

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/243501171>

An Analysis of Story Comprehension in Elementary School Children

Article · January 1979

CITATIONS

1,751

READS

18,232

2 authors, including:



Nancy Stein

University of Chicago

79 PUBLICATIONS 6,033 CITATIONS

SEE PROFILE

3 An Analysis of Story Comprehension in Elementary School Children

In R.O. Freedle, Ed. (1979) *New directions in discourse processing*. Hillsdale, N.J.: Ablex, Inc.

Nancy L. Stein
Christine G. Glenn
Washington University, St. Louis

Recently, there has been a renewed attempt to describe the structures underlying the comprehension of complex linguistic information, such as story material (Mandler, Johnson, & DeForest, 1976; Rumelhart, 1975; Stein & Glenn, 1976). While knowledge concerning the cognitive structures which regulate single word and sentence processing are critical for a more complete understanding of story comprehension, this type of information is not sufficient to describe the results found in studying stories. The cognitive structures or schemas used during story processing may be quite independent of the structures used during single sentence processing. Accurate predictions concerning which parts of stories will be recalled, forgotten, or transformed cannot be made from data bases containing only knowledge of single word or sentence comprehension. Stories contain multiple cause-effect relations and descriptions of entire behavior sequences of events and actions. This necessitates the development of a model which defines the underlying structure used to comprehend the informational units in a story and the relations that occur between the units.

Bartlett (1932) was one of the first investigators who attempted to define the types of mental structures used during the encoding and retrieval of stories. Almost all of the recent studies on story recall or comprehension, including the present investigation, have adopted and attempted to refine some of the concepts used by Bartlett (i.e., Brown, 1975; Kintsch, 1976; Mandler et al., 1976; Paris, 1975; Stein & Glenn, 1976). In the process of collecting data on story recall, Bartlett arrived at several conclusions which diametrically opposed the available theories of memory at the time of his investigation. He argued that story recall is not an exact copy or reproduction of incoming information, as many trace theorists believed. Subjects did not

remember the exact syntactic and semantic aspects of stories. The information underwent blending, omissions, inventions of new detail, and similar transformations. Bartlett felt that subjects tended to get an impression of the whole story and, on the basis of this mental "attitude," they would then reconstruct the details of the story. Subjects often based their reconstructions upon probabilistic estimates of what could have occurred rather than what actually did occur.

The fact that transformations occurred in recall led Bartlett to the conclusion that memory is constructive and is a product of the interaction between the incoming information and the strategies, mental operations, and structures used by the subject. The concept of a mental schema or structure influencing story comprehension is perhaps Bartlett's major contribution to theories of memory and is widely adopted by investigators studying the internal structure of stories (i.e., see Brown, 1975; Kintsch, 1976; Mandler et al., 1976; Paris, 1975; Rumelhart, 1975; Stein & Glenn, 1976).

A schema, to Bartlett (1932), represented "an active organization of past reactions and experiences which are always operating in any well-developed organism" (p. 201). These past experiences, although serially encoded and organized, operate as a unitary mass. Bartlett emphasized the reciprocal interaction which occurs between incoming new information and existing mental structures by stating that incoming information is actively integrated into a subject's existing mental structure but, at the same time, new information modifies the organization of preexisting structures. He described both the consistency and variability of story recall in terms of these structures. On the one hand, he felt that the broad characteristics of these schemas were stable over time and were shared by many individuals at least within a given culture. This would explain the consistency observed in recall over a period of repeated reproductions and across many individuals. However, he also argued that individual differences in attitudes, interests, and affective states existed and influenced the variability that occurred in recall.

Although Bartlett's work covered a large number of theoretical problems, the application of his concepts requires the addition of major theoretical innovations. Bartlett never clearly defined the schemas which guide story processing. Furthermore, he was not concerned with the description of the external organization of stories and the variability that might exist between stories. Bartlett's stories, such as the *War of the Ghosts*, lacked a great deal of external organization; critical presuppositions were omitted, explicit references to the exact temporal occurrence of events were not included, and the social and cultural settings of the story were removed from those which were familiar to his subjects. Thus, it remains extremely difficult to make predictions concerning the processing of other stories from his results. In order to accomplish this task, a model which considers the relationship between the external organization of stories and the existing internal structures used by a subject must be developed.

Many investigators have been able to verify Bartlett's statements concerning the constructive aspect of memory by investigating the role of inferential thinking and prior knowledge on story comprehension (see Bransford & McCarrell, 1974, or Paris, 1975, for recent reviews of this research). However, a model or theory of story comprehension which formally defines the types of strategies, operations, and schemas used by a processor is also necessary to investigate the nature of story memory.

Two of the basic requirements for any model of prose comprehension are that it contain rules for defining the types of informational units contained in the material and that it define the types of relations that exist between these units. These rules would permit a precise definition of the information contained in a passage and would enable an investigator to make specific predictions concerning the way in which this information would be encoded and internally represented by a subject.

The first step involved in developing a model, therefore, involves the choice of a unit of analysis. A unit is a measure of information and is a relative concept. The choice of unit will depend upon the questions asked by an investigator. When an investigator chooses a unit of analysis, several assumptions are generally made concerning this choice:

1. The unit is assumed to correspond to the types of categories processors use in structuring and remembering information.
2. The unit can often be described in terms of lower level units and the relations between these units.
3. The unit can be joined to other units of the same level by specified relations in order to form higher order units.

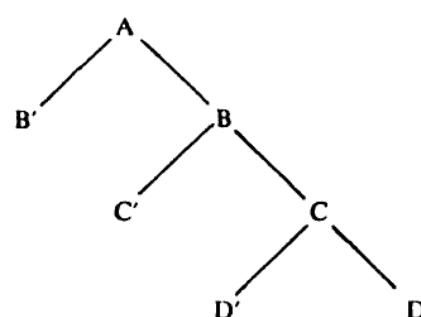
It is generally assumed that the unit chosen for narrative analysis must be larger than the individual word. The unit most widely used to date is the proposition (Fillmore, 1968; Kintsch, 1974). A proposition is defined as a predicator or relational word, usually the verb, and one or more arguments which stand in some specific relation to the predicator, e.g., the actor of a verb. A proposition roughly corresponds to a simple sentence.

The concept of a proposition (or a similar linguistic unit) can not completely describe a prose passage. An analysis of a passage into propositions does not provide information concerning the relative importance of individual propositions within the passage, nor does it indicate how these units are logically related to each other. A model of processing requires an analysis of the types of information that can occur in prose and of the types of relations that can exist between units. In order to do this, it is necessary to specify the kind of prose being examined. Different types of prose contain different types of information and different interunit relations. The present study is concerned with the comprehension of one type of prose: the story or folktale.

Rumelhart (1975) has recently developed a grammar which attempts to represent a processor's internal organization of story material. The grammar is composed of a set of rules that describe how a story can be broken down into units and how these units are related to one another. It is assumed that the organizational principles formalized in his grammar correspond to the organizational strategies used by subjects. In developing this grammar, Rumelhart analyzed the structure of folktales, fables, and myths. This type of narrative has two major characteristics: it is usually orally transmitted and its frequency of transmission is extremely high (for studies of folktales see Colby & Cole, 1973; Lord, 1965; and Propp, 1958). Even though there is variation in the production of a tale as it is retold, the end result is that a stable organization emerges. The type of logical sequence produced upon recall remains highly consistent despite variations in the specific content added to or deleted from the story.

In his schema for stories, Rumelhart's primary unit of analysis is defined as an informational node or category. Each category refers to specific types of information which serve different functions within the story structure. For example, almost all stories begin with information concerning the physical, social, or temporal context within which the remainder of the story occurs. The function of this information is to set the stage for the subsequent events. Rumelhart defines several different categories existing in a story structure, the information in any category containing one or several propositions. The number of propositions occurring is not the critical variable defining category membership. At times, information in an entire sentence may be classified into one or two different categories, depending upon the functional role of each portion of the sentence.

The categories can be described in terms of a hierarchical network in which a logical sequence is created among the categories and specific relations determine the degree of causality existing between any two categories. In describing the hierarchical network, Rumelhart assumes that each of the categories can be described in terms of higher order categories and that the hierarchy is basically a binary network. Thus, the internal representation of a story can be portrayed in schematic form as:



The highest order category in this network is A. A can be defined in terms of B' and B. B' is, in most instances, a primary category which cannot be further divided into other categories. A primary category can contain multiple elements but all of the elements have an underlying similar feature which makes them belong to category B'. Conversely, category B is a higher order category which can be defined in terms of C', a primary category, and C, another higher order category.

It should be noted that there are other types of representations which can be used. For instance, the informational categories could be represented as a linear sequence; A would then be diagrammed as follows:

B' ————— C' ————— D' ————— D

This type of representation does not postulate any higher order categories, and implies a rather simple model of processing. A set of informational categories is postulated which are joined by a set of relations. The choice between a linear and a hierarchical representation depends upon the interpretation of a hierarchical representation; at least two interpretations are possible. The least stringent is that the hierarchical network is used solely as a descriptive tool. The justification for its use is that it can describe a large number of individual cases, in this instance stories; presumably many stories can be more easily described if higher order categories are postulated. For instance, some stories might be described as containing several "B" sequences. If the hierarchical representation is interpreted in this way, the choice between a hierarchical and a linear representation depends on such criteria as convenience and ease and range of application; no differences in processing have been stated. A second interpretation of a hierarchical representation is that processing follows a hierarchical sequence. This interpretation obviously makes more assumptions about processing and about the psychological validity of a hierarchical model. The exact implications of this position have not been clearly developed. For example, one hypothesis that might be derived from the second interpretation is that the higher nodes are more central to the organization of the story and will be better recalled. There is at present no evidence which would support the second and more stringent interpretation and therefore no choice between interpretations and between the use of a linear versus a hierarchical representation can be made on the basis of data. Reasons for employing a hierarchical representation will be presented in the next section.

In an initial study (Stein & Glenn, 1975) Rumelhart's schema for stories (1975) was used to analyze story recall protocols from elementary school children. Several difficulties were encountered in an attempt to apply his original story schema to many of the stories in our collection of folktales and fables. The difficulties encountered in using Rumelhart's story schema and the subsequent changes made as a result of those problems are listed below:

1. Rumelhart used separate systems to describe semantic and syntactic relations occurring in stories. We found this distinction to be cumbersome and somewhat artificial. Therefore, the semantic and syntactic relations occurring in the story are combined into one structure.

2. Rumelhart's grammar did not specify the variety of causal links that occur within each category and between episodes of a story. Nor did he specify the structural variations that can occur within a single episode. Our story schema does both.

3. The third difficulty in using his grammar concerned the classification of story information into categories. His initial category distinctions were either too restrictive or did not encompass all types of information found in a variety of folktales. In our initial attempt to parse many children's stories, we found it necessary to delete some of his category distinctions, add new categories, and broaden the type of information classified in certain categories.

The next two sections include the presentation of the story schema that we used in analyzing the four stories presented in our two experiments. In addition, another 50 or more children's stories and fables were analyzed while constructing the schema. When examining the stories, it appeared that several major types of information could adequately describe the stories. The categories were an attempt to formalize these intuitive impressions. The final categories were chosen because they can be used to describe a wide range of stories. It is possible, however, that the category definitions will have to be changed or modified as data are collected. Furthermore, there may be significant differences between cultures in the types of distinctions used by processors. Nonetheless, these categories can be used as a first approximation in the attempt to delineate the distinctions people naturally use. The final sections of this paper present data from two studies that test some of the hypotheses derived from our schema for parsing stories.

THE STORY SCHEMA

Several assumptions are made concerning the analysis of stories. The first assumption is that story material has some kind of internal structure much like sentences (Rumelhart, 1975). The second assumption is that stories can be described in terms of a hierarchical network of categories and the logical relations that exist between these categories. It is further assumed that this network corresponds in some way to the way processors organize story information. This network defines a logical order which is assumed to exist between categories. The categories are types of information which recur in most folktales or fables. The intercategory relations specify the degree to which a category influences or logically precedes the occurrence of a subset

category. The first section of the grammar presents the rules which define the category structures and the intercategory relations occurring in a simple story. Figure 1 summarizes all of the rules to be discussed in this section. Figure 2 presents both the internal structure of a simple story and an example which identically matches this structure. It should be noted that most story representations are more complex than the simple story. The structural variations and complexities that can occur are presented at the end of this section. However, the story, *Melvin, The Skinny Mouse*, should aid the reader in following the basic structural components of our schema.

A story consists of a setting category plus an episode system. These two categories are connected by an ALLOW relation. The rule for defining these categories is given by:

Rule 1: Story → ALLOW (Setting, Episode System)

The first two lines in the Melvin story are each setting statements. The remainder of the information consists of an episode. The setting category serves two functions in the story. It introduces the main character(s) and it describes the social, physical, or temporal context in which the remainder of the story occurs. The type of information contained in this category is basically stative in nature and refers to long-term or habitual states of characters or locations, e.g., the mouse's name was Melvin, and he lived in a barn. However, an activity of a character may also be included in the setting if it describes habitual behavior patterns. The types of information in a setting statement are defined by:

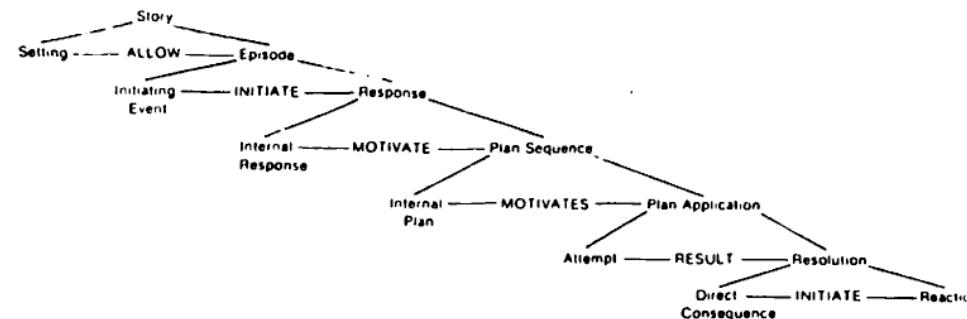
Rule 2: Setting → [State(s)
Activity(ies)]

Several states or activities can occur within the setting category and each is considered to be an exemplar of the category. Each exemplar can be referred to as a base level statement. In the Melvin story, there are two base level setting statements. The use of this term does not imply the existence of a hierarchy within the category. When more than one state or activity occurs, each is related to the other(s) by one of three types of relations: AND, THEN, and CAUSE. The AND relation describes the case in which two units co-occur in time. It can also describe the relation between two units in which there is no definite or apparent temporal sequence existing between the two statements. This is the case in the Melvin story (he was a skinny little mouse AND he lived in a barn). The THEN relation refers to the case in which one statement temporally precedes a second statement but does not directly cause the second although the first may create the necessary preconditions for the second statement to occur. The CAUSE relation refers to the situation in

Summary of Grammatical Rules

1. Story \rightarrow ALLOW (Setting, Episode System)
 2. Setting \rightarrow State(s)
Action(s)
 3. Episode System \rightarrow AND
THEN
CAUSE (Episode(s))
 4. Episode \rightarrow INITIATE (Initiating Event, Response)
 5. Initiating Event \rightarrow Natural Occurrence(s)
Action(s)
Internal Event(s)
 6. Response \rightarrow MOTIVATE (Internal Response, Plan Sequence)
 7. Internal Response \rightarrow Goal(s)
Affect(s)
Cognition(s)
 8. Plan Sequence \rightarrow INITIATE (Internal Plan, Plan Application)
 9. Internal Plan \rightarrow Cognition(s)
Subgoal(s)
 10. Plan Application \rightarrow RESULT (Attempt, Resolution)
 11. Attempt \rightarrow (Action(s))
 12. Resolution \rightarrow INITIATE (Direct Consequence, Reaction)
 13. Direct Consequence \rightarrow Natural Occurrence(s)
Action(s)
End State(s)
 14. Reaction \rightarrow Affect(s)
Cognition(s)
Action(s)
- Intra-category connectors:
- AND: includes simultaneous or a temporal relation.
 - THEN: includes temporal but not direct causal relations.
 - CAUSE: includes temporal relations which are causal in nature.

FIG. 1. Rules which define the internal representation of a story.



Melvin, The Skinny Mouse

- | | |
|--------------------|---|
| Setting | [1. Once upon a time, there was a skinny little mouse named Melvin |
| | [2. who lived in a big red barn. |
| Initiating Event | [3. One day, Melvin found a box of rice crispies underneath a stack of hay |
| | [4. Then he saw a small hole in the side of the box. |
| Internal Response | [5. Melvin knew how good the cereal tasted |
| | [6. and wanted to eat just a little bit of the cereal. |
| Internal Plan | [7. He decided to get some sugar first |
| | [8. so that he could sweeten his cereal. |
| Attempt | [9. Then Melvin slipped through the hole in the box |
| | [10. and quickly filled his cereal bowl. |
| Direct Consequence | [11. Soon Melvin had eaten every bit of the rice crispies |
| | [12. and had become very fat. |
| Reaction | [13. Melvin knew he had eaten too much |
| | [14. and felt very sad. |

FIG. 2. Structure of a simple episode.

which one statement directly influences the occurrence of the second statement. Within the category the relations between statements can be diagramed in a single logical chain similar to Schank's (1975) type of representation.

Although both the character introduction and the description of story context are considered to be setting statements, the two types of information may function differently in the organization of story material. It is almost impossible to begin the production of a story without including a character introduction. In stories in which there is no specific character introduction, many children construct their own introduction in order to begin story recall. This type of statement appears to act as a marker for the initiation of the recall schema (Stein & Glenn, 1975). Other types of information in the setting category may or may not assume a similar importance in the production of a story. In order to distinguish between these two types of setting information, we have labeled the character introduction as the Major Setting category and the other types of setting information as the Minor Setting category.

Setting statements generally occur at the beginning of a story, but they can occur almost anywhere in the sequence of the story schema when it is necessary to describe a new character or a new physical and social context.

The remainder of the story structure is described by an episode system. An episode system, like a story, is a higher order category and incorporates the entire story structure with the exception of the initial setting. An episode system consists of one or more episodes and is defined by the rule:

AND

An episode is an entire behavioral sequence. The meaning of this term will become clearer below. Most stories contain two or more episodes which can be related to each other in several ways. Because of the complex interrelations that can exist among episodes, the schema of a simple episode will be described first.

An episode is the primary higher order unit of a story and consists of an entire behavioral sequence. It includes the external and/or internal events which influence a character, the character's internal response (goals, cognitions, plans) to these events, the character's external response to his goals, and the consequence resulting from his overt responses. Inherent in this sequence is a causal chain of events beginning with an initiating event and ending with a resolution. Thus, an episode is defined as:

Rule 4: Episode – INITIATE (Initiating Event, Response)

which states that an episode consists of an initiating event plus a response. In the Melvin story, lines 3 and 4 are both base level initiating event statements. They mark Melvin's discovery of the box of rice crispies with a hole in it. These two statements serve to INITIATE (i.e., precipitate or lead to) the response which includes the remainder of the story. The INITIATE relation denotes a direct causal connection between the Initiating Event and Response categories.

The main function of an initiating event is to cause a response in the main character. The informational content of an initiating event can include three types of statements:

**Rule 5: Initiating Event → Action(s)
Natural Occurrence(s)**

A natural occurrence is a change of state in the physical environment and, in most cases, is not caused by an animate being. Examples of these types of occurrences would be, "the chimney began to crack and fell on the roof." An action performed by either the major character or a minor character is also considered to be an initiating event if it evokes a response in a character. In one of our stories, *Epaminondas*, the boy's mother tells him to take a cake to his grandmother. The mother's action in this story is considered to be an initiating event. An action originating in the main character can also be classified as an initiating event. For example, the little boy, Epaminondas, could have baked the cake. If he reacted to his own baking by deciding to share it, show it to his grandmother, etc., then his initial action is classified as an initiating event.

Internal events such as the perception of an external event are also classified as an initiating event, as in the Melvin example, i.e., Melvin sees the box of cereal. Changes in internal physiological states, such as hunger, pain, or sickness are also considered to be internal initiating events.

Setting and event statements can generally be distinguished because the former refers to habitual states or actions while the latter refers to changes in such states or to novel actions. Their major difference, however, is that they have different functions in the story. The setting provides the context for the story while the event is an immediate cause for a response on the character's part.

The initiating event category can contain several statements or exemplars. These statements are related by the same three relations which connect individual statements in the setting category: AND, THEN, and CAUSE. In the Melvin story the two event statements are joined by a THEN relation. (Melvin found the box of rice crispies, THEN he saw the hole in the box.)

The next higher order category, the response, consists of an internal response plus a plan sequence and is defined by:

Rule 6: Response → MOTIVATES (Internal Response, Plan Sequence)

The internal response refers to the psychological state of a character after an event. Lines 5 and 6 in the Melvin story are both internal responses. This category's main function is to MOTIVATE the character to formulate a plan sequence. The internal response category is defined in Rule 7 and contains three types of statements: affective responses, goals, and cognitions.

Affective Response(s)

**Rule 7: Internal Response → Goal(s)
Cognition(s)**

Affective responses include all types of emotional responses, such as happiness, sadness, despair, and indicate that a state of disequilibrium has occurred in a character. In the Melvin story, line 5, Melvin became very excited, is an affective statement. Goal statements refer to a character's desires or intentions. Line 6 in the Melvin story is a goal statement, i.e., he wanted to eat just a little bit of cereal. Cognitions are statements which refer to a character's thoughts. Most cognitions begin with phrases like—she knew, she remembered, she realized, she thought, etc. A possible cognition for the Melvin story would be, he knew the hole was just a little bigger than he was.

The internal response can contain one, two, or all three of these types of statements. There is no fixed order among these three types of statements, and they can be connected by AND, THEN, and CAUSE relations.

Many written stories do not contain the internal response category. The omission of this category can indicate that a character's feeling, goals, and thoughts are implicit either from the type of initiating event which has occurred or from the behavior which follows the initiating event. However, even when the written story does not contain a character's internal response, the internal representation of the story structure does.

The next higher order category, the plan sequence, can be divided into the internal plan plus a plan application:

Rule 8: Plan Sequence → MOTIVATE (Internal Plan, Plan Application)

The MOTIVATE relation again connects the internal plan to the plan application and implies a direct causal link between the two. The internal plan consists of a series of statements that define a character's strategy for

obtaining a change in the situation. Lines 7 and 8 in the Melvin story constitute an internal plan. The function of an internal plan is to direct the character's subsequent behavior. It is composed of two types of information: subgoals developed in order to achieve the main goal, and cognitions about the situation, the hypothesized activity or the consequences of the behavior. It is defined by the rule:

Rule 9: Internal Plan → (Cognitions, Subgoals)

The internal plan category is omitted from most children's stories because most characters have one major goal and use only one or two actions to obtain their goal. The internal plan usually occurs in stories in which the character perceives some difficulty in goal attainment and must think of a sequence of subgoals which are necessary if the major goal is to be obtained. A well developed internal plan is included in *The Tiger's Whisker*, one of the stories used in our two studies to be presented. If several statements occur in the internal plan, the three relations—AND, THEN, and CAUSE—can connect any two statements. The internal plan of the character MOTIVATES the plan application.

The plan application refers to both a character's overt attempt to attain his goal and the resolution of his conflict or disequilibrium:

**Rule 10: Plan Application → RESULT
THEN (Attempt, Resolution)**

The attempt includes statements referring to the character's overt actions to obtain a goal and the resolution includes the remainder of the story sequence. The attempt and resolution categories are connected either by a THEN relation or a RESULT relation. The RESULT relation signifies that the attempt directly causes the resolution. In many stories, however, the attempt is not a direct cause of the resolution but instead creates the necessary preconditions for the occurrence of this category. In the Melvin story, lines 9 and 10 are classified as attempt statements. Both of these statements are connected to the resolution by a THEN relation. The major function of attempt statements is to cause or lead to the resolution. The attempt is defined by the following rule:

Rule 11: Attempt → (Action(s))

Within the attempt category, base level statements can be connected by any of the three types of causal relations: AND, THEN, and CAUSE. In the Melvin story, the two base level attempt statements are connected by a THEN relation.

The final higher order category is the resolution which consists of the direct consequence and a reaction:

Rule 12: → INITIATE (Direct Consequence, Reaction)

The direct consequence INITIATES the reaction and implies a direct causal link between the two categories.

The main functions of the direct consequence category are: (1) to express the attainment or nonattainment of the character's goals, (2) to mark any other changes in the sequence of events caused by the character's actions, and (3) to INITIATE or cause a character's reaction to the direct consequence. Lines 11 and 12 in the Melvin story are base level statements classified as direct consequences. Line 11, "Melvin ate every bit of the rice crispies," marks the direct attainment of Melvin's goal (to eat some rice crispies). Line 12, "Melvin became very fat," marks an unforeseen result of Melvin's behavior.

The types of statements included in this category represent a broad spectrum of information. The three types of information included are: natural occurrences, actions, and end states.

Rule 13: Direct Consequences → [Natural Occurrence(s)
Action(s)
End State(s)]

Natural occurrences are included in this category because they can directly facilitate or impede the attainment of a character's goal. An example of this type of category appears in one of our stories, *The Fox and the Bear*. In one of the last episodes in this story, the roof begins to crack. This is a natural occurrence from the fox's perspective and it impedes his action. The roof and bear then fall in and trap both the fox and bear inside the henhouse. The natural occurrence of the roof falling in is part of the direct consequence because it influences the resolution of their behavioral sequence. Both actions and end states are also exemplars of the direct consequence category. In the Melvin story, line 11 is an action and line 12 is an end state. Several statements can occur in the direct consequence category and, again, any two statements can be connected by the AND, THEN, or CAUSE relation. In the Melvin story the two direct consequence statements are joined by the CAUSE relation.

The reaction is the final category that occurs in the structure of an episode. The types of statements which appear in this category are affective responses, cognitions, and action:

Rule 14: Reaction → [Affect(s)
Cognition(s)
Action(s)]

This category includes statements defining how a character felt about the attainment of his goal or what he thought about it. Lines 13 and 14 in the

Melvin story are reactions. A reaction can also include an action which results from an emotional response. A possible example for the Melvin story is, "Melvin began to cry." While reactions generally indicate how a character responds to a consequence, they can also specify how the attainment of an end state affects a second character in the story. An excellent example can be seen in two of our stories: *Epaminondas* and *The Tiger's Whisker*. In *Epaminondas*, the boy arrives at his grandmother's with a crumbled piece of cake. These statements are direct consequences. The grandmother reacts to the crumbled cake by telling the boy he's silly and then telling him how he should have carried the cake. The grandmother's response is defined as a reaction on her part. Her response contains an implied affective reaction and an overt action. The story does not explicitly state her affective response. However, in defining the story schema, it is hypothesized that an affective response is an inherent part of a reaction.

The reaction category is similar in content to the internal response category. However, there is one major difference. The reaction category contains no clear goal statements and does not lead to a plan sequence. In *Epaminondas*, the grandmother simply reacts to the boy bringing the crumbled cake. If a goal statement had been included in her response and if that goal had motivated a plan sequence, then her reaction would have been considered an internal response which then indicates the start of a new episode. The AND, THEN, and CAUSE relations are again used to connect individual statements in this category.

The reaction category usually occurs at the end of an episode, but it can also occur at other points in the episode. A character may have a reaction while he is involved in overt behavior. In some stories, characters pause to reconsider their goal but then proceed to complete their original plan sequence. If the consideration of a new goal does not cause a character to formulate a plan sequence, then the character's response is considered to be a reaction and not an internal response.

It is obvious from examining most folktales or fables that very few are as simple or straightforward as the structure given in a simple episode. Stories vary in terms of both their interepisodic complexity and in the number of episodes they contain. In fact, most stories include two or more separate episodes. The next section will consider the relations between episodes as well as some of the complexities that can occur within a single episode.

EPISODIC RELATIONS

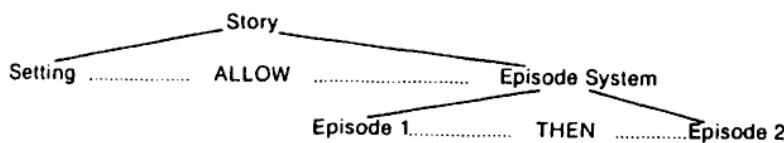
Recall Rule 2, which defines the structure and relations of an episode system:

AND

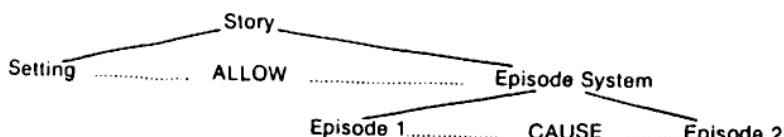
Rule 2: Episode System → THEN (Episode(s))
CAUSE

The rule states that an episode system consists of one or more episodes. We have not postulated a hierarchical structure to describe how two or more episodes are related in a story. This is because two episodes need not be combined to form a higher order category or unit of analysis. The relationships between individual episodes within an episode system are always represented as a logical chain, similar to the structure Schank (1975) uses to describe the structure of a single episode. The following section defines and illustrates the types of relations connecting episodes.

Any two episodes can be connected by the three relations AND, THEN, and CAUSE. The most common relations which connect episodes are the THEN and CAUSE relations. The THEN relation connects two episodes that occur in temporal succession; furthermore, the first episode does not directly cause the second to occur but may set up the necessary preconditions for the second episode. A good example of this relation is found in the classic folktale, *Goldilocks and the Three Bears*. When Goldilocks enters the Three Bears' home, two episodes occur in succession. The first episode recounts Goldilocks' discovery of the porridge, her desire to eat it, and the act of finishing the Baby Bear's porridge. The second episode describes her becoming fatigued, the discovery of the chairs, and her plan sequence of finding a suitable chair to sit in so that she might rest. The first episode does not directly cause her behavior in the second episode, but it may set the necessary conditions for its occurrence. The diagram below illustrates an episode system which contains two episodes connected by the THEN relation:



The second type of relation which connects two episodes is the CAUSE relation. The CAUSE relation implies a direct causal connection between two episodes. An example of this type of interepisodic relation occurs in *The Fox and the Bear*. The resolution of one episode occurs when the roof collapses and traps the fox and bear inside the henhouse. The next episode contains the behavioral sequence of the farmer who comes out to see what is the matter. Implied in this episode is the fact that the farmer must have heard some type of noise which then causes his investigation. This type of relation between episodes can be diagrammed as follows:



The diagram reads: a story consists of a setting plus an episode system. The episode system contains both Episode 1 and Episode 2; Episode 1 causes the occurrence of Episode 2.

Certain problems arise when the CAUSE relation is used to connect episodes. In many stories one episode does directly influence the behavioral sequence in the second. However, in many stories the processor must infer that there is a direct causal link between the two. Children below a certain age may not have the ability to make the types of inferences necessary to perceive the direct relationship between two behavioral sequences. Accordingly, their internal representation may be different from that of an older child's or an adult's organization of the same material. The Epaminondas story used in this study may, in fact, illustrate this point. Older children may immediately grasp the relationship between the grandmother's telling the boy how he should have carried the cake and the boy's subsequent action which states that he carried the butter in the way his grandmother told him to carry the cake. However, young children may not perceive the connection between the two. In the latter case, the two episodes in this story would not be causally related and would be connected by a THEN relationship.

The reverse phenomenon may be true when considering the representation for episodes connected by the THEN relation. The original story version may not specify a direct causal relation between two episodes. However, a subject, especially an older child or adult may infer a direct causal relation between the two episodes. Thus, in many instances, it is extremely difficult to represent the correct relation connecting episodes.

The third type of relation that can exist between two episodes is the AND relation. This relation describes the link between two episodes which occur simultaneously. Although none of our stories has two episodes occurring simultaneously, we have found a few folktales which do contain this type of episodic relation. The episodes occur in a temporal order in the story presentation but the type of connector which links the two episodes denotes simultaneity, i.e., meanwhile, at the same time, while the fox was doing this, etc. After two simultaneous episodes occur, both are usually related to a third episode by a THEN or CAUSE relation.

The number of relations that can exist between the two simultaneous episodes and a third episode varies. However, the next diagram illustrates the most common relationship between simultaneous episodes, and the type of structural organization between two simultaneous episodes and a third episode:



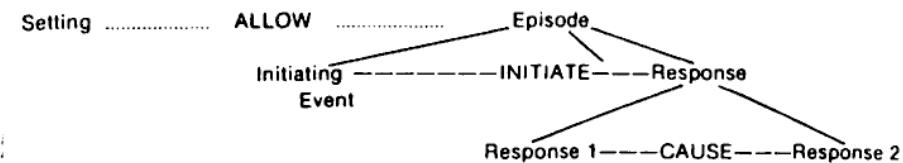
This diagram shows that the episode system is composed of three episodes. The first two are connected by the AND relation. The parentheses designate the fact that both Episode 1 and Episode 2 cause the third episode to occur.

In the fourth type of episodic relation, one episode is embedded or nested in another. An embedded episode is an episode which begins *after* a previous episode has begun and ends either before or at the same time as the previous episode. This type of relation occurs frequently when a story character's attainment of a goal is dependent upon the behavior of a second character. An example of this can be seen in our Judy story; it contains two embedded episodes which are nested in a third episode. The main character, Judy, wants something and depends upon another character for her goal fulfillment. When this occurs, an embedded episode for the second character is begun. This is necessary because the behavior sequence of the second character fulfills the requirements for the construction of an episode. In this story, Judy wants a hammer and a saw and asks her father to get them for her. The act of Judy's asking for these things is an attempt from her perspective but an event from the father's perspective. The event begins the embedded episode; it remains, however, an action from Judy's perspective. This also illustrates how one statement can serve two functions within a story. A second example of an embedded episode can be seen in *The Tiger's Whisker*, the second story used in the present experiment. The lady develops a plan or trick for obtaining a tiger's whisker. She begins her plan application by giving the tiger food and singing to him. The attainment of her goal, however, is contingent upon the tiger's behavioral sequences; his behavioral sequence consists of an embedded episode which is nested in the lady's behavioral sequence.

In addition to variations in the number of episodes found in stories, stories also differ in intraepisodic structure. The episodic structure which was defined by the grammar presents a very simple causal chain in which one type of information logically leads to the subsequent category. There are numerous ways, however, in which the basic sequence can be modified. The most common variation in single episode structures is the case in which an episode contains two or more higher order categories; for instance, a story could contain two responses or two plan sequences. A story would contain two responses if the main character fails to attain his primary goal on his first attempt and then formulates a different plan of attack in his second attempt. His primary goal, however, remains identical to the goal expressed in the first response. Therefore, both responses are considered to be part of the same episode. In addition, the same initiating event precipitates both responses. The fourth story used in this experiment serves as an example of this. In this story, Judy is going to have a birthday party. She decides that she wants a hammer and a saw. She proceeds to ask her father to get them for her but he does not fulfill her desire. She then tells her grandmother about her desire because she still wants to get the tools. Thus, the goal statements in Judy's

second response is identical to that in the first response. There is no need for a new episode to describe her behavior in the second response.

The diagram below illustrates the organization of the Judy story in which one response causes the second to occur (the categories which constitute the response categories are not explicitly given).

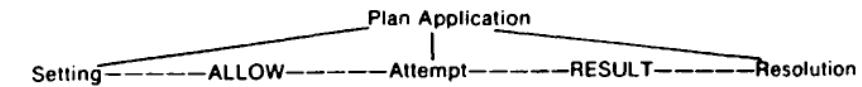


A second type of intraepisodic variation occurs when a setting or reaction appears at points other than their most common position. As stated before, setting statements can occur almost anywhere in the structure of an episode. They do not have to occur at the beginning of the story. When they appear within a single episode, the binary nature of the descending hierarchical structure is somewhat different.

An example of a setting statement occurring in the middle of an episode can be illustrated by an example from the story, *The Tiger's Whisker*, which was used in this study. A setting statement occurs immediately after an attempt statement:

- | | |
|---|---|
| (1) She (the lady) went to a tiger's cave
(2) where a lonely tiger lived | (Action, Attempt)
(State, Minor Setting) |
|---|---|

The minor setting does not cause the attempt to occur but provides the necessary preconditions for its occurrence. The internal structure of this story variation is illustrated in the diagram below:



This indicates that the plan application consists of two primary categories, the setting and the attempt, plus a higher order category, the resolution. In these cases, the descending hierarchy of the story structure is not binary.

The final comment on the story grammar concerns the definition of an episode. In almost all folktales, one or two of the postulated categories are missing from each episode in the story structure. For example, many folktales do not include the character's internal response or his reaction at the end of an episode. Most tales do not include the internal plan. Some do not include an initiating event or an attempt. In order to be considered as an episode in our

schema, a behavioral sequence must contain some reference to: (1) the purpose of the behavioral sequence, (2) overt goal-directed behavior, and (3) the attainment or nonattainment of the character's goal. Therefore, an episode must contain (1) an initiating event or an internal response which causes a character to formulate a goal-directed behavioral sequence, (2) an action, which can either be an attempt or a consequence, and (3) a direct consequence marking the attainment or nonattainment of the goal. If these three criteria are not met, the behavioral sequence is defined as an incomplete episode. An example of an incomplete episode occurs in one of our stories, *The Fox and the Bear*. In the last episode the resolution is omitted. The episode does not specify what the farmer did after he came out to see what happened. Thus, his behavioral sequence is incomplete.

The following sections present data from two studies completed on story recall and comprehension in first- and fifth-grade children. Study 1 examines the development of story recall. Study 2 investigates story comprehension by requiring children to answer probe questions concerning the type of relations they perceive between categories. In addition, Study 2 investigates the child's conception of the most critical elements occurring in story material.

EXPERIMENT 1

A set of hypotheses pertaining to the organization of story recall in children was derived from our story schema and from previous research findings on prose comprehension. The main goal of this study was not to systematically vary the structure of each story presented, but rather to collect recall data on several stories representative of those found in children's literature.

Research on adult memory for prose has shown that the information recalled in stories is not random. Bartlett (1932) found that the pattern of an individual's recall was highly consistent over a repeated number of story reproductions, and Johnson (1970) showed that certain informational units in a story are better recalled by all subjects than other units. Very little data exist in the developmental literature to compare the structure of story recall across age groups. Korman (cited by Yendovitskaya, 1971) and Stein and Glenn (1975) examined children's memory for stories. Korman has shown that children as young as five are capable of recalling the gist or central theme of a story. Thus, certain information assumes more importance in the structure of recall than other units. Similarly, Stein and Glenn (1975) found that the relative salience of story statements, as measured by their frequency of occurrence in recall, was highly consistent across grades (first and third) and over time (recall collected immediately after story presentation and again one week later). These findings indicate a high degree of similarity in the cognitive structures used by children during story encoding and retrieval.

In the present study, the consistency of organization, measured by the frequency of item salience in recall, was also examined. In the Stein and Glenn study, only one story was used. We felt that a greater number of stories had to be examined and that the age interval between the two groups of children had to be widened. However, we predicted that there would still be a high degree of similarity in the types of units recalled by the two different age groups of children.

In addition to examining the recall of individual statements, we examined story recall in terms of the informational categories specified in our story schema. If the concept of an episode described in our schema has any psychological validity, story information relating to the basic logical sequence of events should be retained by children. Furthermore, subjects should chunk information according to distinctions similar to those of our grammar, and certain categories should be structurally more important than others in the description of a story's logical sequence. In our initial study (Stein & Glenn, 1975), major settings, initiating events, and direct consequence statements were the most frequently recalled categories. The event and the consequence categories provide the basic cause-effect relations in a behavioral sequence. The major setting (the introduction of the main character) may act as a marker or signal for the beginning of story production. Thus, if the underlying logic of a behavioral sequence influences story recall, the saliency of categories in recall should vary. We further expected that the major setting, initiating event, and direct consequences statements should again be the most frequently recalled categories in all stories.

The next set of predictions pertain to the temporal sequence of information found in stories. To date, there is conflicting evidence concerning young children's ability to temporally organize story events. Both Piaget (1969) and Fraisse (1963) have maintained that young children lack the cognitive structures necessary to encode temporal relationships. Brown (1975), however, has shown that five-year-olds can reconstruct a sequence of events if the events are logically ordered. Additionally, in the Stein and Glenn study, most first-grade children had little difficulty recalling the correct temporal sequence of story events. The discrepancy among the findings in the above studies may be a function of the stories used. The ability to accurately order a sequence of events may be a function of the organization of the stories presented. If the stories told to children are well formed and match the order of events inherent in a child's internal schema, then the order of events in recall will match those of the story. Violations of the temporal sequence should force children to reorganize the story material or delete the disorganized information from their recall.

The last set of predictions involves the types of transformations occurring in recall. As Bartlett stated, the recall of stories contains numerous

transformations of the original information. In attempting to construct his story grammar, Rumelhart (1975) proposed a set of summarization rules which would predict the type of deletions, integrations, and additions of new information occurring in story material. We have not attempted the construction of formal summarization rules for children's recall. However, several predictions can be made concerning the types of transformations which occur in recall.

If the concept of a behavioral sequence as defined in an episode is valid, we would expect that the recall protocols would contain information which defines the basic logical structure of the sequence. Information which is not directly related to that sequence or which only serves to elaborate the sequence will be omitted from recall. For example, adjectives, minor setting statements (e.g., information pertaining to locations, ancillary characters), and actions not directly related to the logical flow of the story should be omitted more frequently than information which is critical to the maintenance of the logical sequence of events. Additions of new information should occur when categories have been omitted from the external structure of story material or in places where the most probabilistic events of a behavioral sequence have not been included in the story.

Method

Subjects

Subjects were 48 children from an upper-middle-class school in St. Louis County. An equal number of first- and fifth-grade children participated in the study. Approximately half of the children in each grade were males and half were females. The mean ages in each grade were 6 years, 5 months for first grade and 10 years, 6 months for fifth grade.

Materials

Four stories were used in the study. One story was a classical folktale, *Epaminondas*; this story has many different versions and one was selected for use in this study. The other three stories were constructed by reading a variety of children's stories and then creating new versions of the tales. This procedure was followed because many of the initially selected stories were well known to the children participating in the study. The stories were selected as typical of children's stories. Without an ecological analysis of stories, it is not possible to give more specific guarantees of the typicality of these four stories. However, no attempt was made to make the stories correspond to the model, either by including all of the postulated categories in an episode or by equalizing the number of statements occurring in each category.

All of the statements in each of the four stories were parsed into the appropriate category specified by the grammar. The final parsings were completed by having three separate raters parse each story. When a disagreement occurred among the three raters, the statement was assigned to the category which had been used by two of the three raters. The initial interrater reliability for the four stories was 92%. There were very few disagreements and raters disagreed on no more than three statements per story.

Visual diagrams or tree structures of the stories were then constructed for each of the four stories. The original versions of the written stories and their tree structures are presented in Figs. 3 through 10.

Design

Children from each grade were randomly divided into two groups of 12 subjects each. Children in Group 1 at each grade level were told the first two stories; children in Group 2 at each grade level were told the second two stories. Stories were presented in a counterbalanced order.

	1st grade	5th grade
Stories 1 and 2	Group 1	Group 1
Stories 3 and 4	Group 2	Group 2

Children were told the stories rather than presented with recorded versions because pilot work had shown that young children had more difficulty sustaining attention with recorded versions. To control for bias in story delivery, two experimenters tested a random half of each group of 12 children at each grade level.

Procedure

At the beginning of each testing session, the subject was familiarized with the tape recording procedure. When the experimenter felt that the subject was relaxed, the session began. The experimenter told the child that he was going to hear a story. He was told to listen very carefully because when the experimenter finished the story, he would have to tell the story out loud exactly as he had heard it. The experimenter then read the first story to the child. Immediately after the story presentation, fifth-grade children were asked to count backward from 50 by threes. First grades simply counted to 20. Then the child was asked to orally recall the story exactly as he had heard it. After he finished, the second story was presented in an identical fashion. All responses were tape recorded.

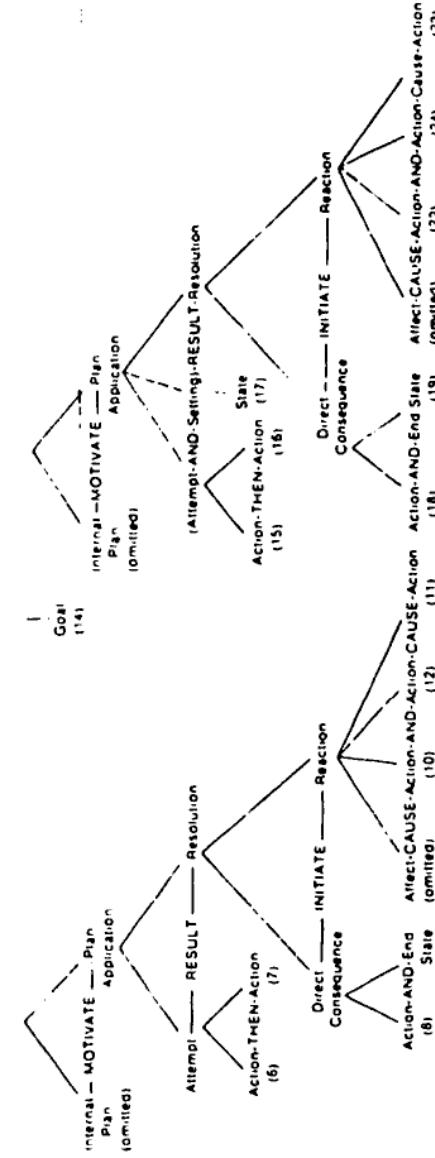
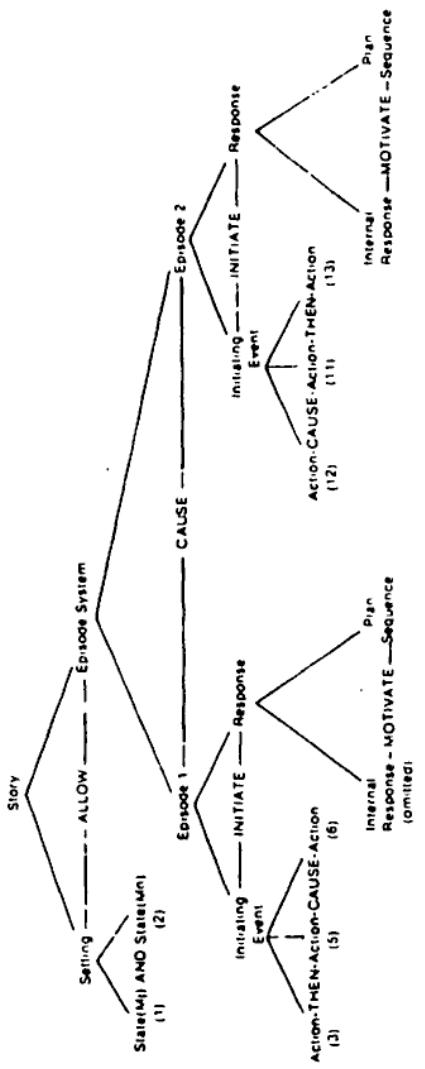


FIG. 3. Tree structure for Story 1: *Epammonidas*.

Category Type	Type of Information
Major Setting	State
Minor Setting	State
Initiating Event	Action
Initiating Event	Action
Attempt	Action
Direct Consequence	Action
Direct Consequence	Action
Reaction	Action
Reaction	Action
Initiating Event	Action
Internal Response	Action
Attempt	Action
Minor Setting	Action
Direct Consequence	Action
Direct Consequence	Action
Reaction	Action
Reaction	Action
Reaction	Action

FIG. 4. Text of Story I: *Epaminonda*.

Statement

1. Once there was a little boy
2. who lived in a hot country
3. One day his mother told him to take some cake to his grandmother
4. She warned him to hold it carefully
5. So it wouldn't break into crumbs
6. The little boy put the cake in a leaf under his arm
7. and carried it to his grandmother's
8. When he got there
9. the cake had crumbled into tiny pieces
10. His grandmother told him he was a silly boy
11. and that he should have carried the cake on top of his head
12. so it wouldn't break
13. Then she gave him a pat of butter to take back to his mother's house
14. The little boy wanted to be very careful with the butter
15. so he put it on top of his head
16. and carried it home
17. The sun was shining hard
18. and when he got home
19. the butter had all melted
20. His mother told him that he was a silly boy
21. and that he should have put the butter in a leaf
22. so that it would have gotten home safe and sound

Category Type

Type of Information

Category Type	Type of Information	Statement
Major Setting	State	1. Once there was a woman
Internal Response	Goal	2. who needed a tiger's whisker
Internal Response	Affect	3. She was afraid of tigers
Internal Response	Goal	4. but she needed a whisker
Internal Response	Goal	5. to make a medicine for her husband
Initiating Event	Natural Occurrence	6. who had gotten very sick
Internal Response	Cognition	7. She thought and thought
Internal Response	Goal	8. about how to get a tiger's whisker
Internal Plan	Goal	9. She decided to use a trick
Internal Plan	Cognition	10. She knew that tigers loved food and music
Internal Plan	Cognition	11. She thought that if she brought food to a lonely tiger
Internal Plan	Cognition	12. and played soft music
Internal Plan	Cognition	13. the tiger would be nice her
Internal Plan	Cognition	14. and she could get the whisker
Attempt	Action	15. So she did just that
Attempt	Action	16. She went to a tiger's cave
Minor Setting	State	17. where a lonely tiger lived
Attempt	Action	18. She put a bowl of food in front of the opening to the cave
Attempt	Action	19. Then she sang soft music
Attempt	Action	20. The tiger came out
Direct Consequence	Action	21. and ate the food
Attempt	Action	22. He then walked over to the lady
Direct Consequence	Action	23. and thanked her for the delicious food and lovely music
Direct Consequence	Action	24. The lady then cut off one of his whiskers
Direct Consequence	Action	25. and ran down the hill very quickly
Reaction	Affect	26. The tiger felt lonely and sad again

FIG. 5. Text of Story 2: *The Tiger's Whisker*.

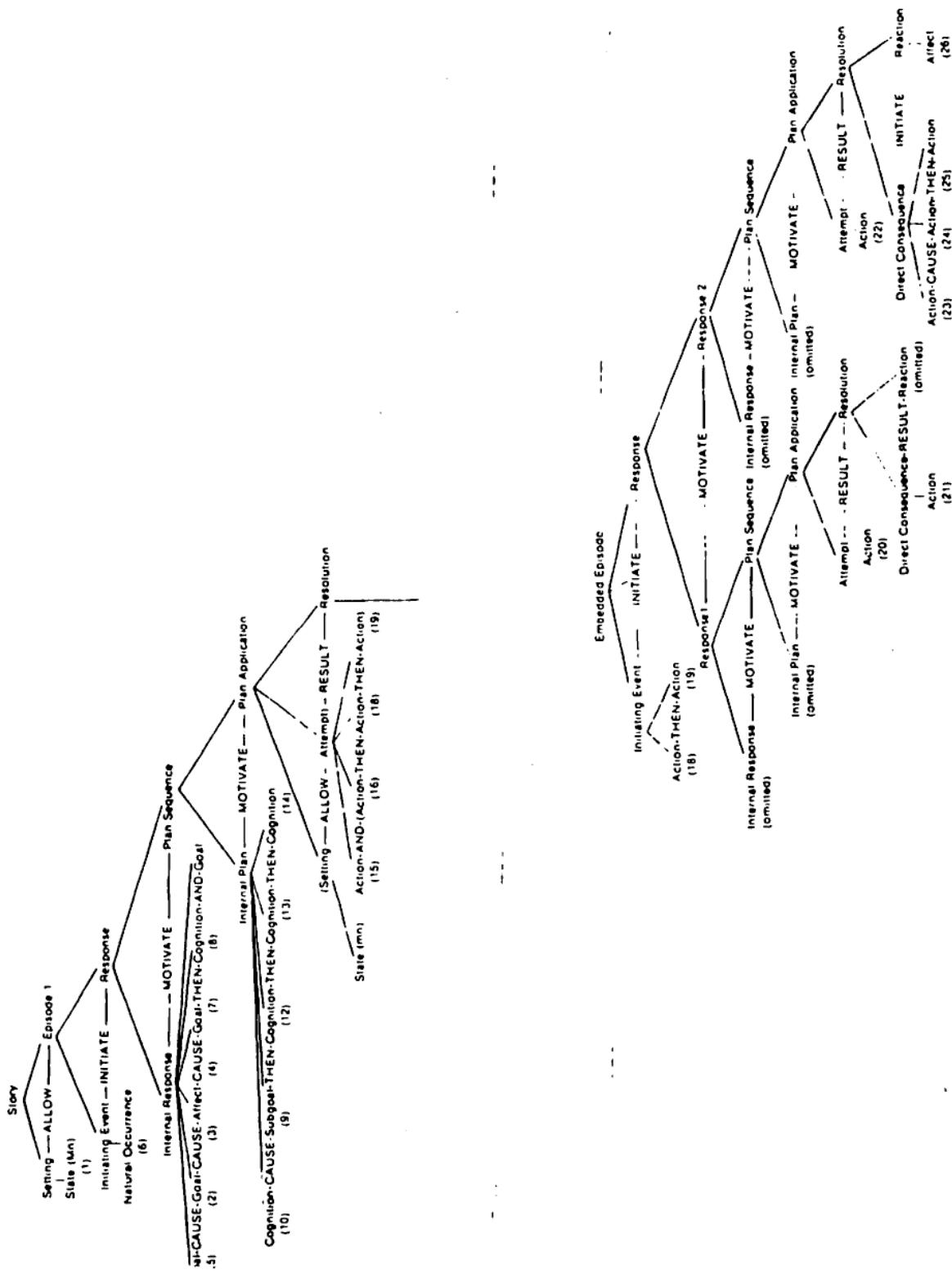


FIG. 6. Tree structure for Story 2: *The Tiger's Whisker*.

Category Type

Statement

Major Setting	
Minor Setting	1. There was a fox and a bear
Internal Response	2. who were friends
Internal Response	3. One day they decided to catch a chicken for supper
Minor Setting	4. They decided to go together
Attempt	5. because neither one wanted to be left alone
Attempt	6. and they both liked fried chicken
Internal Response	7. They waited until night time
Internal Response	8. Then they ran very quickly to a nearby farm
Attempt	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
Direct Consequence	14. He grabbed a chicken
Initiating Event	15. and killed it
Initiating Event	16. As he was carrying it out of the henhouse
Internal Response	17. the weight of the bear on the roof caused the roof to crack
Minor Setting	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 broken henhouse
Attempt	25. Soon the farmer came out
Internal Response	26. to see what was the matter

FIG. 7. Text of Story 3: *The Fox and Bear*.

Category Type

Type of Information

Initiating Event	Natural Occurrence	Statement
Major Setting	State	1. Judy is going to have a birthday party
Internal Response	Goal	2. She is ten years old
Internal Response	Goal	3. She wants a hammer and a saw for presents
Internal Response	Goal	4. Then she could make a coat rack
Attempt	Action	5. and fix her doll house
Internal Response	Goal	6. She asked her father
Internal Response	Goal	7. to get them for her
Internal Response	Action	8. Her father did not want to get them for her
Internal Response	Cognition	9. He did not think that girls should play with a hammer and a saw
Internal Response	Goal	10. But he wanted to get her something
Direct Consequence	Action	11. So he bought her a beautiful new dress
Internal Response	Affect	12. Judy liked the dress
Internal Response	Goal	13. but she still wanted the hammer and the saw
Attempt	Action	14. Later she told her grandmother about her wish
Internal Response	Cognition	15. Her grandmother knew that Judy really wanted a hammer and a saw
Internal Response	Goal	16. She decided to get them for her
Internal Response	Cognition	17. because when Judy grows up
Internal Response	Cognition	18. and becomes a woman
Internal Response	Cognition	19. she will have to fix things
Attempt	Action	20. when they break
Direct Consequence	Action	21. Then her grandmother went out that very day
Direct Consequence	Action	22. and bought the tools for Judy
Raction	Affect	23. She gave them to Judy that night
Reaction	Cognition	24. Judy was very happy
		25. Now she could build things with her hammer and saw

FIG. 8. Text of Story 4: *Judy's Birthday*.

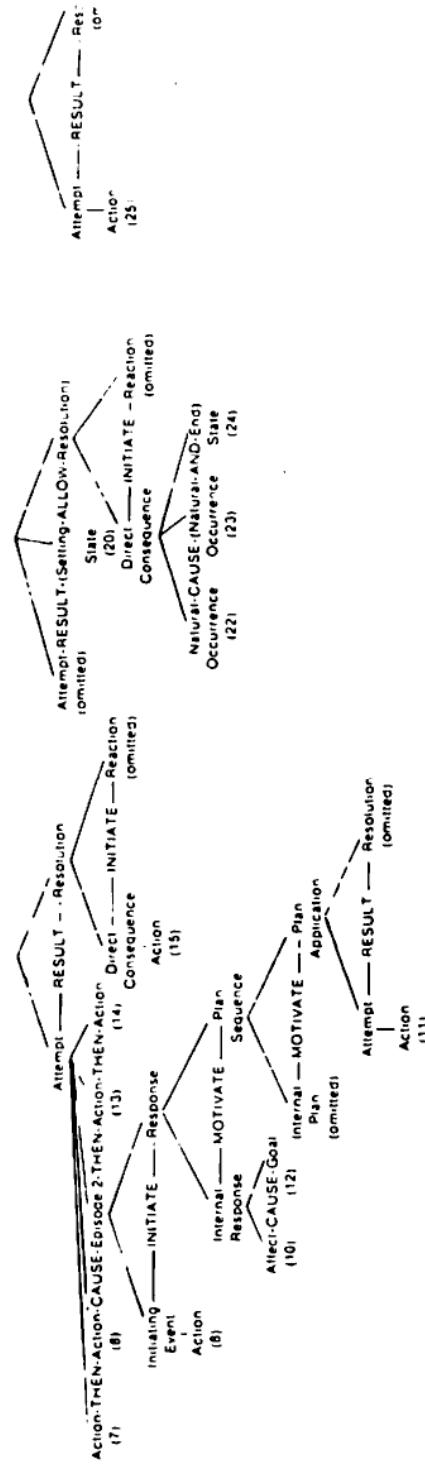
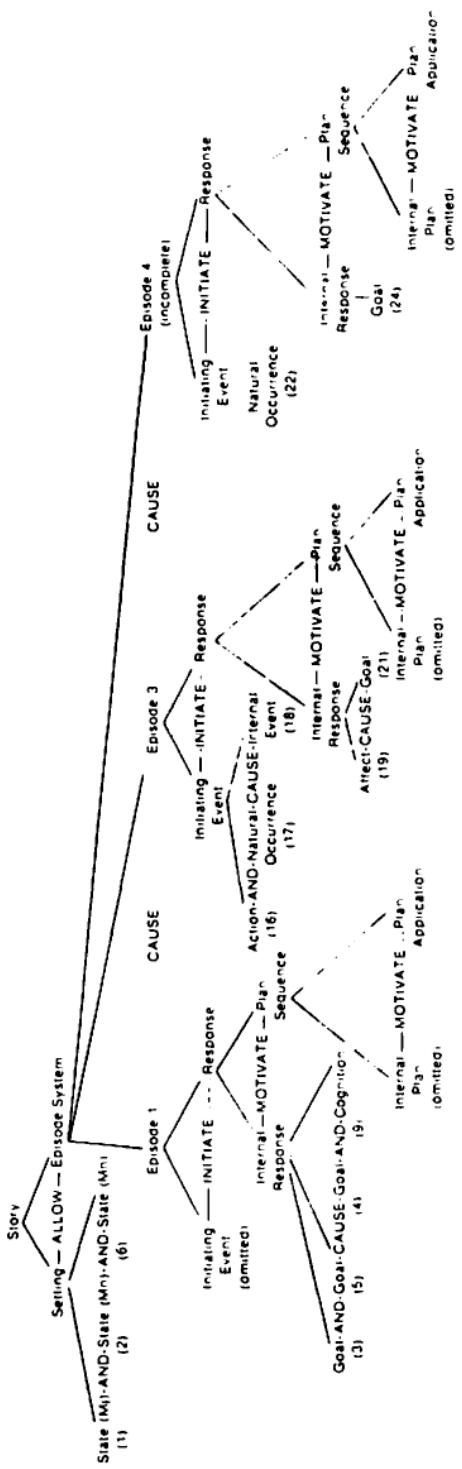


FIG. 9. Tree structure for Story 3: *The Fox and Bear.*

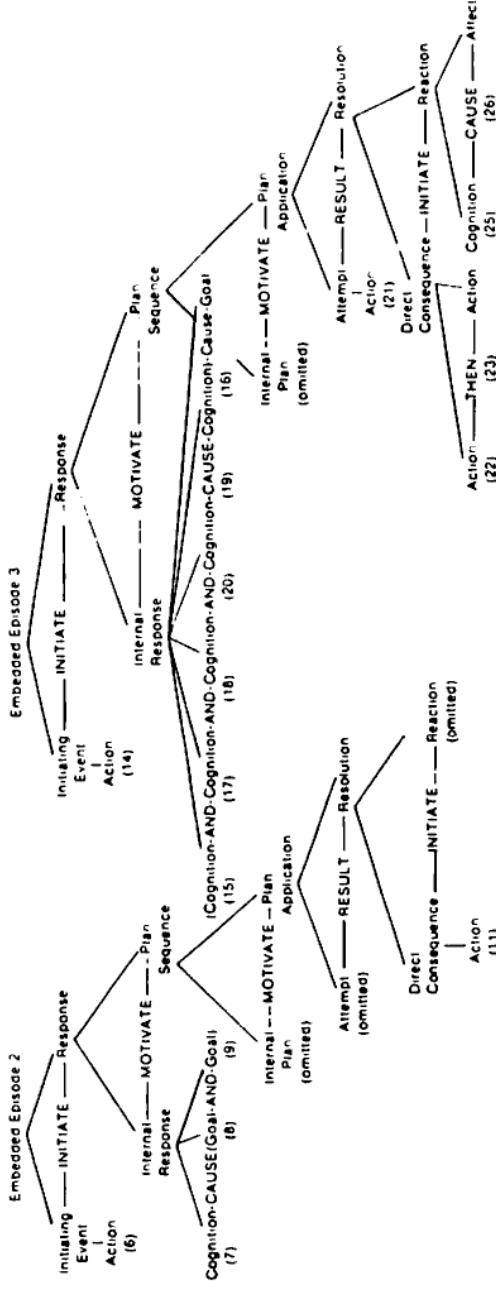
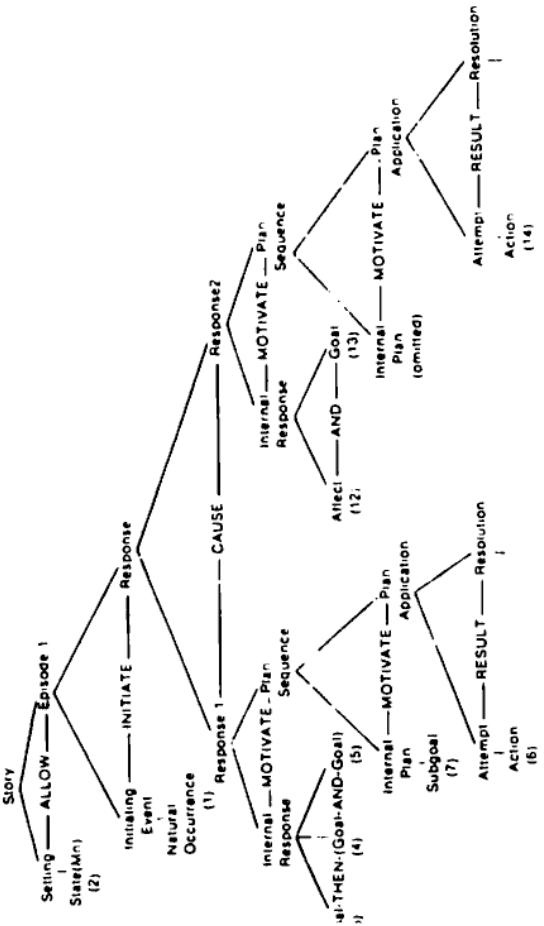


FIG. 10. Tree structure for Story 4: *Judi's Birthday*.

One week later, the child was tested again. He was asked to recall both stories he had heard in any order he could. This procedure was adopted so that the child would receive no information concerning either story.

Data Analyses

Each individual protocol was scored for the total number of accurately recalled units. The criterion for inclusion in the accurate recall measure was based on the semantic content of a base level statement. For example, in the Epaminondas story, many children said, "the sun was real hot and melted the butter." Credit was given for both base statements, "the sun was shining hard," and "the butter had all melted." Again, each protocol was scored by two people. Interrater reliability on scoring items as correctly recalled was above 93% on all four stories.

Results

Accurate Recall Performance

Because there was no a priori reason to predict story differences, each subject received a composite score by combining the total number of accurately recalled statements from both stories and then converting this to a proportion score. A three-way analysis of variance was then performed on this score with grade (1st, 5th) and story (Stories 1 and 2; Stories 3 and 4) as between-subject factors. Time (immediate, delayed) was the within-subject factor. All three main effects were significant. The interaction between time and story was significant, $F(1,44) = 9.46, p < .01$, and more importantly, the grade by time by story interaction was significant, $F(1,44) = 6.72, p < .02$, indicating that the stories were recalled differently as a result of grade and time conditions. Therefore, a separate two-way analysis of variance was completed on each of the four stories. In these analyses, grade was the between-subject variable and time was the within-subject variable. The mean proportion of accurate recall and significance levels for each story is presented in Table 1.

There were no significant grade by time interactions in three of the four stories. In these three stories, grade was a significant variable, with fifth graders recalling a greater proportion of statements than first graders. Time was also a significant variable for two of the three stories; more statements were recalled immediately after presentation than one week later.

In the fourth story, *Judy's Birthday*, time was also a significant factor. However, a significant grade by time interaction occurred. Newman-Keuls tests revealed a significant grade effect on immediate recall, with fifth graders

TABLE 1
Mean Proportion of Total Accurate Recall

Story	Grade Comparisons			Time Comparisons		
	Grade 1	Grade 5	$F(1,22)$	Time 1	Time 2	$F(1,22)$
Group 1 $n = 24$						
<i>Epaminondas</i>	.47	.65	13.8*	.57	.51	ns
<i>Tiger's Whisker</i>	.48	.58	4.3*	.55	.50	6.8*
Group 2 $n = 24$						
<i>Fox and Bear</i>	.42	.51	6.0*	.51	.42	21.4*
<i>Judy's Birthday</i>	.47	.54	ns	.56	.45	27.2*

	Grade Interaction ^d for <i>Judy's Birthday</i> ($n = 24$)	
	Grade 1	Grade 5
Time 1	.50	.62
Time 2	.44	.48

* $p < .001$.

† $p < .05$.

‡ $p < .01$.

^d $F(1,22) = 5.6, p < .02$.

recalling more information on immediate recall than first graders ($p < .01$), and no grade differences on delayed recall.

In summary, all four stories showed a significant grade effect on immediate recall and three of the four stories showed this effect on delayed recall. Time was a significant variable for three of the four stories, with a greater proportion of units recalled in the immediate condition than in the delayed condition.

The recall data from each subject were then grouped according to the seven categories specified in the grammar: major setting statements, minor setting statements, initiating events, internal responses, attempts, direct consequences, and reactions. Each subject received seven scores, each signifying the proportion of statements recalled in each of the seven categories. Because only two stories contained internal plans, the internal plan statements were included in the internal response category for all analyses. A separate analysis of variance was completed for each of the seven category scores with grade as the between subject variable and time as the within subject variable. All stories were analyzed separately. The results were quite variable. The only category which showed significant grade effects in all four stories was the

TABLE 2
Mean Proportion of Accurately Recalled Internal Response Statement for Each of the Four Stories

Story	Grades		Significance Level
	1	5	
<i>Epaminondas</i>	.08	.35	$F(1,22) = 5.07, p < .05$
<i>Tiger's Whisker</i>	.28	.45	$F(1,22) = 10.09, p < .01$
<i>Fox and Bear</i>	.28	.44	$F(1,22) = 5.09, p < .05$
<i>Judy's Birthday</i>	.42	.54	$F(1,22) = 4.14, p < .05$

internal response category. Fifth-grade children recalled significantly more internal responses than first-grade children. The mean proportion of internal response statements recalled in each grade level is presented in Table 2.

The internal response category was also the only category which varied systematically over time. More internal responses were recalled at time 1 than at time 2 in three of the four stories. The mean proportion of internal responses recalled on immediate testing was .47 while the mean proportion on time 2 was .33. The level of significance for all three stories was at the $p < .05$ level. The recall of this category did not decrease significantly in Story 1, *Epaminondas*. The significance of this finding must be evaluated in terms of an increase in internal responses in the new information which children added to stories. The contrast in these two findings will be discussed in another section.

Relative Saliency of Each Individual Statement

The frequency of recall of each individual statement in each story was determined and a rank order of the items, proceeding from the best recalled item to the worst recalled item, was constructed for each grade level and each time condition. Spearman rank order correlations were then performed to assess the degree of relationship between grade levels and between time conditions. The correlations ranged from .84 to .98 for grade comparisons and from .91 to .99 for time comparisons. Although there was some degree of variation over the four stories, each correlation was highly significant, indicating that the extent to which an item is recalled is highly stable over time and between grade levels.

Relative Saliency of the Informational Categories

Because the relative salience of the individual statements in a story did not vary significantly with either time or grade, the recall frequencies of each of

the statements were collapsed across all four conditions. The combined recall scores for each story were then clustered according to category membership, producing a single frequency score for each category. The category frequencies were then converted to proportion scores. Rank orders for each story were then constructed with the best remembered category having the lowest rank and the worst remembered category having the highest rank. Table 3 presents the category ranks for each of the four stories.

The degree of similarity in the rank orderings was extremely high. A Kendall's coefficient of concordance was computed to assess the degree of relationship in the rank orders across all four stories; the coefficient is .84 which is highly significant ($p < .01$).

In all stories, the major setting category was the best remembered. Initiating events and direct consequences are always the next best remembered categories. The difference between the proportions of items recalled in these two categories was, for most stories, very small. The attempt category was fourth in all of the ranks except for one story, *The Tiger's Whisker*. In this story, the attempt category was fifth. Internal responses and minor setting categories were always recalled in the last three positions in the rank order. The exact position of the reaction category varied from fourth to seventh place. This category had a higher degree of variation than all other categories.

In order to more accurately assess the degree of recall variation in each category, the frequency distribution of statements within each category was examined. All of the informational items were divided into thirds according to how well they were recalled, from the third best remembered items to the third least well remembered items. The proportion of each category recalled in each third was then determined and these proportions are presented in Table 4.

TABLE 3
Rank Order of Categories for Four Stories*

Category	Story 1 <i>Epaminondas</i>	Story 2 <i>Tiger's Whisker</i>	Story 3 <i>Fox and Bear</i>	Story 4 <i>Judy's Birthday</i>
Major setting	1	1	1	1
Direct consequence	2	3	2	2
Initiating event	3	2	3	3
Attempt	4	5	4	4
Reaction	5	4		7
Minor setting	6	7	6	5
Internal response	7	6	5	6

*Ranks are integrated over grade and time conditions with best remembered items having the lowest ranks and worst remembered items having the highest ranks.

TABLE 4
Distribution of Category Variation for Four Stories*

Category	Top Third	Middle Third	Bottom Third	Number of Statements in Each Category
Major setting	.00	0	0	3
Minor setting	0	.71	.29	7
Initiating event	.63	.13	.25	8
Internal response	.10	.31	.59	39
Attempt	.53	.16	.32	19
Direct consequence	.87	.13	0	15
Reaction	.22	.56	.22	9

* The proportion of each category recalled in the top third, middle third, or bottom third of the distribution.

Major setting statements and consequence statements were almost always found in the top third of the distribution. A few consequence statements were present in the second third of the distribution. The majority of initiating events are also in the top third of the distribution. There is a greater degree of variation in this category than in either the Major Setting or Consequence categories. This finding is also true for the Attempt category. The majority of Minor Setting statements and Reaction statements are found in the middle third of the distribution. The only category which is not well represented in the top two-thirds of the distribution is the Internal Response category. This category, however, contained 39 statements summed over the four stories and is the most diverse category in the grammar. It contains internal events, goals, affects, cognitions, and plans. The types of internal responses which were represented in the top third of the distribution were the major goal of the main character. In the three stories which contained major goals, these statements were extremely well recalled and were always in the top third of the rank orderings. This finding suggests that major goal statements may be remembered differently from other types of statements in the Internal Response category.

Transformations of the Original Story Material

Very few statements in the stories were recalled exactly as presented in the original story versions. Certain types of transformations occurred regularly in all protocols. These transformations included substitution of words, deletions, and additions of information within statements. The most common transformations were verb substitutions. These substitutions occurred in 60% of all statements recalled in the four stories. Children substituted verbs such

as went for ran, broke for cracked, told for warned, etc. In almost all cases, verb substitutions involved the replacement of the original verb with one that shared some meaning with the original but was semantically less complex.

Deletions and additions of information also occurred. The three types of information which were deleted most frequently were adverbs, adjectives, and prepositional phrases. For example, in *The Fox and the Bear*, children heard the statement, "they decided to catch a chicken for supper." Ninety-one percent of all children who recalled this statement deleted "for supper." Another example can be taken from *The Fox and Bear*. Children heard the statement, "the fox then opened the door of the henhouse very carefully." In over 50% of the protocols in which this unit was recalled, the children simply said, "the fox opened the door." They did not specify which door he opened or how he opened it. When "where," "how," or "when" information occurred in the stories, it was deleted from recall over 50% of the time. Adjectives like "new" and "beautiful" were also deleted consistently. However, additions did occur in the recalls and most involved new adjectives. For example, in *The Tiger's Whisker*, 32% of all subjects said that the tiger was not only lonely but that he was also old and poor.

One type of substitution occurred only in first-grade recalls. Ten percent of the children had difficulty remembering exactly who was the main character in a story. The two stories that presented the most difficulty in this regard were *The Fox and Bear* and *The Tiger's Whisker*. In *The Fox and Bear*, some children confused the actions of the fox and the bear or substituted another animal for the bear. In *The Tiger's Whisker*, the most common error was the substitution of a lion for the tiger. These character substitutions, however, did not detract from the production of a well organized story. In addition, these types of substitution errors were virtually absent from fifth-grade protocols.

One major type of transformation occurred in all of the protocols at both grade levels. Over 50% of all internal responses recalled were produced in an active form by changing the internal response of a character to an action on the part of the character. A clear example of this phenomenon is taken from the story, *Judy's Birthday*. This story had many statements which described the goals and thoughts of both Judy's father and grandmother. If children recalled these statements, they did so by having the father and grandmother tell Judy about their thoughts or feelings. An example from one protocol is:

When Judy told her grandmother about what she wanted, her grandmother said to her: "I understand. I'll get them for you because you'll need them when you get to be a woman."

Thus, not only did this subject integrate and delete information but he also externalized the grandmother's thoughts by providing a conversational exchange between the two characters.

Additions of New Categories

The number of category additions was tabulated for each subject. In order to receive credit for including new category information, subjects had to add information which was not similar to the story content in any form. An example of entirely new information added is taken from two fifth-grade protocols. When these two subjects recalled *The Fox and Bear*, both children added new information at the beginning and at the end of the story. Both subjects stated that the fox and the bear were very hungry and had to find something to eat. Then they continued on with the remainder of the story. As they approached the end, both said that the farmer was very angry and was going to shoot the two animals. These two protocols each contained four new category additions.

An analysis of variance was completed on the total number of category additions with grade and time as treatment variables. Each story was analyzed separately. The mean number of additions per story is presented in Table 5. In three of the four stories, fifth-grade children included significantly more new category information in their recalls than first-grade children. In one story, *Judy's Birthday*, there were no differences between the two grades. Time was a significant variable for only one story, *Judy's Birthday*. In this story, all subjects added significantly more new information to recall in the delayed condition than in the immediate time condition. There were no significant interactions between time and grade for any story.

The inferences almost always made sense within the story; they provided logical links between information that had been explicitly given. For example, in *The Tiger's Whisker*, the character's main goal stated in the story was "to make a medicine for her husband." Many subjects, especially fifth-grade children, inserted the primary goal "to cure her husband" or "to make him feel better." In addition, the story did not include information about the lady's activities after she cut off the tiger's whisker. Almost all fifth-grade

TABLE 5
Mean Numbers of New Categories Added to Each Story by Grade Level
and Time Condition

Story	Grade 1	Grade 5	Time 1	Time 2
1. <i>Epaminondas</i>	1.04*	2.75	1.75	1.91
2. <i>Tiger's Whisker</i>	1.02 ^b	2.87	1.95	2.12
3. <i>Fox and Bear</i>	1.83 ^b	3.79	2.45	3.16
4. <i>Judy's Birthday</i>	2.80	1.98	1.95 ^c	2.58

* $p < .01$.

^b $p < .001$.

^c $p < .05$.

children completed the lady's episode by stating, "she cut off the tiger's whisker, ran home, and made the medicine for her husband."

The same type of additions were found in *The Fox and Bear*. In the original version, there was no initiating event in the beginning of the first episode. In the protocols, 33% of the first-grade protocols and 75% of the fifth-grade protocols included information that preceded the decision to kill a chicken for supper. Most children said, "the fox and the bear were really hungry." A couple said, "they hadn't eaten for days and they needed something to eat."

The categories most frequently added to the story recalls were internal responses and attempts. Forty-one percent of all new categories were internal responses and 37% were attempts. The next largest category added was the consequence category which consisted of 18% of the new responses. The remainder of the new information was distributed among the setting, initiating event, and reaction categories.

The fact that internal responses were consistently added to recall protocols is extremely important because in assessing accurate recall the internal response category was among the least well recalled categories. This discrepancy between the two findings indicates that children are very aware of characters' feelings, thoughts, and goals. The child's comprehension of exactly what these internal feelings or motives are may be different from the internal responses given in the original story versions.

The type of new information added to stories was fairly consistent across grade level in three of the four stories. The only story which contained grade differences in the type of new information added in recall was Story 4, *Judy's Birthday*. First-grade children added twice as many activity statements as fifth-grade children did. However, fifth-grade children added almost three times as many internal responses as did first-grade children. The addition of internal responses explains some of the decrease in fifth-grade recall during the delayed condition. Fifth graders did in fact recall significantly fewer accurate, internal responses on delayed recall. However, this type of category did not decrease in saliency when new information was assessed. The only thing that changed was the semantic content of the internal responses. In the original story, Judy asked her father to get tools for her. The father's response in the original version is given in the next four lines:

1. Her father did not want to get them for her.
2. He did not think that girls should play with a hammer and a saw.
3. but he wanted to get her something.
4. So, he bought her a beautiful new dress.

An example of a fifth grader's recall of the father's response was:

1. Judy's father couldn't get her the tools.
2. He didn't want her to get hurt,

3. because kids can get cut when they play with sharp things.
4. He knew she would be disappointed.
5. So he thought he'd get her something very special.
6. So he bought her a pretty dress.

Thus, children recalled as many internal responses as were in the original story version but added new information which they had inferred from the original story.

The fact that younger children added more new attempt categories than older indicates that first-grade children are capable of adding new information. Younger children may have a more restricted range in terms of the amount and/or the types of new information which they can generate.

Temporal Sequencing Errors in Accurate Recall

The degree to which children were able to recall the story information in its original sequence was examined.

A rank order index was constructed in which the order of an individual subject's recall was compared to the order of the items in the original story structure. Three types of temporal reversals were classified as errors in this rank ordering: (1) intercategory reversals, (2) intracategory reversals, and (3) reversals occurring within a single statement. A Spearman rank order correlation was computed for each individual subject, and then subject means were tabulated for each grade level and each time condition. An analysis of variance was not performed on these data because the number of items recalled by each subject was extremely variable. The mean correlations were used simply as an index of temporal sequencing of story information. They are presented in Table 6.

All of the correlation coefficients were above .92 with one exception (.81). The relationship between the subjects' sequence of information and the

TABLE 6
Correlations for the Degree of Relationship Between the Temporal Sequence of Statement in the Original Story Structure and the Temporal Sequence Recalled by Children

Story	Time 1		Time 2	
	Grade 1	Grade 5	Grade 1	Grade 5
<i>Epaminondas</i>	.97	.99	.95	.99
<i>Tiger's Whisker</i>	.81	.99	.93	.99
<i>Fox and Bear</i>	.97	.95	.93	.96
<i>Judy's Birthday</i>	.92	.97	.97	.97

original story presentations was extremely high in all cases. The three types of temporal sequencing errors were then analyzed separately.

An intercategory error was defined as the temporal reversal of two statements from different categories. The percentage of intercategory errors for all four stories was minimal. Only 7% of all statements recalled in the four stories contained intercategory reversals. In addition, 75% of all reversals could be predicted from the proposed tree structures of each story diagrammed in Fig. 2 suggesting that the external structure matched the internal schema. Three of the four original story versions contained statements that were reversed when compared to their position in the tree structure. An example of temporal disorganization occurring in the presented version of a story can be seen in *The Tiger's Whisker*. The initiating event, which should occur immediately after the major setting statement, does not occur until the character's major goals are presented. The tree structure which represents the hypothesized internal structure of the subject in recalling the story reverses the order of the initiating event. Almost all intercategory errors in this story occurred when subjects recalled the initiating event before any of the internal response statements. A similar finding occurred in *The Fox and the Bear*. In the original story, the minor setting statement, "they both liked fried chicken," occurred between a goal and an action statement. Several children reversed the position of the minor setting statement in story recall and stated the information immediately after the major setting statement.

The remainder of intercategory errors occurred when two characters were interacting with one another. In *Epaminondas*, the major intercategory reversal occurred when children inserted the first action statement between the first two initiating events. An example of this reversal was: "the mother told him to take some cake to his grandmother. He put the cake in a leaf under his arm. Then she warned him to hold it carefully." The same type of reversal occurred in the fourth story, *Judy's Birthday*. Several children stated the direct consequence, "she gave them to Judy that night," and then stated, "she (grandmother) told Judy she would need them when she grew up." Thus, they reversed the order of the consequence statement and one statement from the internal response category.

The number of intracategory errors occurring in recalls was also measured. An intracategory error was defined as to the reversal of two statements within the same category. The two stories that produced the most intracategory errors were *Epaminondas* and *The Tiger's Whisker*. Only 5% of all the information recalled included intracategory errors. Two types of intracategory errors occurred. Children either reversed entire statements within a category or they deleted part of a statement and put the remainder after the second statement in the category. The second type of intracategory error occurred most frequently in *Epaminondas*. Children reversed the first two attempt statements by stating that the boy carried the cake in a leaf under his

arm. This type of error is similar to a truncation error in which subjects delete information in order to make their productions less redundant.

The third type of temporal sequencing error, within statement reversals, occurred in 11% of the protocols. This error occurred primarily when children inverted the order of temporal markers included in a statement. One statement which contained consistent reversals was, "she(grandmother) went out that day." Subjects often stated, "that day she went out." With the exception of these types of reversals, subjects maintained the correct position of the information within statements.

Discussion

The first aim of the present study was to examine the effects of age and time on the recall and organization of stories. Significant developmental differences occurred on three measures: (1) total recall, (2) recall of internal responses, and (3) the number of inferences added to recall. Fifth-grade children included more of each type of information on recall than first graders did. These results were similar to the findings in our initial study (Stein & Glenn, 1975). The developmental increase found in the number of recalled internal responses is consistent with the results reported by Flappan (1968) in her work on children's understanding of social interactions. She found that older children stated more information concerning the intentions and motives of movie characters than did younger children. It may be that older children are more aware of the causal significance of intentional information and therefore include this type of information more systematically in the retelling of a story. However, the recall data in the present study do not indicate whether first-grade children encoded this information less often or whether they simply failed to include it in their recalls.

In contrast to the developmental differences found in the total amount of accurate information recalled, no significant age differences occurred in either the pattern of saliency or in the temporal organization of information in recall. The relative saliency of each informational statement was highly consistent across both grade and time conditions. This result is consistent with the findings from earlier studies on adult organization of recall (Bartlett, 1932; Johnson, 1970). This consistency in recall demonstrates that specific items clearly differ in terms of their importance in the organization and production of story material.

Developmental differences were not found when the temporal organization of story recall was examined. Children's sequencing of story information corresponded closely to the temporal sequence of items in the original stories. This contradicts the findings of Piaget (1960) who found that six- to eight-year-old children's recall of stories was poorly organized. In his studies of

temporal sequencing errors were quite frequent, and several children were unable to produce the logical structure of a story. The differences between Piaget's results and ours may be due to differences in story complexity. While both his stories and ours were relatively short, our stories were more simply constructed in terms of the syntax of the sentences; the inclusion of temporal markers such as one day, later, then, and the logical organization of categories. Not surprisingly, the issue of story complexity is critical in the examination of temporal sequencing abilities. However, our results demonstrate that children as young as six are capable of organizing and temporally sequencing story information in simply constructed narratives.

Brown (1975) has examined young children's ability to temporally organize a series of pictorial events. She found that both five- and seven-year-old children experienced difficulty in reconstructing and recalling series of pictures when the descriptions of the pictures did not include specific causal relations relating the two pictures. However, when her verbal description of the items did include such relations, the ability to reconstruct the items improved significantly in both age groups of children. Although the younger children still had difficulty recalling the correct temporal order, recall greatly improved in the older children. These findings further emphasize the importance of causal relations to constructing an accurate temporal sequence.

The effect of time was significant for three of the four stories. More accurate information was included in the immediate recall condition than in the delayed testing condition. In addition, the amount of new information added in recall significantly increased over a week's period of time in one of the four stories. This provides some support for one of Bartlett's original hypotheses. He argued that the listener develops a general idea of the whole story. Over time memory for specific details decreases. However the gist or theme of the story remains. The subject simply replaces the lost or nonretrievable information with inferred information which is consistent with the original story structure. A model of story comprehension will have to include rules which describe and predict the creation of new information occurring in recall. Certain types of inferences can be predicted from the rules described in our grammar. These predictions will be discussed in the final section.

The second aim of this study was to examine the category distinctions formulated in the grammar. The results from the present study were highly consistent with our original results (Stein & Glenn, Note 1). In all four stories, the seven categories differed in saliency of recall. The relative salience of each category was highly consistent across stories, grade levels, and time conditions. Major settings, consequences, and initiating events were the most frequently recalled categories. The remaining categories in terms of their

recall frequencies were: attempts, reactions, minor settings, and internal responses. Although internal responses were frequently deleted, the primary goal of the protagonist was always well recalled. Furthermore, the majority of inferences were internal responses. This indicates that internal responses may be more important in the production of a story than their rank order suggest.

The fact that category membership did predict the saliency of an item indicates that listeners make distinctions between different types of information and that their distinctions correspond to some degree with the category distinctions made in the grammar. The differences in category saliency show that certain categories are structurally more important in the production of story recall. Subjects may use major settings, initiating events, major goals, and consequence statements as "markers" to generate story recall. Although these four categories may be critical in the production of stories, their saliency does not indicate whether or not other types of information are encoded less frequently.

Although category membership is predictive of item saliency, there was wide variation of item recall in certain categories and little in others. For example, attempt statements were scattered throughout the recall frequencies. This finding indicates that factors other than category membership influence how well an item will be recalled. One factor regulating the saliency of a particular item may be the degree to which the information in the item matches the subject's expectations of what should occur. For example, in Story 3, *The Fox and Bear*, one sequence of events occurring in the original story version was: the fox opened the door of the henhouse very carefully, he grabbed a chicken and killed it. The attempt statement of opening the door was not well recalled. Instead, most subjects inserted the statement, "The fox went into the henhouse." Apparently the act of going into the henhouse was more important in the structural organization of story production than was the act of opening the door. Therefore subjects readily inferred and stated the former action even though it was not present in the original story version.

A second variable which might regulate item saliency in recall is informational redundancy. If the information in a statement is implied by or is an elaboration of a previous item, there may be no reason for a subject to include both of these statements in recall. The rules which determine these summarization processes are not included in our grammar. However, they are an integral part of any model of story comprehension and the development of these rules should be pursued.

The types of relations occurring between the statements within a category may also be a critical factor in predicting how many statements from each category are produced in recall. Subjects may recall only item sequences that are connected by direct causal links. This hypothesis may be particularly valid when several statements occur within one category.

In summary, the results from this first study provide evidence for the usefulness of the story schema for defining the information contained in stories and for predicting the relative importance of various categories of information in recall. A more complete discussion of the use of the schema as a theoretical model will be presented in the conclusion section.

EXPERIMENT 2

The main purpose of Experiment 2 was to investigate aspects of story processing that could not be assessed with recall measures. Two tasks were used. The first concerned the types of information which children judge to be important or critical in each of the stories. The second task concerned the collection of data to determine the comprehension of causal relations both within episodes and between episodes. Probe questions were constructed to investigate children's perceptions of the reasons for the occurrence of certain events in each story. More specifically, the probe questions were used to assess children's comprehension of events connected by the CAUSE relation in each story. While both of these tasks force a child to rely on his memory for story information, they may require the use of different retrieval strategies than those found in recall. Therefore, certain types of information which were not included in recall may be produced during these tasks.

The purpose of the importance of judgments was twofold. The first was to determine the degree of correspondence between the information that children considered to be the most important and the information recalled most frequently in Experiment 1. When subjects are asked for the most important information in stories, the types of information they produce may be quite different from the information most frequently produced in recalling a story. Asking for judgments of importance may encourage more inferential thinking and may tap children's interpretations of the story events to a greater degree than the recall task does. The second purpose of this task was to examine possible developmental differences in children's criteria of importance information.

The probe questions focused on the types of causal relations children perceive between items. While the high accuracy of temporal sequencing found in the recall data indicate that both first- and fifth-grade children organize information in a consistent and similar fashion, the data do not indicate whether any developmental differences are present in the perception of the types of relations linking categories or episodes. By asking questions which focus directly upon the types of relations occurring in the story, developmental differences occurring in the perception of causality can be investigated.

Method

Subjects

Subjects were a group of 24 different children from the same upper-middle-class school used in Experiment 1. An equal number of first- and fifth-grade children participated in the study. The subject pool in each grade was divided equally by sex. The mean ages in each group were: 6 years, 3 months for first grade and 10 years, 5 months for fifth grade.

Materials

The identical four stories used in Experiment 1 were used in this study. A set of 12 or 13 probe questions was constructed for each story. The questions were written to assess children's comprehension of causal relations which either connect statements within an episode or statements that connect two episodes. The probes were phrased as a series of WHY questions. For example, the specific probe questions used for *The Tiger's Whisker* story were:

1. Why did the lady need a tiger's whisker?
2. Why was the lady afraid?
3. Why did the lady need to make a medicine?
4. Why did the lady decide to use a trick?
5. Why did the lady go to the tiger's cave?
6. Why did the lady sing a song and give the tiger food?
7. Why did the tiger come out of his cave?
8. Why did the tiger eat the food?
9. Why did the tiger walk over to the lady?
10. Why did the tiger thank the lady?
11. Why did the lady cut off the tiger's whisker?
12. Why did the lady run down the hill quickly?
13. Why did the tiger feel lonely and sad at the end of the story?

Design and Procedure

The 24 children were divided by grade level into two equal groups. All children were tested individually and each child heard all four stories. The stories were presented in a random sequence to each child. Before each story delivery, the child was told to listen very carefully so that he could answer questions about the story when the experimenter finished the delivery. The experimenter then proceeded to read the first story to the child. Immediately afterward, the 20-second delay occurred. During this time lapse, each fifth-

grade child participated in a backward counting task. Each first-grade child simply counted to 20. Then the child was asked to tell the experimenter the one thing that happened in the story that was the most important thing to remember. After the child replied, the experimenter asked the child to recall the second most important thing and then the third most important thing. After the child answered the three questions, the experimenter proceeded to read the next story and then asked the child the identical questions for the second story. The identical procedure was employed until data had been collected on all four stories.

The decision to ask children for three important events was based on pilot data. First-grade children had great difficulty producing more than three pieces of information they considered to be important. In addition, we felt that the primary function of this task was to determine the types of information that were at the top of the hierarchy in terms of importance to the child.

After importance information had been collected on all four stories, the experimenter asked the child the probe questions for each of the four stories. The experimenter began with the first story the child had heard and proceeded until the data had been collected for all four stories. The probe questions for each story were presented in a random sequence. As in Experiment 1, two experimenters tested the children in each age group to control for experimenter bias.

Results

Importance Task

The importance judgments were first divided into informational statements. Fifth graders consistently produced more statements per importance judgment than the first graders did. First graders generally gave a single statement response while fifth graders gave an average of two statements per response. The difference between grade levels was significant for all four stories; the mean number of statements ranged from 1.0 to 1.17 for first graders and from 1.89 to 2.00 for fifth graders.

Fifth graders often connected their statements with causal or temporal connectors, such as: because, so that, and then, in order to, etc. These types of connectors almost never appeared in first grade responses. For example, in the Fox and Bear story, many children gave the "roof breaking" as one of the most important events in the story. When first-grade children produced this item, they generally gave it alone. However, when fifth-grade children mentioned this event, their statements included several other events. One fifth-grade response was "the bear made the roof cave in because of his weight and that killed some chickens."

The data from the three importance judgments were then divided into two groups: the information that actually occurred in the original story version and the information that was inferred from the original story content. Approximately 25% of the importance judgments from each grade level were inferred. There were no significant differences between grade levels nor were there any significant variations due to story.

The accurate importance judgments were then partitioned into single category statements and classified according to the categories postulated in the grammar. Each of the three judgments was analyzed separately. The data were collapsed across stories because the pattern of importance judgments did not vary significantly across the four stories. The total percentage of accurate responses per category for each of the judgments is presented in Table 7. The sum of the percentages in each column can exceed 100 because some responses included statements from two categories and were counted twice.

When the first importance judgments were examined, grade differences were found in the types of information children considered to be most important. First graders mentioned direct consequences proportionately more often than any other category. Internal responses were mentioned second and initiating events were mentioned third. Fifth graders gave proportionately more internal responses than any other category in their first judgments. Initiating events were mentioned second and consequences were mentioned third.

Proportion tests were completed to examine the differences between grades in each of the categories. Significant differences were found in the internal response and consequence categories. Fifth graders included significantly more internal responses than first graders in their first importance judgments

TABLE 7
Proportion of Accurate Responses Occurring in Each Category on Each of the Three Importance Judgments

Category	1st Judgment		2nd Judgment		3rd Judgment	
	Grade 1	Grade 5	Grade 1	Grade 5	Grade 1	Grade 5
Minor setting	.02	.08	.03	.02	.00	.06
Initiating event	.20	.21	.08	.04	.07	.04
Internal response	.29 ^a	.63	.26 ^b	.48	.26	.23
Attempt	.12	.06	.13 ^b	.31	.11	.27
Direct consequence	.37 ^a	.17	.50 ^a	.21	.44	.54
Reaction	.02	.04	.00	.06	.07	.13

^ap < .01.

^bp < .05.

while first graders included proportionally more consequence statement than fifth graders in their first importance judgments.

The same developmental differences were found on the second judgment. The only major difference between the first and second judgments was the increase in the number of attempt statements in the fifth-grade responses. It should be noted that when fifth graders included an attempt statement, it was generally causally related to either an internal response or to a consequence statement. There were no significant differences between first and fifth graders on the third judgments.

The accurate statements given in the three importance judgments were then compared to the information that was most frequently recalled in the stories in Experiment 1. The importance task was not a standard ranking task in which subjects had to rank order all information in the story according to their conception of importance. Therefore, the importance data were compared with the items in the top third of the frequency ranks from each of the four stories.

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 third of the recall items, whereas 76% of all first-grade judgments appeared in the top third of recall. The differences between the two measures were primarily due to the fact that internal responses were mentioned proportionately more in the importance judgments than they had been in recall. This was particularly true of fifth-grade responses. In addition, major settings and initiating events which were almost always found in the top of the recall frequencies were included infrequently in the importance judgments. The discrepancies between the two measures show that neither recall nor importance judgments alone indicate the structural importance of a category in the organization of stories. Furthermore, although subjects may initially organize story information in a consistent fashion independent of the specific task demands, the task demands do alter the type of information retrieved by subjects at both grade levels.

The last analysis on the importance judgments focused on the inferences that were included in the judgments. The new information was classified into two types of responses: those responses that included the moral lesson of the story and those responses that were simple category additions or elaborations.

In Story 1, *Epaminondas*, 95% of the additions referred to either the moral lesson of the story or to a summary statement of the entire story. Examples of moral lesson statements were "different things should be carried in different ways" or "he should always cover the butter if the sun was shining." In Story 2, *Judy's Birthday*, 61% of the additions were moral lessons such as: "the

important thing to remember is that her grandmother really understood her feelings." The inferences in the other two stories were primarily category additions such as new goals explaining a character's behavior in more detail or new consequence statements. For example, in *The Tiger's Whisker*, some children said that the most important thing was that "she got back to her husband safely," or that "the tiger didn't get mad at the lady because he understood her."

Analysis of Probe Questions

The responses to probe questions were first classified into three categories: nonresponses, errors, and correct responses. Children's answers were classified as errors when they clearly contradicted the original story information. Both the error rate and the number of nonresponses were extremely low in both age groups. In the first grade, 12% of the responses were classified as errors and 7% were classified as nonresponses. Only 2% of the fifth-grade responses were erroneous and 4% of the probes remained unanswered. The majority of erroneous responses occurred in Story 3, *The Fox and the Bear*; 72% of all first-grade errors and 59% of all fifth-grade errors were found in this story.

The number of accurate statements that were given in response to each probe question was then tabulated. Fifth graders gave significantly more statements per probe question than did first graders (1.56 for fifth graders versus 1.06 for first graders, $p < .01$). The multiple statement responses were generally linked by either CAUSE or AND relations. An example of a multiple response from the Judy story occurred in response to the question, "why did the grandmother buy Judy the tools"; several fifth graders replied, "she bought them because she knew Judy wanted the tools and because it was her birthday." The first reason is an internal response and the second is an initiating event. The two statements are related to each other by an AND relation and both are causally related to the grandmother's behavior, which is classified as a direct consequence. In contrast to this type of reply, first-grade responses generally contained only one reason for the occurrence of a specific event.

An analysis was then performed on the types of information given in response to probes. First, each probe question was classified according to the categories of the model. Then the responses to each of the questions were classified according to category type. Two separate analyses were performed: the first concerned the probe questions constructed to measure perceived causality between two episodes; the second concerned probe questions designed to measure perceived causality between statements within an episode. Each type of relation will be considered separately.

Relations Between Episodes

In the four stories used in this experiment all of the interepisodic relations were causal. There were two types of episodes in the stories; embedded episodes and nonembedded episodes. Questions were constructed to elicit the types of connections which children perceived between both embedded and non-embedded episodes.

Three stories contained embedded episodes. Both *The Tiger's Whisker* and *The Fox and the Bear* contained one embedded episode; *Judy's Birthday* contained two such episodes. In both *The Tiger's Whisker* and *Judy's Birthday*, the embedded episodes occurred as the direct result of the characters' attempts to obtain his or her goal. In both of these stories the main character was dependent upon a second character to achieve his or her goal. In the *Fox and the Bear* story, an embedded episode was the result of the bear formulating a second goal before the resolution of his primary goal. In all three stories the embedded episode occurred as a result of one of the character's attempts. Therefore, the responses to the probe questions should contain an attempt as the causal factor. The proportion of responses which contained the correct causal event for the occurrence of each of the embedded episodes is presented in Table 8.

All children in both grades produced the correct reason for the occurrence of three of the four embedded episodes. The only embedded episode which caused any difficulty was the bear's behavioral sequence in Story 3, *The Fox and Bear*. Only 58% of the fifth graders and 42% of the first graders gave correct responses in reply to the probe question, "Why did the bear feel lazy?" Correct responses to this question included replies such as "he was tired from running so fast" or "he was lazy because he didn't sleep enough before he ran."

TABLE 8
Proportion of Subjects Who Produced Causal References in
Reply to Probe Questions Concerning the Relationship
Between Episodes

	Grade 1	Grade 5
Embedded Episodes ($N = 4$)		
<i>Tiger's Whisker</i> ($N = 1$)	1.00	1.00
<i>Fox Bear</i> ($N = 1$)	.58	.42
<i>Judy's Birthday</i> ($N = 2$)	1.00	1.00
Nonembedded Episodes ($N = 5$)		
<i>Epaminondas</i> ($N = 2$)	.37*	1.00
<i>Fox and Bear</i> ($N = 3$)	1.00	1.00

* $p < .001$.

The remainder of the children at each grade level did not know why the bear felt lazy.

The remaining questions concerned the perception of causality between nonembedded episodes. Three nonembedded episodes were present in Story 3, *The Fox and Bear*, and two were present in Story 1, *Epaminondas*. The proportions of correct responses concerned the causal relations between each of two episodes are also presented in Table 8. All fifth graders gave correct responses to all probe questions. First graders had more difficulty with the first story *Epaminondas*. This story accounted for all of their errors. Two questions were asked to investigate the perception of causality between the *Epaminondas* episodes. The first was, "why did the boy want to be very careful with the butter?" and the second was, "why did he put the butter on top of his head?" In response to the first question, 16% of the first graders stated that Epaminondas didn't want to ruin it like the cake, 8% said he didn't want it to melt, 59% stated that he either wanted to eat something with it or that his mother wanted to make something with it, and 16% did not know why. Thus, 75% of the first-grade children gave no explicit causal reason which could be linked to any behavior in the previous episode. When responses to the second question were analyzed, 50% of the first graders responded by saying that he put the butter on top of his head because his grandmother told him to do that. The remainder of the children stated that he either wanted to get it home safely or that he did not know the sun was shining. Thus, 50% of the first-grade children did indicate that the grandmother's previous reaction caused the boy's subsequent behavior. However, these children remained convinced that the grandmother actually told the boy how to carry the butter rather than the cake.

The results from these two probe questions indicate that many of the first-grade children may not have perceived the relationship between the grandmother's reaction to the crumbled cake and the boy's subsequent attempt. Thus, for these children the two episodes would be linked by the *THEN* relation which implies no direct causality between the episodes, but indicates that one episode contains the necessary preconditions for the next episode to occur. In addition, the results indicate that the percentage of younger children who did perceive some type of causal relationship between the two episodes based their interpretation on incorrect data. This misperception was also reflected in the types of value judgments and inferences some children made at the end of the testing session. For example, one first-grade child commented on the story after task completion by saying that his mother shouldn't have called him a silly boy because he carried the butter the way his grandmother told him to. This comment indicates that the semantic content of the reaction was transformed to fit the child's expectations of what should have occurred in the story.

Intraepisodic Relations

The remainder of the probe questions concerned the perception of causal relations within an episode. The questions contained statements from four categories described in the grammar. These categories were: internal responses, attempts, consequences, and reactions. The one question concerning an internal plan was grouped with the internal response questions. An example of each type of probe question is listed below:

1. Internal Response: Why did the lady need a tiger's whisker?
2. Attempt: Why did Judy tell her grandmother about her wish?
3. Consequence: Why did the fox kill the chicken?
4. Reaction: Why did the tiger feel lonely and sad again?

Probe questions concerning the cause for major settings and initiating events were not included in these analyses. The major setting category has no causal event preceding it; therefore, the *WHY* question is inappropriate. Probes concerning initiating events in the beginning episode of each story were inappropriate for the same reason. Probe questions were constructed for initiating events occurring in the second and third episodes of stories, but these were used to assess the comprehension of causal relations between episodes.

The probe questions and the responses were classified according to category type. The data are presented according to the four types of probe questions asked.

(a) *Internal Responses* In the story grammar, an internal response is caused by either an initiating event or another internal response. If a probe question is asked about the cause of an internal response which is logically preceded by another internal response, subjects' responses should include the statement of the immediately preceding internal response. In these types of questions the inclusion of an initiating event as a causal factor may depend upon the ability of the child to proceed in reverse fashion through a causal sequence. If, however, an internal response follows an initiating event, subjects' responses should include the event. Of the probe questions focusing on internal responses, 43% contained statements that directly followed the initiating event in the original story version. The remainder of the questions concerned internal responses which followed other internal response statements. The proportion of responses occurring in each of the categories is presented in Table 9. In this table, a distinction was made between responses containing only one informational category and those containing two

TABLE 9
Proportion of Correct Responses Occurring on Probe Questions: Responses Are Grouped by Informational Category

Categories Occurring in Responses	Categories Occurring in Probe Questions						Reaction		
	Internal Response	Attempt	Grade 1	Grade 5	Consequence	Grade 1	Grade 5	Grade 1	Grade 5
Minor setting	.08	.07	—	.01	.07	.13	—	—	—
Initiating event	.18	.10	.26	.19	.27	.09	—	—	—
Internal response	.63	.40	.67	.55	.39	.30	.20	.04	—
Attempt	—	—	—	—	.05	.13	.62	.52	.15
Consequence	—	—	—	.12	.11	.07	—	—	—
Reaction	—	—	—	—	—	.06	.29	.02	.03
Initiating event + internal response	—	—	—	.10	.10	.01	.20	.03	.03
Internal response *	—	—	—	—	—	.03	.12	—	—
internal response	—	—	—	—	—	.01	.03	—	—
Consequence + attempt	—	—	—	—	—	—	—	—	—
Internal response + setting	—	—	—	—	—	—	—	—	—
Attempt + setting	—	—	—	—	—	—	—	—	—

categories. The former are presented first in the table while the combination responses are given below them.

When the responses were analyzed, internal responses and events were the most frequently included categories. Sixty-nine percent of the fifth-grade responses and 74% of the first-grade responses contained internal responses; event statements were found in 19 and 26% of the fifth- and first-grade responses, respectively. Event statements were included less often than would be expected. There may be two reasons for this. First, the original story versions did not contain the highest order goal which was the immediate result of the event. Subjects often gave a higher order goal rather than an initiating event. An example of this occurred in *The Tiger's Whisker*. When subjects were asked why the lady needed to make a medicine for her husband, only 30% of the first-grade children and 75% of the fifth-grade children gave the initiating event, i.e., her husband's illness, as the reason. The remaining children in each grade responded to this question by giving a higher order goal, e.g., the lady wanted to cure her husband. A second and related reason is that the higher order goal may directly imply the event. For example, curing a person implies an illness. Thus by stating this goal, many children may have felt it unnecessary to explicitly refer to the initiating event. However, most of the fifth-grade children who included a higher order goal also included the initiating event. Furthermore, in questions which could have included an internal response from the story, many fifth graders responded by giving two internal responses as the cause for the internal response given in the probe question. The overall proportion of multiple responses was .11 for the first grade compared to .49 for the fifth grade. The proportion tests completed on this data showed the difference to be significant ($p < .01$).

Although significant developmental differences were present in the number of statements included in the responses, none of the younger children had difficulty in producing higher order goal statements or other types of internal responses in reply to the probe questions. Furthermore, many of the internal responses that were poorly recalled in Experiment I were frequently produced in response to these questions by children from both age groups.

(b) *Attempts* In the structure of an episode, an attempt is part of a plan application. The attempt is directly caused by an internal plan which in turn is caused by an internal response. Therefore, most attempts should be directly caused by an internal plan, if it is contained in the story, and/or an internal response. Because the internal plan category was well developed in only one story, responses which contained internal plan statements were grouped with replies which contained internal responses. Furthermore, only one attempt probe question elicited any type of internal plan statement. When children were asked why the lady sang a song and gave the tiger food, 50% of the fifth

graders and all of the first graders responded with a goal statement that was not included in the plan.

The majority of the reasons given for attempt statements were internal responses. Internal response statements were given in 73% of all first-grade responses and 77% of all fifth-grade responses. Initiating events were given in 19% of the first-grade responses and 26% of the fifth-grade responses. This type of response generally occurred when an internal response was not included in the original story version and the initiating event immediately preceded the attempt statement. Fifth-grade children again gave more multiple responses in reply to attempt questions than first-grade children. The few instances in which children responded to attempt probes with attempts or consequences occurred in Story 1, *Epaminondas*, and Story 4, *Judy's Birthday*. Some children responded to the question, "why did Judy tell her grandmother about her wish?" with the statement, "because her father got her a dress." These children omitted the internal response, which occurred immediately before Judy's attempt and gave a consequence statement instead. However, these types of responses occurred infrequently.

(c) *Direct Consequences* The responses to direct consequence probes were the most varied of all types of responses. Five of the six categories were represented in response to these probes. However, the most frequently mentioned category was the internal response which was included in 45% of the first-grade responses and 58% of the fifth-grade responses. Children in both age groups regarded the character's intentions and motives as the major locus of causality. The actual attempt was not as psychologically important in causing the consequence. Initiating events were linked to consequence statements in response to a few probes. When asked why the fox killed a chicken, many children simply said, "because he was hungry;" similarly, when asked why the cake crumbled, some children said, "because his mother didn't tell him how to carry it."

Direct consequence probes occasionally elicited consequence responses. This occurred when there was more than one direct consequence statement and the first caused the second to occur. For example, when children were asked why the fox and bear were trapped, most children replied, "because the trap fell in on them." Minor setting statements occurred in responses referring to the butter melting in *Epaminondas*. Almost all children said, "because the sun was shining" or "because the sun was hot."

Thus many different categories are perceived to cause the end result of an episode. The goal statement, however, remains the predominant cause of the consequence.

(d) *Reactions* The majority of reactions were perceived to be caused by the previous direct consequence or by an attempt plus consequence. Seventy-

three percent of all first-grade responses and 81% of all fifth-grade responses included at least one consequence statement. An example of an attempt plus consequence response occurred in *Epaminondas*; when asked why the grandmother told the boy he was silly, many children replied, "because he carried the cake on his head and it broke."

Discussion

The first purpose of this experiment was to compare the types of information judged to be most important in stories with the information subjects recalled the most frequently in Experiment 1. A high degree of overlap was found, indicating that the structural importance of certain types of information may be a relatively stable aspect of processing. Specific statements appear to be central to the organization of information independent of task demands, at least as long as the task focuses on the semantic content of the story. However, the results also show that task demands do influence the types of information that are retrieved. The major difference between the types of information given on the two tasks involved the internal responses. When asked for the most important information, subjects stressed the motives, feelings, and thoughts of the characters to a greater degree than subjects did on recall. This kind of information appears to be more central to what can be considered the meaning of a story than the recall data indicate. The importance of internal responses was particularly prominent among fifth graders. Older children gave significantly more internal responses than younger children. While the majority of first graders included some reference to the characters' intentions or feelings, they focused on the outcomes more frequently than on the internal responses. The reason for this developmental difference in importance judgements is unclear. It is evident from the probe questions that both first and fifth graders were aware of the internal responses of story characters. In addition, previous research (Bearison & Isaacs, 1975; Berndt & Berndt, 1975) has shown that when motives and intentions of characters are explicitly stated in stories, children as young as six or seven years will use intentions rather than outcomes to make judgments concerning the relative "goodness" or "badness" of a character's behavior. Thus, first-grade children do comprehend intentions and motives. In our stories, the character's goals, desires, and thoughts were explicitly stated. Thus, we would have predicted that younger children as well as older children would stress similar types of information in their judgments. As is evident from the results, this was not the case. Young children may simply not spontaneously attend to motivational factors as consistently as older children do.

The fact that 25% of the children in each age group included inferences or moral lessons in their importance judgments supports the contention that inferences are an integral part of the comprehension process. While there

were no differences between grades in the number of such inferences, there did seem to be a change in the type of information given; this was particularly evident in the Judy story. Many of the fifth-grade inferences were attempts to draw a general interpersonal moral or lesson from the story. Examples of this are "The most important thing is that her grandmother really understood her feelings" or "the most important thing is to have parents who understand you." The lessons given by first graders tended to focus on a more personal event or statement in the story; for example, "She should not get her dress dirty," or "she should be careful because hammers and saws are dangerous." It is evident that more data must be collected before these hypotheses can be confirmed. Nonetheless, the examination of children's conceptions of importance may provide useful information on children's processing of stories and the types of inferences they make.

The second purpose of this experiment was to investigate children's perceptions of cause-effect relationships in stories. Children had little difficulty answering the probe questions. The responses to the questions generally indicated that children perceived the cause-effect relations proposed in the story grammar; the results give some support to the relations linking categories. However, the preponderance of replies that included internal responses was greater than would be predicted by a simple inspection of the grammar. Internal responses were perceived as the immediate cause for most internal response, attempt, and consequence statements. This clearly indicates that internal responses are perceived as the principle locus of causality in a story and parallels the central importance attributed to them by older children on the importance judgments. Variations in the responses also showed that factors other than the logical organization proposed in the grammar determine the perception of causality. The semantic content of the statements appears to be critical in determining which two statements children will perceive as being causally related.

A major developmental difference in the amount of information produced was found on both the judgment task and the probe question task. Fifth graders consistently gave more information in their responses than first graders. While first graders typically gave one statement responses, fifth graders gave more multiple statement responses. One possible reason for this difference is that older children may be more aware of the informational needs of a tester than younger children are. They may understand that another person will not assume that they are aware of many reasons for the occurrence of an event unless they explicitly state the multiple reasons. However, the overall results indicate that this reason may not be the most appropriate one. Fifth graders did not give multiple responses to all probe questions. Additionally, when first graders were asked if there were any more reasons for the occurrence of an event, most of them could not produce additional information. Thus older children may make spontaneous causal

inferences more readily than younger children and chunk more story information into larger units than younger children.

CONCLUSION

This study has presented and partially validated a schema for stories. The experimental results answer certain fundamental questions about children's organization of story information. This section will further explicate the theory of processing inherent in the grammar. The theory is based on the assumption that incoming information is encoded in relationship to already existing psychological structures or patterns of information. These existing structures determine the information encoded and inferences generated in the process of comprehension. When reading or listening to a story subjects expect certain patterns of information, attend to informational sequences that match these patterns, and organize incoming information into similar patterns. Task requirements may influence both the type of information retrieved from a structure and the particular structure used to encode information. If the grammar corresponds to the internal structures used by subjects during story comprehension, several predictions concerning both the organization of incoming information and the generation of new information can be made.

Temporal Sequencing of Story Information

The first set of predictions concerns the variables which regulate children's ability to produce the correct temporal sequence of a given story. Two sets of predictions can be made. The first concerns the skills necessary to organize statements within an episode. The second concerns the skills necessary to order entire episodes in the correct temporal sequence.

If the temporal organization within an episode in any given story corresponds to the structure represented in the grammar, subjects should have little difficulty organizing the information and maintaining the original temporal sequence. The results from our recall study support this hypothesis. The stories used in the recall experiment did correspond (for the most part) to the logical sequence specified in the grammar. The proportion of temporal ordering errors was small for both age groups. However, an adequate test of the postulated episodic structure requires the examination of stories which violate this structure. If subjects do organize story information according to the rules of the grammar, then any deviation from the proposed structure should require some type of reorganization of the incoming information. One method of creating deviations in the temporal sequence of an episode is to manipulate the positions of each of the seven categories. If this procedure is

carried out, then reorganization should occur by: (1) changing the order of the presented categories to correspond to the logical order postulated in the grammar, (2) adding logical relations which directly connect the relocated category with surrounding categories, (3) adding both new categories and relations to create a logical sequence, or (4) deleting inconsistent or poorly organized information.

The type of reorganization which a subject will use may be a function of the distance a category is moved from its original location and the relation of the moved category to the new surrounding categories. For instance, an analysis of the linguistic forms used to mark logical relations indicates that cause-effect orders and effect-cause orders are easily interchangeable. The sentences, "her husband was sick so she needed to make a medicine" and "she needed to make a medicine because her husband was sick" are interchangeable and both linguistically acceptable. If a story is disorganized by simply reversing two categories, subjects may supply the causal connection between the two categories. If the category is moved more than one location away from its original position, there may be no plausible direct connection between the moved category and the surrounding categories. In this situation, the subject should either reorganize the story by placing the mislocated category in its original position or generate new information and relations to logically link the misplaced category with surrounding categories.

The type of category manipulated may influence the reorganizational strategy used. For instance, the probe question data showed that the internal response category was perceived as the major locus of causality for both attempts and consequences. If the temporal organization of the episode is changed so that the internal response is placed after either the attempt or the consequence, subjects may only need to generate the appropriate causal connection between the displaced internal response and the surrounding categories. The movement of other categories may require a greater amount of reorganization.

The above predictions were based on the logical structure of an episode. It is also important to examine the temporal sequencing of episodes in a story and of statements within a single category. A factor which may influence children's ability to retain these sequences is the types of logical relations between episodes and between statements. We would expect the temporal sequencing of information joined by a CAUSE relation to be well retained. Conversely, the temporal order of information joined by the AND relation may be highly variable; sequential reversals should be more common. Sequences joined by the THEN relation may fall between the two; to the extent that the first unit is perceived as creating the necessary preconditions for the second, the order should be well retained.

Two critical factors may influence all types of story reorganization. The first is the availability of critical cognitive operations necessary to perform the

transformation on information. The second is the ability to apply the appropriate strategy, given that the subject has the cognitive operations available to transform the data. Both Brown (1976) and Piaget (1960, 1969) argue that the preoperational child lacks operational reversibility, i.e., the ability to retrace a logical sequence or argument in reverse order. Brown (1976) argues that although preoperational children can construct logical sequences in a forward order, they cannot construct the sequence in a reverse order, e.g., from effect to cause. Thus for preoperational children any temporal disorganization which occurs in the structure of a story should decrease the amount of accurately recalled information. The young child may recall only those sequences which have a direct forward cause-effect relationship. However, older children who have the operational structures to proceed through a logical sequence in a reverse order may be able to reorganize a disorganized story without deleting information. As Brown notes, the type of logical relation between items as well as the child's operational level will influence performance significantly.

Inferences

Inferential thinking is another critical issue related to story comprehension. The production of inferences is a normal product of story comprehension. The grammar can be used to predict many of the kinds of inferences which occur. As subjects process a story, they may form hypotheses about the kinds of information which are appropriate or likely to occur; the inferred information may then become a part of their internal representation of the story. This type of constructive thinking is presumably the result of knowledge about the structure of stories, namely, the informational categories and relations, knowledge concerning the specific kinds of events portrayed in stories, and the developmental level of the child.

Knowledge about the structure of stories should be apparent in at least two ways. First, the deletion of one or more categories should increase the number of inferences made. That is, if one or more of the categories proposed in the grammar are missing from the original story version, the subject may generate new information to construct a logical sequence. For example, if the initiating event is deleted from the original story version, subjects should generate information which would make the internal response in the story more meaningful. Generally, the inferential information should be of the same category as the deleted information; this is the most obvious way to maintain the logical sequence. However, the additions may not correspond to the deleted category. For instance, when an event is deleted, an individual may create an appropriate event or he may include a higher order internal response, as both events and internal responses are perceived as causing other internal responses.

A second way in which structural knowledge may influence inferential additions concerns the types of categories added. Some categories are structurally more important than others. Major settings, initiating events, major goal statements, and consequences are the most salient categories in recall; if these types of information are missing in a story, subjects may tend to add them more frequently than they would add minor settings, other internal responses, attempts, or reactions, if the latter categories were missing.

An additional factor which may affect the production of new information is a subject's prior knowledge about the specific situation or events of a story. In our recall data subjects often substituted new information for information that occurred in the original story. The new information belonged to the same category as the original information but was probably more consistent with the subject's knowledge of similar situations. Substitutions consisting of more probable events may help the processor maintain the structural and semantic cohesiveness of the story.

Developmental differences should occur when certain types of categories are deleted from a story. Children below the age of six or seven have a great amount of difficulty in spontaneously generating the cause of a subsequent behavior or in proceeding in reverse fashion through a logical chain (Brown, in press). Therefore, when the first category in an episode is deleted, young children may have more difficulty adding information to the story than older children.

Construction of Stories

The final issue to be discussed is the spontaneous construction of new stories. It is assumed that the structures that influence the comprehension of stories also influence the spontaneous generation of stories. Thus, the type and sequence of categories generated in spontaneous stories should be similar to the proposed internal representation.

From our initial inspection of stories generated by children in school situations, there appear to be critical differences between story comprehension and spontaneous story production. Children in first and second grade frequently generate stories that include only major and minor setting statements, e.g., descriptions of characters' physical states, activities, and recurrent desires. Older children begin to generate behavioral sequences defined in an episode but omit critical categories and relations which are critical in the development of a logical sequence of events. Some stories contain several episodes in succession which have no relation to one another. Even in our examination of adult story production, irrelevant themes often pervade the story sequence; the storyteller often forgets what type of information he already generated and begins an entirely new behavioral episode. One of the critical differences between the comprehension of stories

and the spontaneous construction of stories is that in the former the complete logical sequence is inherent in the story, i.e., the items are prearranged. When a subject spontaneously constructs a story, the logical relationships between categories and/or episodes are often not apparent to the subject until after he has begun production. In order for the story to contain a logical flow of events, many subjects may have to rework the information they have generated in order to develop all possible productions.

These predictions were all generated from the model of processing inherent in our schema. However, they remain to be tested. They are presented to define the types of organizational processes used during story encoding and retrieval. While the studies presented in this paper offer support for the category distinctions and the interrelations between categories, the validation of the schema as a reliable construct for predicting more general aspects of story comprehension remains a long-term goal.

ACKNOWLEDGMENTS

We thank Lois Orchard, Sally Rude, and Patti Schwartz for assistance in data collection, and express our gratitude to Merlynn Bergen, Lois Orchard, Tom Ludwig, and John Stern for helpful comments on an earlier draft of this manuscript. We are extremely grateful to Mr. Elmer Schweiss, principal of Spoede School, and Mr. Joe Brown, principal of Old Bonhomme School, for their continuing patience and support of our research.

REFERENCES

- Bartlett, F. C. *Remembering: A study in experimental and social psychology*. Cambridge, England: Cambridge University Press, 1932.
- Bearison, D. J., & Isaacs, L. Production deficiency in children's moral judgments. *Developmental Psychology*, 1975, 11, 732-737.
- Berndt, T. J., & Berndt, E. G. Children's use of motives and intentionality in person perception and moral judgment. *Child Development*, 1975, 46, 904-912.
- Bransford, J. D., & McCarrell, N. S. A sketch of a cognitive approach to comprehension. Some thoughts about what it means to comprehend. In W. B. Weimer & D. S. Palermo (Eds.), *Cognition and symbolic processes*. Washington, D.C.: Winston, 1974.
- Brown, A. L. The development of memory: Knowing, knowing about knowing, and knowing how to know. In H. W. Reese (Ed.), *Advances in child development and behavior*, Vol. 10. New York: Academic Press, 1975. Pp. 103-152.
- Brown, A. L. The construction of temporal succession by preoperational children. In A. D. Pick (Ed.), *Minnesota symposium on child psychology*, Vol. 10. Minneapolis, Mn.: University of Minnesota, 1976.
- Colby, B., & Cole, M. Culture, memory and narrative. In R. Horton & R. Finnegan (Eds.), *Modes of thought: Essays on thinking in Western and non-Western societies*. London: Faber & Faber, 1973. Pp. 63-91.

- Fillmore, C. The case for case. In F. Bach & R. Harms (Eds.), *Universals in linguistic theory*. New York: Holt, Rinehart & Winston, 1968.
- Flappan, D. *Children's understanding of social interaction*. New York: Teacher's College Press, 1968.
- Fraisse, P. *The psychology of time*. New York: Harper & Row, 1963.
- Johnson, R. Recall of prose as a function of structural importance of the linguistic unit. *Journal of Verbal Learning and Verbal Behavior*, 1970, 9, 12-20.
- Kintsch, W. *The representation of meaning in memory*. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1974.
- Kintsch, W. In comprehending stories. Paper presented at the Carnegie Symposium on Cognition, May, 1976.
- Lord, A. B. *The singer of tales*. New York: Atheneum, 1965.
- Mandler, J. M., Johnson, N. S., & DeForest, M. A structural analysis of stories and their recall: from "Once upon a time" to "happily ever after." Center for Human Information Processing Technical Report, April, 1976.
- Paris, S. G. Integration and inference in children's comprehension and memory. In F. Restle, R. Shiffron, J. Castellan, H. Lindman, & D. Pisoni (Eds.), *Cognitive theory*, Vol. I. Hillsdale, N.J.: Lawrence Erlbaum Associates, 1975.
- Piaget, J. *The language and thought of the child*. London: Routledge & Kegan Paul, 1960.
- Piaget, J. *The child's conception of time*. London: Routledge & Kegan Paul, 1969.
- Propp, V. *Morphology of the folktale*. Bloomington, Indiana: Indiana University Research Center in Anthropology, Folktale and Linguistics, 1958, P. 10.
- Rumelhart, D. E. Notes on a schema for stories. In D. G. Brown & A. Collins (Eds.), *Representation and understanding: Studies in cognitive science*. New York: Academic Press, 1975. Pp. 211-236.
- Schank, R. The structure of episodes in memory. In D. G. Brown & A. Collins (Eds.), *Representation and understanding: Studies in cognitive science*. New York: Academic Press, 1975. Pp. 237-272.
- Stein, N. L., & Glenn, C. G. A developmental study of children's recall of story material. Paper presented at the Society for Research in Child Development, Denver, 1975.
- Stein, N. L., & Glenn, C. G. An analysis of story comprehension in elementary school children: A test of schema. *Resources in Education*, Vol. 11, No. 8, August, 1976.
- Yendovitskaya, T. V. Development of Memory. In A. V. Zaporazhets & D. B. Elkonin (Eds.), *The psychology of preschool children*. Cambridge, Mass.: MIT Press, 1971. Pp. 89-110.