistic (.90).

It was hypothesized that one of the pictures, the fire truck, would give rise to more motive resolution sequences than the other picture because a goal was implied within the picture itself: that of putting out a fire. Had this proved to be the case, scores representing the degree of structural complexity present in fire truck stories would have been higher than those for the playground picture. Results indicate that the fire truck did provide some advantage over the playground scene but it was not as large as anticipated: 41 percent of the second graders scored higher in level of complexity for the fire truck stimulus; 14 percent scored higher on the playground story, and for 36 percent there was no difference. Comparable figures for the first grade were: 53 percent higher on the fire story; 36 percent higher on the other; 14 percent with no difference. Figure 17 illustrates the degree of structural complexity evidenced in the written protocols for both grade levels. In addition, children's stories were logged for use of beginning conventions, ending conventions, number of thought units, and presence of setting information. For each of these features, there was a statistically significant difference between the stories of the first and second graders ( $p < .05$ ). The results of Student's t-tests used in this analysis appear on Table 23. In this analysis, and each that follow, the story protocol that exhibited the highest degree of structural complexity was used in the computation of statistical tests. In cases where the structural level was identical in the two stories, the longer story was entered into the analysis.

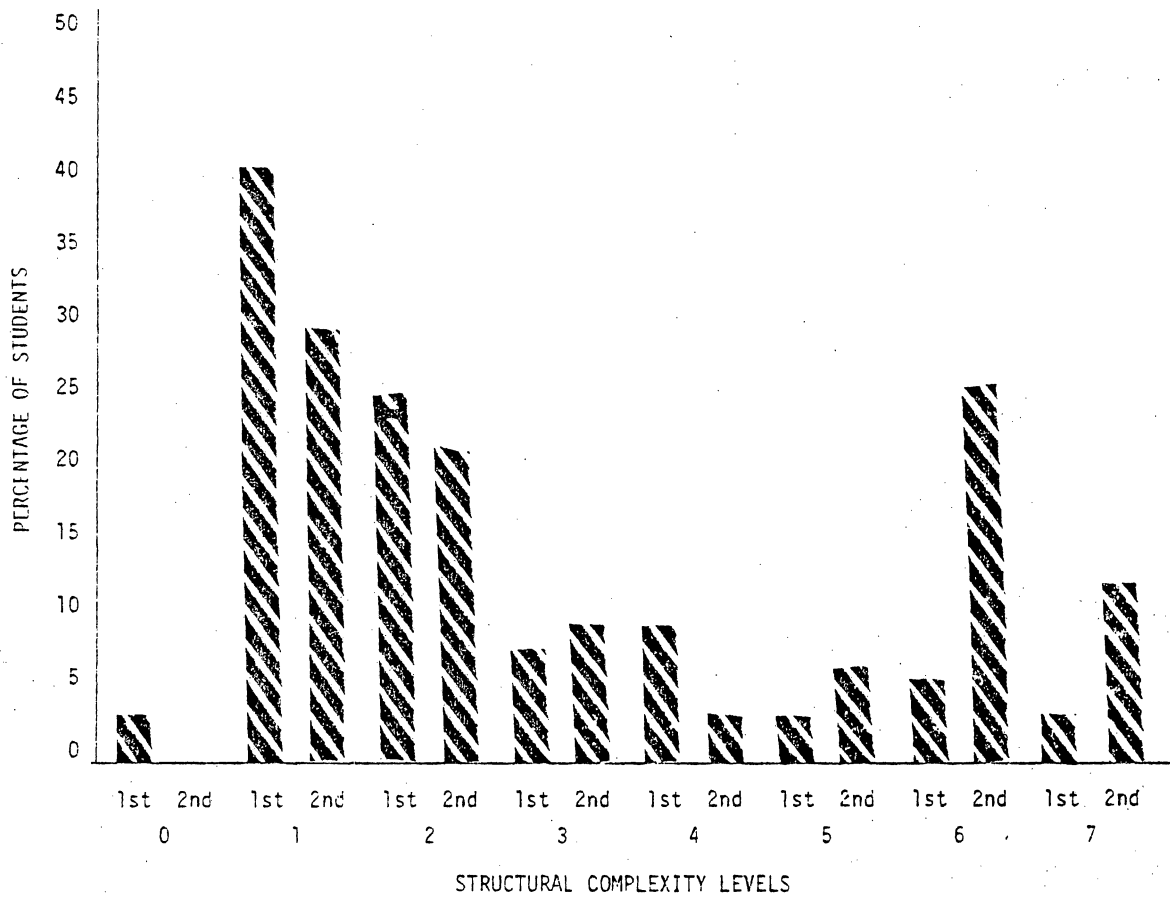


Figure 17: Level of structural complexity present in first and second graders' written stories.

Table 23  
Means and Standard Deviations by  
Grade Level for Features of Stories  
Task #5: Written Stories

	Story Feature									
	Structural Complexity		Beginning Conventions		Number of Words		Number of Thought Units		Setting information	
Grades:	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
1st	2.17	1.62	.19	.40	40.74	20.07	6.53	2.92	.36	.49
2nd	3.82	2.27	.52	.51	52.75	19.84	8.20	2.42	.70	.46

$p < .01$  for all

In this procedure, pictures were used as stimuli rather than story starters in order to ascertain how many children could supply their own setting information and to determine what effect, if any, the presence or absence of the setting category has on the remainder of the story. Thus, the written protocols were examined for this information. Of the 54 stories that were written containing no motive resolution sequences (complexity levels 1, 2 or 3), 22 contained setting information and 32 were without a setting. Of the 25 protocols evidencing a goal structure, (complexity levels 4 through 7), 19 contained settings and 6 did not.

The first experimental hypothesis predicted that the stories written by second graders would reflect higher degrees of structural complexity than those of the first graders. The results of a Student t-test comparing the mean complexity levels for each group supports

this hypothesis ( $p < .000$ ). The other research hypothesis for this task postulated a relationship between reading achievement and story complexity. This hypothesis was not supported by the results of an analysis of covariance procedure that analyzed the amount of variance in total reading achievement at the year's end that could be accounted for by the ability to write a structurally complex story. A Chi square analysis was undertaken to investigate a possible relationship between this aspect of writing ability and reading performance for the best versus the poorest readers at each grade level. For this analysis, children who scored in the top 25 percent of their class on the Gates-MacGinitie Reading Test, combining vocabulary and comprehension raw scores, were considered the best readers; those who scored in the bottom 25 percent, the poorest. A high degree of structural complexity included stories that scored a six or seven on the rating scale used in the taxonomic analysis of complexity. Stories rating a three, four or five were assigned to the medium range of complexity for this analysis and those scoring a one or two to the low category. For the first grade subjects, there was a significant difference between stories written by the best and the poorest readers (Chi square = 6.38,  $p < .04$ ). This was not the case for the second grade sample, however.

Pearson product-moment correlations were computed to determine the relationship between story complexity and the other features delineated above. The correlations were fairly strong, except for the use of ending conventions; and all were significant ( $p < .000$ ). This information is reported on Table 26. A second set of Pearson product-moment correlations were performed to ascertain the relationship between IQ, mental

age, and the presence of structural complexity in the stories (See Table 25). The correlations were low and non-significant ( $p < .10$ ).

Table 24  
Structural Complexity of Written Stories  
and Other Features  
Pearson Product-Moment Correlations

	Beginning Conventions	Ending Conventions	Number of Words	Number of T Units	Setting Information
Structural Complexity	.56	.29	.44	.45	.42

$p < .01$  for all.

Table 25  
Task #5: Written Stories  
Pearson Product Moment-Correlations

	1st Grade	2nd Grade
IQ	-.05	-.16
MA	.11	.04

$p < .05$

### Summary

The two experimental hypotheses pertaining to the process of story schema acquisition, were, overall, supported by the findings. In



general, the greatest fall to spring growth in story schema (as measured by the four tasks used in this study) was displayed by kindergarten participants followed by the first graders.

The third hypothesis, which predicted that a significant amount of the variance in early reading performance could be accounted for by the developmental level of story schema, was supported for the first grade children on tasks one, two and three. Task four accounted for a significant amount of the variance in reading performance for the first grade sample but not for the second. Good and poor readers among the first grade participants were shown to perform significantly differently on task five which measured the level of structural complexity present in written stories.

Of interest to this investigation was the relationship of the IQ and mental age to performance on the experimental procedures. The highest correlation was found between task four, the inferring of causal relationships, and the IQ/MA for the younger subjects. In general, the relationship between these factors and performance on the tasks was weak.

## Chapter 5

### DISCUSSION

This chapter will be concerned with a discussion of the results of the experimental tasks. Essentially, there were two main questions investigated in each procedure: the level of story schema acquisition evidenced in childrens' performance on the task, and the subsequent influence on reading achievement. Accordingly, findings from each task will be discussed individually with regard to their interpretation as assessments of cognitive processing. The relationship between performance on the tasks, IQ and reading achievement will be examined collectively in a separate section. The chapter will conclude with a consideration of educational implications of the findings and suggestions for further research.

#### Task 1: Metacognitive Knowledge of Story Structure

Schemata are a collection of knowledge that describe the prototypical features of the concept they represent. As complex constructs, schemata are assumed to be acquired over time. Whether the acquisition of a schema, which is a processing mechanism as well as a conceptual construct, is similar to that of natural concept acquisition, is not known at this time (Thorndyke and Yekovich, 1980). The results from the metacognitive task in this investigation suggest that such may be the case.

The developmental acquisition of a concept implies movement from

the inability to identify exemplars of the concept to the capacity for generating exemplars. The first task, as well as the two warm up questions that preceded it, constituted an informal assessment of each child's position along a continuum of growth in this ability relative to the acquisition of a story schema. How this growth occurs from non-recognition to production of a concept, is, at present, the topic of theoretical debate.

Feature-list theories of semantic development and memory such as that of Smith, Shoben and Rips (1974), postulate that concepts are identified and processed by means of a list of common features defining category membership. Hence, concept acquisition is a process of categorization based on the increasing differentiation of features and the relations between them. Concept recognition thus occurs by means of featural comparisons.

An alternative to the feature-list theories is the prototype plus transformation paradigm delineated by Franks and Bransford (1971). While the exact nature of conceptual acquisition in their model is not fully specified, they do suggest that individuals abstract out of many instances of a concept the best single example, which becomes the prototype. The category is then represented in memory as a schema; one aspect of which is the exemplar or middle-most example; a second aspect is a set of rules for transformations that can be performed on the prototype without loss of category membership.

This notion of a range of possible values constituting category membership has been extended in Rosch's (1973, 1975, 1976) pioneering work in levels of classification. She has sought evidence against

feature-list theories on the basis that such theories imply equivalent membership status for all instances of a concept within a category, since all must exhibit the necessary features for membership. Her work supports the Gestaltist's view that natural categories are represented in memory as prototypes and allowable distances from the prototype.

Bourne, Dominowski and Loftus (1979) point out that these differing views of concept acquisition and representation are not nearly as far apart as they may initially appear to be. All are dependent on the same basic process of discerning probability distributions associated with dimensions of exemplars. In feature-list theory, not all members of a category exhibit identical features. Likewise, as Rosch's research demonstrates (1975, 1976), features occur in differing probabilities among members of natural categories. Those features having a probability of occurrence approaching 1.0 in feature-list theory would constitute critical or defining features; in Rosch's terms, they would reflect properties of the prototype. As a person acquires a new concept, each dimension of the concept can be represented by an underlying probability distribution. Those aspects of the concept or the schema that occur most often, or always, become critical features; the probability distributions of other features determine allowable distances from the prototype before category membership is lost.

Data from this first task can be interpreted in light of these theories of conceptual development. Children who were willing to accept commands (sit down; stand up) as stories or an unrelated list of nouns (stimuli A) may not have had access, as yet, on a metacognitive level, to the critical or defining features of a story; a causally related

sequence of events wherein planful or goal directed behavior on the part of a protagonist occurs. This type of processing would be anticipated at an early stage of conceptual development. For these children, acquisition of a story schema, in Bourne's (1979) terms, was not yet advanced to the point where metacognitive operations were possible based on implicit knowledge that goals and consequences have the highest probability of occurring in a story. As hypothesized, this ability to discern defining features and to render judgments of category membership based on the presence or absence of such features improved across and within grades over the span of the year. This improvement is attributable, presumably, to processing difference related to the acquisition process.

At initial stages of concept development, there appears to be a process of differentiating between defining features, those that are essential for category membership; and characteristic features, which are descriptive but not critical (Smith et. al., 1974). Probability distributions for dimensions within the category are being estimated as the individual increases his or her knowledge of the concept through multiple exposures. During this acquisition process, concepts may be more inclusive than when fully developed because permissible distances from the prototype are not yet well established. Thus, individuals may be inclined to over extend category membership to include non-instances of the concept. Performance by subjects on stimuli B and C can be interpreted in terms of this theoretical framework.

As characteristic features of a story were introduced into the stimuli: a protagonist in stimuli B; a goal in stimuli C; the number of children willing to label each a story increased as predicted. This

may have occurred because the distance between the stimuli and the prototype of a story in children's minds was an allowable one. Stimuli B and C, although lacking in critical features, were regarded as members of the category of stories because for young children the concept of a story may not contain the same essential features as those of an adult. These findings were replicated in a doctoral dissertation reported by Stein and Trabasso (1981). In this study, second graders were willing to accept significantly more non-motive resolution sequences as stories than were their teachers. These researchers concluded that second graders' concept of a story is broader than that of adults. The findings from this first task are in agreement with that observation.

The reasons children articulated for accepting or rejecting a stimulus as a story in this task provide additional insight into the schema acquisition process. The same bases for category membership or lack thereof were identified across the four groups with few exceptions. What differed was the proportion of responses of each type. This finding supports the Gestalt model of acquisition which postulates that concepts are initially acquired as a whole, ill defined at early stages though they may be.

Where playful behavior on the part of a protagonist was present in the stimulus, a defining story feature, substantial numbers of older subjects named it as the basis for their judgment. In the absence of a goal, other critical features were mentioned. And when the stimuli literally made no sense, the unrelated list of nouns, the lack of temporal or causal relationships was frequently given as the basis for judgment by the older subjects (comments in the cohesion category).

The profile of responses by the kindergarten children was, perhaps, the most interesting. Roughly half the group answered in a manner similar to that of the first and second graders. The other half demonstrated a level of performance comparable to the Head Start subjects. These findings suggest that the kindergarten year is a significant one in story schema acquisition. This conclusion was also reflected in raw gain scores by the kindergarten subjects on the task itself.

An unexpected finding occurred relative to stimuli D, which included a setting, initial incident, goal, attempt and consequence. In the fall of the year, more second graders than first graders or Head Start children said stimulus D was not a story. One possible explanation is that by the second grade children may require an explicitly stated, rather than implied, reaction by a protagonist following a consequence before they will label a narrative a story. This hypothesis is supported by the finding in task five that well constructed stories produced by first and second graders contain reactions of protagonists as concluding categories. Thus, a story schema at a certain level of development may include a featural requirement of a reaction.

A second explanation has to do with the subjects rather than the stimuli. Second graders' performance over the course of the year declined for each stimulus presented in this procedure. In general, their performance was not anticipated on the metacognitive task. There may have been some extraneous variables affecting the second grade subjects that were not operable for the other groups studied.

### Summary

The findings from the first task suggest that story schema acquisition progresses in much the same manner as other types of conceptual development. Of the four groups studied, most growth in metacognitive awareness of story structure occurred in the first grade year. The acquisition process was shown to continue through the first two years of elementary school with second grade subjects demonstrating a broader, less well defined, concept of a story than represented by story grammars. Features articulated as criteria for inclusion in the category of story ranged from surface or perceptual aspects: mode of presentation, length, to the essential structural feature of a goal. Developmental level of story schema was, in general, reflected in subjects' bases for acceptance or rejection of a stimulus as a story. Qualitative differences across age groups in childrens' metacognitive concept of story were demonstrated by subjects' performance on this first task.

### Task 2: Detection of Structural Variation

In story schema literature, there are a number of studies providing evidence for the influence of story sequence in the processing of story information (Thorndyke, 1977; Kintsch, 1977; Stein and Nezworski, 1978). A story represents an ordered progress of events. Characters act out of motives; events occur in predictable sequences; one category of information flows logically from the previous. So powerful are the expectations that readers and listeners have relative to these conventions, that when they are interferred with, encoding and retrieval is hampered (Mandler and Johnson, 1977; Rumelhart, 1977; Kintsch, et. al. 1977).



These findings supporting the influence of text structure on comprehensibility provided the basis for the second task which required subjects to designate whether a story was scrambled or was presented in the correct order. It was reasoned that at increasing stages of story schema acquisition, children would have proportionately less difficulty making the distinction. This developmental difference was anticipated because of the lack of congruence children would experience between incoming data (the scrambled story) and the developing schema. The better defined the schema, the greater the incongruence. In general, this hypothesis was supported by the findings. As in the first task, the kindergarten and first grade subjects demonstrated the most growth in this ability suggesting the importance of these years in schema acquisition.

There were, however, 25% to 50% (fall/spring) of first graders and 30% to 13% of second graders who did not recognize the structurally deviated stories as being out of order. These findings are similar to Markman's (1977) results. In her study, children in grades one and three were given instructions in how to play a game or perform a magic trick. In both cases, critical information was missing. The older children realized the instructions were incomplete whereas the younger ones did not until they actually attempted to carry them out. In Markman's judgment this metacomprehension failure occurred because first graders did not execute the instructions mentally as they listened to them. Markman concluded that because they did not actively evaluate their comprehension, first graders did not know they did not understand.

These findings raise the question as to the relationship between processing mechanisms that make not only comprehension, but the awareness

of it, possible. One hypothesis about this relationship is that schemata as they develop, facilitate processing on an unconscious level from the earliest stages of development but are not accessible for metacognitive operations until later stages. There is a substantial amount of evidence to support the first proposition in this hypothesis (see Stein and Trabasso, 1981), but additional research is needed relative to the second.

The differential influence of schemata in metacognitive operations as a function of acquisition would account for findings such as those of Denhiere and LeNye (1980). Their study of comprehension and recall of narratives by children eight and eleven years of age and adults, required subjects to render importance judgments on sentences in story protocols. The older children and adults recalled essentially the same propositions they had independently judged as the most important. The younger children did not recall the units they judged to be important, but, instead, recalled the units that the older children and adults judged important. Thus, for the younger children there appeared to be a metacognitive failure; that is, unimportant propositions were judged to be important, but no comparable failure of story schema processing occurred on an unconscious level.

The results of Markman's (1977) study, the Denhiere and LeNye (1980) study, and performance by first and second graders on this task, suggest that between the first and third grades children acquire the capacity for certain types of metacognitive operations on oral discourse similar to those of an adult. The acquisition of story schema appears to be related to this development. How the schema becomes accessible for metacognitive operations is not clear at this time.

There is evidence that two and a half year olds have metacognitive skills (Clark, 1978; Slobin, 1978). However, evidence of these abilities depends upon the type of task used to assess the skill (Brown, 1978; Clark, 1977). When metacognitive functions are called for that operate upon schema based knowledge, it appears that the lack of metacognitive skills in themselves are not the cause of poor performance by young subjects. One of the recognized weaknesses of current schema theory is in this area of process specification (Thorndyke and Yekovich, 1980). While structural properties of schema have been well researched, assumptions regarding process mechanisms inherent in schemata, or which act upon them, have not been empirically tested to the same extent.

An unexpected finding in performance on this task was that there was no difference in recognition levels for the three conditions: consequence moved, setting moved, and initial event moved. It was hypothesized that the consequence moved condition would be the most readily identified as a scrambled story because it caused the most disruption in the coherence of the story and of the three, it is considered the most important category. In a recent study of recall and recognition (Thorndyke and Yekovich, 1980) it was found that the recognition of a story proposition following a reading is independent of its importance in the hierarchy of a story. Similarly in this task, the recognition of a deviated category was independent of its importance. These findings suggest that schema based recognition operations differ from retrieval mechanisms. In retrieval, the level of a proposition in the schema hierarchy largely determines its accessibility; this does not appear to be the case in certain types of recognition operations.

### Summary

The findings from task two provide additional evidence for the developmentally increasing influence of schemata on the processing of story information. While the majority of subjects could detect structural deviations that rendered a narrative incomprehensible, some first and second graders were not aware of the incoherence. This same type of failure has been evidenced in other recent work and is presumably related to the interaction of schema and metacognitive skills.

### Task 3: Recognition and Retrieval of Missing Information

Two empirically supported putative properties of schema (instantiation and hierarchical organization) provided the basis for the third procedure in this study. Schema theory postulates that comprehension of discourse is a process of constructing a representation for the text using prototypical patterns stored in memory. This construction occurs by means of schema based processes of matching or instantiating incoming propositions into existing cognitive structures composed of slots or frames (Minsky, 1975; Winograd, 1975). In terms of the theory, if no slot exists in the schema for a particular proposition, it will not be instantiated and will not, therefore, be available for recall or recognition processes.

The hierarchical organization of a discourse schema relates to the saliency of propositions in recall and to their importance in a narrative. Certain categories of information are consistently recalled by nearly all subjects, whereas other propositions are rarely recalled

(Kintsch, 1974; Thorndyke, 1977; Mandler and Johnson, 1977). Propositions highly salient in recall are the same ones generally rated as important to the meaning of a text (Johnson, 1970; Meyer and McCorkie, 1973). Frequently recalled and important propositions appear as high nodes in hierarchical representations of text structures.

In this task the levels effect of hierarchical organization (i.e., the correlation between propositional importance and saliency in recall) was controlled for in a procedure that required recognition operations dependent on instantiation. Subjects heard an intact story once, and a second time with a category of information deleted. The missing information represented either high or low level propositions. Participants were asked to specify whether the second rendition was complete and if not, what was missing. It was assumed that information high in the structural hierarchy of a story would be recognized as missing to a greater degree than would be low level information. This prediction was supported by the findings.

The experimental hypothesis of significant improvement on this task over the course of the year was only borne out in the second grade sample. This is an interesting phenomena given that most gains in story schema acquisition in this investigation were made by the kindergarten and first grade subjects. A second interesting finding is that of no difference across groups in performance at the fall administration. Approximately the same proportion of Head Start children as second graders (42 percent and 43 percent respectively) were unable to detect that salient information was missing in the second telling of the story. By the spring, the percentage dropped to only 11 percent for the second graders.

Schema theory suggests two possible explanations for the second graders' gains. Either more information was instantiated at the spring administration than had been in the fall, which would imply the acquisition of additional schema slots, or, the recognition process itself improved. In the fall, 23 of the 44 second grade subjects were unable to spontaneously produce the missing information; but only nine were unable to supply it when probed. Therefore, instantiation was evidenced by all but nine second grade subjects in the fall.

Since instantiation did occur in the fall for the large majority of subjects, improvement in encoding itself can be ruled out as a cause of the gains observed in the spring. An alternative explanation is that the recognition operation improved over the course of the school year. This finding is congruent with the result of Markman's (1977) study. In her investigation, as well as in this task, children approximately eight years of age were significantly better able to monitor incoming data than were younger subjects. In her study, as well as here, the monitoring involved recognition of missing information which rendered the stimulus incomplete.

In the first condition, high level categories of information -- either the setting, the initial event, or the consequence -- were deleted. In the second condition, low level categories were deleted -- either the attempt, the internal response, or the reaction. While the profile of performance on the recognition task for the second condition resembled that of the first condition, the scores were, overall, considerably lower. This finding was predicted on the basis of previous research, indicating these second condition categories are less salient in recall

(Stein and Glenn, 1977; Mandler and Johnson, 1977).

However, a different picture emerges when the probed responses are examined across conditions. In condition two, the older subjects actually demonstrated better probed recall for the lower level propositions than for those in condition one. Schema theory offers two possible interpretations for this finding. One explanation has to do with the inherent limitations of human information processing (Thorndyke and Yekovich, 1980). If a subject hearing a narrative is attempting to infer and store the structural features of the story while at the same time learning the syntactic and semantic details, he or she may attend carefully to the precise wording of relatively unimportant information. This may occur because the processor knows the high level information can be reconstructed in memory, relying on the organization schemata. In this case, precise wordings would be superior for the less salient categories.

Therefore, in this task, verbatim recalls would be expected to be the greater for condition two if the theory holds. In general, they were not; condition one produced more verbatim recall.

A second explanation is that schematic frames, or story categories may be semantically as well as functionally constrained. Some evidence exists that they are (Nezworski, et.al., 1978). This being the case, semantic content of categories may vary as a function of their level in the hierarchy. Categories high in a story's structure may be able to instantiate propositions encompassing a large semantic space; low level categories may contain more highly specified descriptions (Thorndyke and Yekovich, 1980). Therefore, less salient categories would be syntactically restricted to a greater degree than higher level

ones. These conditions would account for better surface memory for lower level propositions.

The findings from the probed recall on this task appear to support this second explanation. More subjects were able to offer information when probed under condition two than under condition one. It must be borne in mind, however, that the subset of subjects involved in this analysis are those children who did not spontaneously recognize or recall the missing information. When it was recalled without a probe, the high level information was considerably more salient. These findings are similar to those of Taylor (1978) who reported a greater proportion of detailed recall by poor readers than recall of main ideas.

The influence of schema can be seen in the type of information produced in response to the probes. The Head Start children were the only group to give fanciful information in significant numbers. By kindergarten, children were able to judge when fanciful information was inappropriate. In terms of conceptual development theory, allowable semantic distances from the prototype were greater in the story schema of four year olds than those of five year olds. This makes sense in that probability distribution of story features have had fewer opportunities to be estimated among younger children.

The structural constraints operable in schema were evidenced by the proportion of subjects who supplied information to probe questions that were semantically different than, but in the same story category as, the originally encoded information deleted in the retelling. Importations of this type were more common than the generation of semantically appropriate but categorically different information. These findings are



all consistent with the schema theory prediction, that information is reconstructed based on the conceptual category of the originally encoded information (Mandler and Johnson, 1977).

### Summary

Task three provides evidence that the ability to recognize incomplete texts and to retrieve encoded material improves as a function of schema acquisition. Further, this competency seems to undergo a marked improvement between the ages of seven and eight. The findings suggest that this improvement is attributable to more efficient recognition operations. In addition, evidence was found in support of differential semantic constraints among story categories.

### Task 4: Inferring Causal Relationships

Discourse processing is always an interaction between knowledge stored in the head and text-based information. The impact of this interaction on comprehension is probably as significant in the inferring of causal relationships as it is in any other aspect of processing. Stories are event sequences connected by temporal, causal and motivational relationships. The extent to which these are successfully detected greatly influences comprehension. Schema theory suggests that a failure to establish these relationships can result in a breakdown of the instantiation process which is essential to the construction of meaning. Findings from earlier research (Piaget, 1960; Flapan, 1968) seemed to imply that young children are incapable of inferring appropriate connections between events. More recent research, however, using different materials

and procedures (Day, et al., 1979; Nezworski, et al., Collins, et al. 1978), has provided contrary evidence to the effect that children as young as four are able to infer the intentions and internal states of characters. No doubt it will be some time before the particular conditions under which young children can demonstrate understanding of various types of causality will be delineated. The assumption underlying this fourth task was that the understanding of causal relationships is largely dependent on the child's knowledge of the world as well as on his or her functioning of schemata.

On this task, children's performance in answering eight questions designed to assess comprehension of implied causal relationships supported the experimental hypothesis of significant improvement over the academic year for each group. In fact, it was the only task in the study where significant within-group gains were demonstrated at all four grade levels. This finding suggests that the ability to infer relationships in a story develops rather steadily between the ages of four and eight. Previously cited research suggesting that four year olds can infer causal relationships quite readily was not replicated by the performance of the Head Start subjects in this study. Their mean scores of less than two indicate the average response was only one correct answer per subject. This one correct answer for most of the four year olds was supplied in response to question number five, "Why did the fox kill the chickens?" In answering, the child was required to supply consequence information which is usually a salient category in a narrative. In essence, these

children seem to have understood the main idea in the story but little else. This finding reflects a low level of schema acquisition, and, probably, background of knowledge relative to the content of the story.

Question number five proved to be the easiest to answer for all the subjects. This finding is not surprising and may be interpreted in several ways. Top level information in a story hierarchy is generally well recalled. But question five represented a special case. A reverse between-episode inference was required. Children had to relate the consequence back to the goal. It may be that some pathways, such as those connecting goals and consequences, are stronger than others. Being more easily traveled in retrieval, these paths result in greater recall. A second possibility is that content effects were more salient in comprehension than the influence of structure. A fox killing a chicken for his dinner may be a familiar concept to rural children as most of these subjects were. In this instance, prior experience may have accounted for the comprehensibility of that aspect of the text when the remainder of it was evidently incomprehensible to the younger subjects.

On this story heard in the fall, the Fox and Bear, the questions that proved most difficult to answer for the majority of children across the groups were numbers two and six. Question two, "Why was the fox frightened when he heard the roof crack?" required children to infer a character's internal response. The two common answers "He was afraid somebody was gonna come out," and, "He was afraid it was going to hurt the bear," both represent the correct category of story information called for by the question but are semantically unacceptable. In the second instance, children confused who was on the roof, the bear,

with who was in the henhouse. In the first, subjects may have been reflecting their inexperience with collapsing roofs, not realizing the more immediate danger. Thus, performance on this item could have been a function of schema acquisition, that is, retrieval did not access correct information, or prior experience could have influenced children's comprehension directly. The best guess is that performance was affected by both. Question six, "Why did the bear feel lazy?" also required an answer in the internal response category and a between episode inference. Such inferences were, in general, more difficult for subjects to make than within-episode inferences, presumably due to the distance of the paths to be traveled. Most children could not offer a response to this question, including 89 percent of the second graders. Ineffective schema functioning seems to be indicated rather than the lack of world knowledge because the relationship between physical activity (the bear had run to the farm) and feeling lazy is within the personal experience of the child.

The third question in the fall, "Why couldn't the fox and the bear get out of the henhouse after the roof caved in?" was answered correctly considerably more often by first and second graders than by the younger children. This finding was rather surprising for two reasons. First, the information called for related to physical causality generally the first type of causal understanding to be evidenced by young children (Piaget, 1960). And secondly, the type of information called for by the question was in the consequence category which is usually easy to reconstruct. However, the consequence in this instance was not directly related to the main goal of the story. Performance on this item may

well have been a function of schema acquisition. Pathways between categories may be stronger at later stages of development, accounting for the superior performance by the older children. An alternative explanation is that perhaps instantiation itself is not as effective for some categories at early stages of acquisition. The fact that the last two questions asked, numbers six and seven, related to information at the beginning of the story but were better answered than some previous questions suggests that decrements in recall due to forgetting were not a contributor to performance on this task.

Turning to the spring story, Epaminondas, question four, "Why did he put the butter on top of his head?" and five, "Why did he want to be careful with the butter?" were the most difficult for the majority of the children to answer. Both required information in the internal response category. In the majority of instances where children offered a response, their answers did represent that category of information. The most common reason given for putting the butter on top of his head was that his grandmother told him to. This answer indicated that children understood Epaminondas' action was in response to his grandmother's comments, but they could not infer the correct relationship. In response to question five, subjects said Epaminondas wanted to be careful with the butter so it wouldn't melt. Whereupon the experimenter would ask, "But did he know it was going to melt?" The child generally responded, "No." "But why then did he want to be careful with it?" was the experimenter's next question. "I don't know," was the child's most frequent reply. Most children were unable to make the causal connections necessary to arrive at the correct answer.

As was evidenced in the preceding exchange, which was repeated many times over in the course of data collection, performance on this item seemed to be as much a function of the reasoning operations available to the child as it was a reflection of schema acquisition. This example raises an interesting question. It seems intuitively clear that reasoning ability develops independent of story schema. A child who had never heard a story would still be capable of logical thought, one assumes. Yet, logical relationships are believed to inhere in schemata themselves. They are described as the pathways connecting frames. This problem can be interpreted in light of the work of Spiro (1980) and Schank and Lebowitz (1980) who are investigating what they believe to be even more basic cognitive structures and operations that can account for schemata themselves. Perhaps logical reasoning is one of them.

Inferences of physical causality were required by the two items that proved to be easiest for the majority of children to answer correctly. The first question, "Why did his mother tell him he should have put the butter in a leaf?" and the third, "Why did the butter melt?" called for information in the initiating event and consequence categories, respectively. Both represent high level nodes in a story structure. What is interesting, though, is that the question, "Why did the butter melt?" required the same type of path traversals and represented the same type of causal relationship as did the earlier question regarding why the fox and bear could not get out of the henhouse. In the spring, one-hundred percent of the kindergarten children knew why the butter melted but 68 percent did not know why the fox and bear could not get out of the hen house. Some story schema development may account for this large gain

over the course of the year, but experience in life situations clearly influenced the comprehension process.

### Summary

In this task, performance seemed to be a function of both schema based processing, and the child's prior experience. This interaction seemed more significant in relation to the inferring of causal relationships than it was on the other three tasks in this research. The profile of performance across groups was fairly uniform with regard to which questions were easiest and which most difficult. What differed was the proportion of correct responses. Children at each successive grade level answered more questions correctly than the preceding group. This finding seems to suggest that while schema slots may be acquired as a Gestalt, operations performed on them may become increasingly more efficient as a result of the acquisition process and of the child's expanding knowledge of the world.

### Task 5: Written Stories

According to Rumelhart (1975), every knowledge structure should simultaneously be interpretable as a process. Task five tested this hypothesis in regard to the production processes associated with story schema. Children were asked to engage in a generation task, and it was assumed that the operations involved would occur by virtue of the existing knowledge structure. The product, therefore, was anticipated to reflect the structure. The extent to which this was evidenced was remarkable. Subjects in this research had had no prior instruction in story writing or story structure. When teachers were interviewed to

confirm this information, it was also verified that none of the subjects had been asked to write a story in the course of the school year. Yet the more advanced protocols reflected story grammars very well. The categories of information were present and, in most cases, in the order specified by the grammars. The less sophisticated writings reflected structures not unlike those used in task one where there was a deliberate attempt to construct stimuli approaching a true story structure. Without any explicit knowledge of story parts, so far as it is possible to tell, many children wrote well formed stories. This finding is powerful evidence for the psychological validity of story grammars as representations of how the mind organizes story information.

Experimental hypothesis one, related to the improvement between grades in complexity of story structure, was supported as expected. This finding is consistent with the notion of schemata becoming increasingly more available for cognitive operations as a function of development. Given the lack of instruction, it would be difficult to account for these findings except in terms of the child's own schema acquisition. Unlike encoding operations where the structure can be said to reside in the input, in production the structure obviously resides in the source of the product, the child's own mind.

It was assumed that if schemata are production processing mechanisms the more features inherent in the schema, the more they would be reflected in children's stories. This appears to have occurred as evidenced by the fairly strong correlations between story conventions and structural complexity. The argument could be put forth that some



children are simply better writers than others. What is being suggested here is that writing ability, like reading ability, is dependent to some extent on the cognitive representation and organization of knowledge.

Setting information in children's stories was of special interest because most story grammars (Stein and Glenn, 1979; Mandler and Johnson, 1977) define stories as being composed of settings plus episodes. It was hypothesized that some children would produce a setting but then be unable to generate an episode. It was not anticipated that episodes would occur frequently without settings. These assumptions were borne out in children's protocols.

Recognition was given in Chapter three to the hazards of attempting to draw conclusions about how well children can write based on one or two samples produced under experimental conditions. There is little doubt that some subjects could have written more complex stories under different conditions. Some children even expressed disappointment that there was no opportunity to go back and work on their stories to make them better. Clearly these children had criteria for good stories that exceeded what they had produced.

One unanticipated development occurred which may have had a detrimental affect on the quality of some of the stories. The researcher asked the children to write a story, "Just like you might read in a storybook or that your teacher might read to you." Upon hearing this direction, one little subject turned to the next and asked, "But why does she want a boring story?" Another child, having completed his protocol, handed it to the researcher who said, "I'll enjoy reading this." The child responded, "No, you won't. It's dumb. But you asked

for a story just like I might read in my storybook." Perhaps if the children had been asked to write good stories just like they would want to read in their storybooks, the directions would have made more sense to some of the subjects. Whether they would have produced better stories is another question.

A serious question concerns the degree to which story protocols did reflect schemata for the considerable number of children who wrote stories virtually lacking in structure. Obviously, young children know more than they can express; language production is generally acknowledged to lag behind comprehension abilities. Additionally, written stories require task demands of a mechanical nature that oral stories do not require. It is perhaps a safe assumption that all the children possess more complex schemata than was evidenced in the written stories. How much more complex is impossible to specify on the basis of the data in this task. On the other hand, it is possible that written stories do access the cognitive structure of schemata directly and accurately. Stein (1981) raises the issue that perhaps children write non-motive resolution sequences because they actually believe them to be good stories. In task one of this study, and in a similar study completed by a doctoral student of Stein's (Stein and Trabasso, 1981), children did identify various types of structures as stories. More research is needed to clarify these points.

### Summary

Story schema was shown to be influential as a processing mechanism in the production of written stories by young children. Episodic structures were more evident in the stories of second graders presumably

reflecting their more advanced state of schema acquisition. Whether children wrote non-motive resolution sequences when asked to compose a good story because they believe them to be good stories, or because they were not capable of writing stories with goal structures is unclear.

### General Conclusions

Developmental studies are expected to demonstrate improvement across time. Children progress as they get older. The central questions addressed in this research were: in regard to the processing of story information, in what ways do they improve? And, perhaps more significantly, how does this improvement occur?

The ways in which children demonstrated improvement in this research were first, in the ability to conceptualize about stories, and second, in cognitive operations performed on story information, including: monitoring, recognition, reconstruction and retrieval.

As to how this improvement occurs over time, the weight of the findings presented in this study suggested that a normal sort of concept acquisition process seems to occur whereby the child's understanding of what a story is develops over time. In the stages prior to the child's full acquisition of the concept of a story, processing dependent on conceptualization at this level will proceed in a manner different from that of adults.

The structural components of story schema appear to be acquired as a Gestalt. The story categories that are not salient for adults are even less so for children but they are not absent entirely from the knowledge structure. Processing differences of story information seem

instead to be attributable to operations on the schematic slots themselves and to characteristics of schema categories such as the strength of pathways connecting frames, and the semantic constraints within slots. In addition to these schema based factors other aspects of the child's cognitive structure seem to influence story comprehension. Evident in this research was the influence of metacognitive skills, and the wealth of experiences stored in long term memory.

The answer to the question, are story schema acquired developmentally seems to be yes, to the extent other concepts and knowledge structures are. However, improvement in the ability to deal with story information does not appear to be attributable to the developmental acquisition of schemata but rather to its increased assessibility and efficiency as a processing and production mechanism.

#### Story Schemata, IQ and Reading Achievement

This study investigated the extent to which story schema functioning, as it was assessed in four experimental tasks, influenced subsequent achievement in reading among first and second graders. On three out of the four tasks that were administered in the fall, performance accounted for a significant amount of the variance in reading growth over the course of the year for the first graders in the sample. On the fifth task, which was administered in the spring, good readers were shown to perform significantly better than poor readers.

Only one task measuring the ability to infer causal relationships in a story proved to be a significant contributor to the variance in reading growth over the course of the school year for the second grade

sample. This finding was unexpected in that story schema functioning would appear to be even more of an influence in second grade than in first given the task demands reading imposes in the second year as compared to the first year of instruction. Children are reading more narratives and longer ones; story schema would seem to have a greater contribution to make at this level than at the initial stages of reading acquisition. The fact that the developmental level of story schema was a significant factor in beginning reading but not in the second year suggests that the finding may be an anomaly.

There are several possible reasons why the results were not as predicted. One explanation is that story schema development itself may reach a maximum level of influence in the first grade and thereafter level off. However, this hypothesis does not seem tenable in light of the performance by the second graders on the experimental tasks. In each case, there was room for further improvement in performance. In fact, on the one measure that did contribute to the variance in reading achievement, the inferring of causal relationships, the second graders demonstrated strong gains over the course of the year, performing significantly better than the first graders in the spring. This finding suggests that story schema processing continues to improve throughout the second grade.

Another explanation for the lack of contribution to reading achievement may be that the Gates-MacGinitie Reading Test assesses comprehension differently than the experimental tasks. Perhaps the amount of incongruence between assessment measures accounts for the finding of no significant relationship between level of schema acquisition and reading achievement. This explanation seems plausible in light of the

fact that the one task which most closely resembled the Gates assessment, the questions requiring a causal inference, did account for variance in subsequent reading growth. On the other hand, if incongruence between evaluation measures caused the second grade results, it seems probable that the first grade results would have likewise also been adversely affected. Evidently they were not.

A final possibility is that the sample of second graders studied were atypical. This possibility is suggested by the fact that the scores of children in this group were observed to decline from the fall to the spring administrations on several of the tasks. While the declines were generally not significant, they were unexpected. With regard to their reading performance, as a group the second graders did show significant gains in the spring over their fall scores. However, as compared to the group on which the Gates-MacGinitie Test was normed, they actually regressed in reading ability. The picture that emerges is that of a group of students who did not make expected academic gains over the course of the school year. This fact alone could account for the finding of no relationship between performance on the experimental tasks and reading achievement among the second graders.

For the first grade students, performance on the experimental tasks was predictive of subsequent reading growth over the first year of instruction. Interestingly enough, the one task that was not related to reading achievement was the inferring of causal relationships. Nearly all the first graders performed poorly on this task in the

in the fall, which probably accounts for its failure as a predictor of reading growth. The task was evidently too difficult to measure the type of inferences the children were capable of making.

The findings in this study show kindergarten and first grade years to be a time of rapid growth in the child's acquisition of a story schema and in the corresponding processing of story information. This growth was demonstrated to be related to success in beginning reading. The relationship was first evidenced in task one, which assessed the child's concept of a story. Findings from this procedure reflect those of other studies (Downing, 1971; Johns, 1974; Evanechko, et. al., 1973) that indicate a child's conceptualization of words and sentences contribute to his or her performance in reading. In general, this research suggests that concepts a child brings to reading instruction (the nature of what he or she will read, and what is involved in learning to read [Evanechko, 1973]), establish expectations in the learner that apparently help or hinder reading acquisition. Findings from the present study indicate that the clearer the notion the child has about what a story is, the better prepared he or she is to learn to read one.

A different type of comprehension skill was measured in tasks two and three which also predicted subsequent reading achievement for first graders. In both procedures monitoring of incoming data was assessed. In addition to measuring the effectiveness of instantiation, task three also tapped recognition and retrieval operations. These processes are generally recognized as being important to reading performance. Children who could not perform them well on auditory stimuli were likewise more likely to be unable to use them effectively when learning to read.

Performance on the last task, story production, also related to reading achievement for the first grade population. It represented, perhaps, the most direct assessment of the cognitive representation of story structure. The relationship between reading achievement and the ability to write a well structured story presumably reflected a greater accessibility of story schema for cognitive operations among the good readers as compared to its accessibility among the poor readers. The structurally complex stories produced by the first grade students were, in general, written by the good readers. This finding was interpreted to indicate a more advanced state of schema acquisition and corresponding processing ability among these students.

The demonstration of story schema as an influence on beginning reading provides evidence for the interactive nature of the reading process from its earliest stages of acquisition. The facilitative effects of macrostructures in the comprehension process of older readers has been shown in earlier studies (Meyer, 1977; Thorndyke, 1977). Findings from this research suggest that beginning readers also benefit from schema based processing mechanisms.

The correlation between the verbal IQ and performance on the five experimental tasks was generally low and, in many cases, non-significant. This finding may indicate that performance on the tasks was not a function of the child's general degree of verbal intelligence, but rather, reflected cognitive structures and operations independent of those measured by the Peabody Picture Vocabulary Test. The data here suggest that the acquisition of the concept of a story and of story schemata itself is not greatly dependent on the child's verbal IQ.



### Suggestions for Further Research

The findings from task one of this study suggest the acquisition of a story concept proceeds in much the same manner as the acquisition of much simpler concepts. But the data are far from definitive. The acquisition process itself needs to be further specified, as do the features of a story at different stages of development in the child's mind.

The reasons why children accept as stories, structures that adults reject, should be explored. It may be that children's concept of a story is different than that of an adult's or, perhaps, children have the same concept of story structure, but attend to other story features when making a judgment. Findings from the present study indicate that either or both may be the case.

There are yet many aspects of schema that are not well defined.

Those that pertained to this research included:

- the nature of connections or pathways between schema slots:  
their strength, accessibility
- the semantic space available in schema slots
- the relationship between metacognitive abilities and schema-based processing
- the relationship between specific schemata and long term memory store
- the factors influencing schema activation and accessibility in the comprehension of discourse
- the relationship between the development of natural categories, basic cognitive operations, and schemata.

Each of these problems require further specifications of existing schema theory and, of course, empirical investigations.

### Educational Implications

In this study, a child's concept of a story was demonstrated to be related to his or her subsequent achievement in reading. This relationship can be interpreted in light of schema theory, which posits that expectations generated prior to reading, on the basis of what is known about the material to be encoded, affect instantiation and retrieval processes. Hypotheses as to probable content and structure of what is to be read orient the reader to the task and help to reduce bottom-up or text-based processing demands. For example, when handed a cake recipe to read, most people already know how the information to be encoded is organized and what relations will pertain among the words, phrases and sentences. This prior knowledge helps to make reading a recipe a relatively easy task.

Findings in this research indicate that when a teacher in a kindergarten, first or even second grade class says, "Now we'll read (or write) a story," some children have more accurate ideas about what they will be required to do than others. The children who have well developed story concepts are in a better position to generate hypotheses about structure and content than those who do not. Teachers can help children acquire critical features of stories by referring to only actual stories as stories. Materials that do not represent narrative sequences should not be presented to children as stories. For example, the Gates-MacGinitie Reading Test Teacher's Manual for the primary grades directs

teachers to tell students to read the stories beneath the pictures. There are no stories beneath pictures, just short sentences. Perhaps the test publishers believe that primary school age children might not know what a sentence is and, in fact, some research does suggest that young children do not have clear concepts for terms like sentence or word (Downing, 1971). Many young children do not have a well defined concept for a story either and labeling sentences as stories will clearly not help them to develop such conceptualizations. Accurate use of language in educational materials and in classrooms may assist children's conceptual development for many words commonly used in instructional settings.

A second finding that relates to classroom practice is that many children (in the primary grades and beyond) do not realize when the information they are receiving is incomplete, or when they are really not comprehending it very well. The common practice of asking children, "Do you understand?" or of saying, "Tell me when you don't understand," may well be futile for this age. In classrooms where individualized instruction is implemented and children are expected to do a fair amount of their work independently by following written directions, this problem could cause difficulties. Some effort, perhaps, should be made to determine which children are capable of monitoring their own understanding and to provide instructional assistance for those who are not.

The influence of schemata on the processing of story information should be taken into account in planning and teaching reading lessons. Several generalizations have been substantiated by research to the point where their application in classroom practice seems warranted. Two such

findings replicated in this study include the following: most young children appear to have a story schema but the degree to which it is accessible for use in processing information seems to vary. The traditional practice of preparing a child to read through discussion, the use of pictures, and so on, may be invaluable in activating schemata for later comprehension.

Once having read a story, not all information is equally available at recall even for good readers. Teachers are often trained to estimate the level of difficulty of a comprehension question by its type: literal, inferential, evaluative, etc. As the findings demonstrate, there is a hierarchy of difficulty within each type of question. Some inferences are readily made by even young children. The students' background of experience with the content of the material appears to be a significant determinant of his or her success. In regard to literal level questions, some, again, are easier than others. Those that require an answer in the attempt, internal response, or reaction categories will generally be harder for the average student than those that tap the more salient story categories. Rather than representing a hierarchy from easy to hard, question types overlap and even cross each other in level of difficulty. Some literal level questions may pose more of a challenge than some inference questions, and vice versa.

A basic knowledge of text structure and its effect on comprehension would enable the teacher of reading to design instructional strategies that can help to maximize student learning. The preceding discussion of questioning techniques is one example of the use that can be made of this knowledge in guiding and assessing reading comprehension.

Finally, the major finding of this research, that story schema is related to success in beginning reading, underscores the importance of activities designed to develop cognitive, as well as perceptual abilities, in the beginning reader. Telling stories, reading stories to children, as well as providing other forms of exposure to a wide range of narratives appears to be important in developing the child's concept of story and his or her story schema. This research suggests both may influence subsequent achievement in reading.

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APPENDIX A  
Task #1  
Qualitative Results

Table 3  
 Proportion of Responses to Question:  
 "Why is Stimulus A a Story?"  
 (Or Not a Story)?  
 Task #1 - Fall Administration

	Don't Know	Presentation	Length	Cohesion	Content	Storylike	Goal
HS	.75	.16	0	0	.08	0	0
K	.29	.18	.02	.02	.36	.11	0
1st	.04	0	.11	.24	.38	.20	.02
2nd	.07	0	.02	.34	.32	.16	.09

Chi-Square = 98.81  $p < .000$   
 Pearson's  $r = .56$   $p < .000$



Table 4

Proportion of Responses to Question:

"Why Is Stimulus B a Story?"

(Or Not a Story?)

Task #1 - Fall Administration

	Don't Know	Presentation	Length	Cohesion	Content	Storylike	Goal
HS	.79	.08	0	0	.04	.04	.04
K	.25	.25	.02	.02	.27	.14	.04
1st	.11	.02	.07	.09	.37	.33	0
2nd	.07	.04	.02	.02	.59	.23	.02

Chi Square = 85.71  $p < .000$ Pearson's  $r = .511$   $p < .000$

Table 5

Proportion of Responses to Question:

"Why Is Stimulus C a Story?"

(Or Not a Story)?

Task #1 - Fall Administration

	Don't Know	Presentation	Length	Cohesion	Content	Storylike	Goal
HS	.71	.08	0	0	.12	.04	.04
K	.31	.23	.02	0	.23	.09	.11
1st	.16	0	.07	.07	.22	.24	.24
2nd	.55	.02	.02	.02	.25	.13	.50

Chi Square = .79  $p < .000$ Pearson's  $r = .56$   $p < .000$

Table 6

Proportion of Responses to Question:

"Why Is Stimulus D a Story?"

(Or Not a Story)?

Task #1 - Fall Administration

	Don't Know	Presentation	Length	Cohesion	Content	Storylike	Goal
HS	.62	.08	0	0	.12	.08	.08
K	.25	.23	0	0	.20	.11	.20
1st	.13	.02	.04	.04	.22	.22	.31
2nd	.09	0	.07	.02	.11	.20	.50

Chi Square = 61.82  $p < .000$ Pearson's  $r = .45$   $p < .000$

Table 7

Proportion of Responses to Question:

"Why Is Stimulus A a Story?"

(Or Not a Story)?

Task #1: Spring Administration

	Don't Know 0	Presentation 1	Length 2	Cohesion 3	Content 4	Storylike 5	Goal 6
HS	.71	.06	0	0	.18	.06	0
K	.22	.05	0	.17	.41	.15	0
1st	.07	0	.10	.10	.51	.22	0
2nd	.05	0	0	.35	.45	.15	0

Chi square = 61.8 p&lt;.000

Pearson's r = .41 p&lt;.000

Table 8

Proportion of Responses to Question:

"Why Is Stimulus B a Story?"

(Or Not a Story)?

Task #1: Spring Administration: I

	Don't Know 0	Presentation 1	Length 2	Cohesion 3	Content 4	Storylike 5	Goal 6
HS	.59	.06	0	0	.23	.12	0
K	.27	.05	.02	.02	.51	.12	0
1st	.15	0	.07	0	.51	.22	.05
2nd	.07	0	.05	.02	.60	.20	.05

Chi square = 31.33  $p < .02$ Pearson's  $r = .37$   $p < .000$

Table 9

Proportion of Responses to Question:

"Why Is Stimulus C a Story?"

(Or Not a Story)?

Task #1: Spring Administration

	Don't Know 0	Presentation 1	Length 2	Cohesion 3	Content 4	Storylike 5	Goal 6
HS	.59	0	0	0	.18	.12	.12
K	.29	10	.02	0	.20	.12	.27
1st	.12	0	.05	0	.34	.17	.32
2nd	.05	0	.02	.02	.32	.18	.40

Chi square = 39.14  $p < .002$ Pearson's  $r = .39$   $p < .000$

Table 10  
 Proportion of Responses to Question:  
 "Why Is Stimulus D a Story?"  
 (Or Not a Story?)  
 Task #1: Spring Administration

	Don't Know 0	Presentation 1	Length 2	Cohesion 3	Content 4	Storylike 5	Goal 6
HS	.59	.06	.00	.00	.06	.18	.12
K	.22	.10	.05	.00	.22	.10	.32
1st	.05	.00	.05	.00	.32	.20	.39
2nd	.02	.00	.02	.03	.33	.13	.48

Chi Square = 49.7  $p < .001$   
 Pearson's  $r = .44$   $p < .000$

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A STUDY OF STORY SCHEMA ACQUISITION AND ITS  
INFLUENCE ON BEGINNING READING

by

Nora Lee Hoover

(ABSTRACT)

This study investigated the developmental acquisition of cognitive structures, which influence the encoding and retrieval of story information. Examined were the between and within group differences among young children in the acquisition of story schema and in the processing of story information. A series of four experimental tasks were administered individually at the start of the academic year and again at the end to each of the 156 four, five, six and seven year olds in the sample.

Tasks chosen were selected on the basis of research suggesting their viability as measures of schema acquisition and related processing. Specifically, they assessed: metacognitive knowledge of story structure; detection of structural deviation; recognition and retrieval of missing information; and inferring between and within episodic relationships. In a fifth task, first and second graders wrote two stories in the spring of the year based on picture stimuli. In addition, the Peabody Picture Vocabulary Test was administered to each subject in the fall of the year.

The first two hypotheses predicted significant between group differences at the fall administration of the tasks and significant within group gains over the course of the year. In general, findings

supported these hypotheses ( $p < .05$ ). The third hypothesis predicted that fall performance on tasks one through four would account for a significant amount of the variance in reading growth over the year. This hypothesis was supported for the first graders relative to tasks one, two, and three ( $p < .10$ ). For these subjects, level of structural complexity present in written stories was significantly different for good versus poor readers ( $p < .05$ ). For second grade subjects, performance on task four was shown to contribute a significant amount of the variance in reading growth ( $p < .07$ ). In general, correlations between performance on the tasks and IQ were low.

Findings from task one suggest that young children acquire the concept of a story in the same developmental manner that other concepts and knowledge structures are believed to be acquired. Children's performance on the experimental tasks two, three and four suggest age related differences in monitoring, recognition, reconstruction and retrieval operations on story information. However, improvement in the ability to deal with story information does not appear to be attributable to the developmental acquisition of schemata but rather to its increased accessibility, engagement, and efficiency as a processing and production mechanism.