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ABSTRACT

To better understand the early stages of literacy, a study investigated how young children learn about the registers of the written story genre. Subjects, 47 kindergraten children, were individually read to and then asked to "pretend-read" one or two selected picture storybooks on three consecutive days; their readings were audiotaped and their comments--with the adult's responses--were also recorded. Results of a textual-linguistic analysis showed that by the third reading, children's pretend readings were already close approximations of the actual text, although all of the children had been initially unfamiliar with the stories. Findings indicated (1) that these approximations could not be explained simply in terms of rote memory; and (2) that, by the time they reach kindergarten, children are fairly sensitive to written language registers; (3) that the development of these registers, characterized by various kinds of approximations and overextensions, is a constructive process in children's cognitive/linguistic development; and (4) that some element triggers children to create implicit rather than explicit meanings from texts, allowing them to learn to read by reading. Overall, findings suggested that the message dimension of written language provides an important continuity from prereading to reading. (The two stories used in the study, coding examples of the token types for each book, a 10-page bibliography, and extensive statistical data are appended.) (JD)

Learning to Read by Reading: Exploring Text Indices for Understanding the Process

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Final Report

to

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The Lazy Bear (Wildsmith, 1973) and The Owl and the Woodpecker (Wildsmith, 1971) were reprinted in Appendices A and B with permission from Oxford University Press.

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The data analyzed in this report are part of a larger research project. My co-principal investigator of the project is Elga Brown, Eugene Public Schools, Eugene, OR 97403.

Running Head: LEARNING TO READ BY READING

Abstract

This report argues that an essential factor in becoming literate is young children's developing an understanding of the registers of written language. In order to explore what might be involved in this process, kindergarteners' reading-like behavior is examined. Children's three pretend readings of two picture storybooks are analyzed in terms of approximate, ambiguous, and five types of extrapolated tokens, text indices derived from the analytic scheme employed in the study. Different patterns of these tokens across the children's three readings were observed, suggesting that children use various constructive strategies to acquire a familiarity with the conventional registers of typical written story language.

Learning to Read by Reading: Exploring Text Indices for Understanding the Process

Smith (1982) has argued that there are two insights that young children must acquire in order to learn to read: they must develop an understanding that (1) print is meaningful, and that (2) written language is different from speech. Recent research (Ferreiro & Teberosky, 1982; Goodman, 1980; Harste, Burke, & Woodward, 1981; Harste, Woodward, & Burke, 1984; Heibert, 1978) has indicated that the roots of the first insight can be found in the preschool "prereading" child who generates and tests hypotheses about the meaning and function of labels and signs found in his or her everyday world.

The written language of labels and signs (which consist of single words or small groups of words or phrases), however, is "contextualized" print (Cochran-Smith, 1984) and its role of language is similar to typical oral or spoken language (Smith, 1982). Typical oral language is language which accompanies action. The perceptual environment and the shared or negotiated perspective between speakers are taken for granted when using oral language (Wells, 1981a). Paralinguistic parameters in such environments, thus, are a large part of the relevant context for the language being used since this kind of environment provides cues to its meaning. Indeed, as Wells (1981a; 1986) has argued, it is in these contexts of interaction that children become communicators during the preschool years. Donaldson (1978)

has argued a similar thesis regarding oral language development-- in interpreting social situations, young children interpret and learn the language "embedded for them in the flow of events which accompany it" (p.88).

It is in these everyday face-to-face encounters, preschool children acquire conversational strategies and develop linguistic procedures in order to take turns and collaborate with others in the construction of meanings (Bruner, 1983; Wells, 1981a). In doing so, young children learn much about the lexicogrammatical realizations of the language system so that they are able to control a variety of different oral language registers to express their meanings. They learn to calibrate their linguistic choices to the features of particular social contexts-- the setting, the participants and the specific task at hand.

In contrast to this "ancillary" role of oral language, the role of typical written language is "constitutive" (Halliday, 1977; Hasan, 1984c). Written communication occurs across space and time. The perceptual environment in which the language is being used is no longer shared by interlocutors, who, as reader and writer, are usually unknown to each other. Written language, thus, is necessarily "disembedded" from the immediate here-and-now perceptual situation in which it occurs (Donaldson, 1978). As Tannen suggests (1985), written discourse relies less on immediate context factors or interpersonal contribution or involvement, but instead is more <u>message-focused</u> discourse.

In Halliday's (1977) words, a written text "creates its own immediate context of situation, and the relating of it to its environment in the social system is a complex and technical operation" (p. 198). In other words, written language must provide, by itself, its own relevant context.

Thus, the second insight involves children realizing differences of relevancy regarding oral and written language. Certainly, basic concepts and principles regarding the visual or medium aspects of the written language system are involved in learning to read (Clay, 1975, 1979, 1982; Ferreiro & Teberosky, 1982; Heibert, 1981; Mason, 1980, 1981; Mason & McCormick, 1981; Robeck & Wiseman, 1982). However, making sense of written language entails much more than the decoding or deciphering of printed symbols (Cochran-Smith, 1984). To become literate the young child must also come to terms with certain important features of written communication-- its sustained organization, its characteristic rhythms and structures, and the disembedded quality of written language (Wells, 1985). That is, an essential factor in young children's literacy development is their understanding that the meanings communicated through typical written language are realized or expressed by different lexicogrammatical patterns or registers (Halliday & Hasan, 1976).

Many argue that young children learn about written language on this message level only by being read to, by hearing written language read aloud (Cambourne, 1981;

Holdaway, 1979; Smith 1982; Teale, 1984; Wells, 1981b, 1982, 1985). Extensive, repetitive experiences with a range of favorite books enable children to learn these different registers or conventions of written language (Smith, 1982), develop a "literacy set" (Holdaway, 1979) regarding these conventions, and begin to acquire a metalinguistic awareness of written text (Sulzby, 1981, 1985; Sulzby & Otto, 1982). Thus, the roots for the second insight Smith argues as being essential in becoming literate can also be found in the preschool "prereading" child who has had these shared-book experiences.

Many observers have noted that when young prereading children have been read storybooks, they frequently and independently have "re-enacted" or "pretended to read" their favorite books (Butler, 1980; Crago & Crago, 1983; Holdaway, 1979; Schickendanz & Sullivan, 1984; Sulzby, 1985; Taylor, 1983). During storyreading sessions, naturalistic and case studies have indicated that important interpersonal interactions and negotiations about aspects of books occur between young children and their parents or teachers (Cochran-Smith, 1984; Crago & Crago, 1983; Heath, 1982, 1983; Snow, 1983; Taylor, 1983; Teale, in press; Wells, 1986). But in pretend reading-- or what I have also termed "protoreading" (Pappas, in press)-- children attempt to tackle the text on their own. Although they cannot as yet read the words of the text conventionally, their "role play" reading (Holdaway, 1979, 1986) provides a pragmatic way for

them to focus on the message or the constitutive nature of written texts.

Some studies have examined the nature of this reading-like behavior by noting how children of different ages have read the same favorite book (Holdaway, 1979) or noting how children of the same or different ages read different favorite books (Sulzby, 1985). Most of the findings of these studies have been reported by general descriptions (Clay, 1979; Doake, 1985; Holdaway, 1979) or by classifying children's attempts to "read" in terms of whether they are governed by pictures or not, whether they were oral language-like versus written language-like, and so forth (Sulzby, 1985). No detailed linguistic analyses have been performed on this reading-like behavior, and for the most part, studies have only examined children's single re-enactments. It has been reported, however, that when children have attempted to "read" the same book over and over again, their readings sound more and more like the book-- that is, the children begin to approximate the text of the book read to them (McKenzie, 1977). In the final stage of this approximation process, young children can frequently even recite almost verbatim their favorite books, which has often been dismissed as "rote memorization." However, current research (Pappas & Brown, in press a, in press b; Sulzby, 1985) indicates that a very different process may be at issue-- children use constructive

cognitive/linguistic strategies in their efforts to pretend read a book.

The present report describes a linguistic analysis to examine children's three "pretend readings" of each of two different picture storybooks read to them. Rather than show that the children's readings include certain vocabulary words or grammatical sentence constructions found in the book read to them-- which is the usual way children's understandings of written language "dialect" (Clay, 1979; Doake, 1985; Holdaway, 1979) are reported-- an attempt is made here to describe their reading development in terms of textual indices that reflect the ways vocabulary words and sentence constructions are connected in the text of each picture storybook that children read.

A picture storybook is defined as a book that has pictures, but the illustrations are only extensions of the text or linguistic message (Huck, 1976). That is, the pictures may enrich the interpretation of the story, but they are not necessary for its understanding-- the text of the book "stands on its own." Thus, while a picture storybook provides a pictorial content, its linguistic message is coherent and "constitutive" without pictures-- it is a good example of typical written story language. That does not mean that young children do not use the structure of this pictorial content to help them construct the linguistic message. What is important, however, is that they also begin to rely more on the structure of the

linguistic message. While pictures still seem to play an important role in this process, their function tends to be more and more defined in terms of the particulars of the linguistic message. That is why a picture storybook is a suitable vehicle for looking at children's developing cognitive and linguistic procedures for dealing with the registers of written language.

An analysis of how children construct and sustain monologic story discourse (Britton, Burgess, Martin, McLeod, & Rosen, 1975) can reveal information about literacy development that is not available from other sources. Schema-theoretic approaches to young children's comprehension of stories have emphasized the constructive process of making sense of stories (Stein & Glenn, 1977; Stein & Trabasso, 1981). Yet the stories used in these experiments are rarely real children's stories; they are usually very short, lack pictures and a real author, and are constructed specifically for experimental purposes. Moreover, this research is usually cross-sectional, not longitudinal. Thus, while this research has contributed greatly to our understanding of the development of children's comprehension of narrative prose, the findings of this research are still limited. Reading a real book to a child several times and then each time inviting the child to take his/her turn to "read" it is tapping the reading comprehension process from a different pragmatic perspective. It is a more ecologically valid means to

discover how young children's schemata for the story genre might develop. It will enable us to explore how children deal with the contradictions and inconsistencies that may arise (Markham, 1979; Stein & Trabasso, 1981) as they attempt to penetrate the intentions of an author (Pappas, 1984) and understand the motives and social plans and actions of the characters of a story (Bruce, 1980).

The text-linguistic analytic scheme used in the study describes how the content or message of the text of the book is organized-- its constitutive nature-- and then compares children's three constructions of that text. What is being explored here, then, is how children are coming to understand the registers of written story language, or "the development of familiarity with the ways in which language is used in characteristically written as opposed to spoken communication" (Wells, 1985, p. 249).

Method

Subjects

The subjects, whose pretend readings will be the focus of this report, were middle-class children who attended either a morning or afternoon kindergarten session at a public school in a small university city in the northwestern United States and who were taught by the same teacher (my co-principal investigator in the research project) who used no formal reading program.

The study began in the spring of the children's kindergarten year. They were read two picture storybooks

written by Brian Wildsmith-- The Lazy Bear (1973) and The Owl and the Woodpecker (1971). The children read The Lazy Bear first and then read The Owl and the Woodpecker approximately three-four weeks later. These books were chosen for study because they were coherent texts and good examples of the story genre. Pilot work indicated that they were books that young children enjoyed, and although the books could be found in most public libraries, they were ones that most children were unfamiliar with. Twenty-seven children (13 boys; 14 girls) read The Lazy Bear, twenty children (10 boys; 10 girls) read The Owl and the Woodpecker, and nineteen children (9 boys; 10 girls) read both books.

Procedure

The children were read each of the two picture storybooks three times (on consecutive days for each book). They were individually taken out of their classroom for these reading sessions. Each time a book was read to a child, the child was then invited to take his/her turn to "read" it. We merely told the children, who did not as yet read in the traditional sense, that we were interested in their ideas about reading books. We acknowledged that they might not be able to read the book "for real," but suggested that they could read it "their own way"-- they could "pretend read" it if they wanted. Nothing specific about the book (initially unfamiliar to them) was pointed out to the children before reading to them, but the adult reader

(the author of this report) did respond to any questions and comments they had about the book.

In summary, there were three reading sessions for each book and each session consisted of reading a book to the child and then having the child read it. When children took their turns to read, they were in charge of the book, turned the pages and so forth. All of the children used a "reading" voice, not a "telling the story or pictures" voice-- that is, they did indeed pretend to read.[1] The children's readings were audio-taped and the children's questions/comments and the adult's responses were either audio-taped or written down immediately after the reading session.

Description of the Text Analysis

The text-analysis scheme used in study has relied on text-linguistic notions from the systemic-functional grammar model (Fries, 1985; Halliday, 1977, 1985; Halliday & Hasan, 1976; Martin, 1983), and especially on the work done by Hasan (1980, 1984a, 1984b, 1984c). The analysis scheme investigates aspects of both global text structure and of texture or properties of cohesion. First each book was analyzed and then the children's three readings were analyzed by comparing their wording patterns with those of the book.

Global Text Structure Analysis

The global text structure scheme developed by Hasan (1984a, 1984c) was applied to each book. In this scheme

there are obligatory or necessary elements which any story must include, and optional elements which may or may not be realized in a particular story. The Initiating Event (IE), Sequent Event (SE), and Final Event (FE) of the global structure are obligatory elements; the Placement (P), Finale (F), and Moral (M) are optional ones. Briefly, Placement is an element where characters are introduced, and where some information about the time or locale of the story or about what characters habitually do may be provided; the Initiating Event is the element in which the conflict or problem of the story emerges; the Sequent Event describes characters' attempts to resolve the conflict or problem; the Final Event is the global element where resolution of the problem/conflict gets settled; the Finale is a restoration of the habitual or normal state of affairs; and, the Moral is where a moral claim is made.

The text of each book in the study, of course, possesses these obligatory elements-- an Initiating Event (IE), a Sequent Event (SE), and a Final Event (FE). Both books also have the optional element Placement (P)-- a "discrete" Placement which precedes the Initiating Event. The second book children read, <u>The Owl and the Woodpecker</u>, also has the optional element Finale (F) which follows the Final Event. The first step of the analysis, then, was to identify and label the global structure elements (GSEs) on the text of each book and on each of the children's three readings of each book. Appendices A and B contain the texts

of The Lazy Bear and The Owl and the Woodpecker, respectively, coded in terms of these global elements.

Texture Analysis

The texture analysis was then performed on the text of each book and then on the children's three reading texts of each book. For each book, this analysis involved several stages.

Identification of Identity Chains. The first step was to identify Identity Chains. Identity Chains are determined by looking at the means by which the author or child-reader used pronouns or referent items (Halliday & Hasan, 1976) to talk about identical elements (e.g., characters, things, objects) in the story. Eight Identity Chains were identified in The Lazy Bear: the Bear, Raccoon, Deer, Goat characters; the wagon; the other animals in the forest; the hill, and the pond. Seven Identity Chains were identified in The Owl and the Woodpecker: the Woodpecker and Owl characters; the Woodpecker's and Owl's trees; the other animals in the forest; the forest; and the storm.

Identification of Similarity Chains. The next step in the texture analysis was to identify Similarity Chains. Again, the analysis of each book was done first. Wordings entered into particular Similarity Chains as tokens when they had a similarity in meaning. The traditional standard meaning relations of synonymy, antonymy, hyponymy (and co-hyponymy), and meronymy were used (Fries, 1985; Hasan, 1980, 1984b; Pappas, 1981, 1985; Rentel, King, Pappas, &

Pettegrew, 1983). Occasionally, strong collocational associations were used to determine these semantic fields and place tokens in Similarity Chains. Twenty-five Similarity Chains were found in The Lazy Bear text; twenty-six were determined in The Owl and the Woodpecker. Two miscellaneous sets of wordings were also formed in the analysis for each book-- a Peripheral Set which consisted of all of the lexical tokens which could not be included in any chain-- and a Conjunctive Set (which will not be considered in the present analysis) that included conjunctions and story markers such as once-upon-a-time.

Interactions between Identity Chain and Similarity Chain tokens. The third step of the texture analysis is to identify the relationships which obtain between individual Identity and Similarity Chain tokens. Figure 1A displays the first four units of The Lazy Bear and the analysis for those units. Figure 1B displays the first three units and the illustration of the analysis for The Owl and the Woodpecker. Each figure depicts Identity and Similarity Chain tokens, as well as relations between tokens (indicated by the lines connecting tokens). These relations are the role relations derived from the transitivity system networks in the systemic-functional model (Halliday, 1967a, 1967b, 1968, 1985). These meaning relations have to do with the sense of content-- they concern the clause in its ideational function, that is, how the clause represents patterns of experience (Halliday, 1985). These relations can be simply

described as sayer and process of saying; doer, doing and thing affected by doing; action and manner of action; and so forth (Hasan, 1980, 1984b; Pappas, 1981, 1985). Thus, by referring to Figure 1A, 'find' and 'had-been-left' tokens relate to or interact with tokens of 'wagon' in terms of an action-goal relationship; these actions also interact with the 'hill' tokens ('top-a-hill' and 'there {hill}') as circumstances of location. Similarly, interactions can be pointed out in Figure 1B: `Woodpecker' and 'Owl' tokens interact with tokens of 'sleep' and 'work' in terms of an actor-action relationship; and the actions of 'sleep' and 'work,' in turn, interact with the temporal circumstances of 'all-day' and 'all-night.'

Insert Figures 1A and 1B about here

The texture analysis of the children's three pretend readings of each book determined if wordings could be placed in an Identity or Similarity Chain identified in the analysis of the book; if they could, it noted whether the tokens interacted in the same way as in the book. The analysis of each book depicts how chains interact-- how the "bear," "raccoon," "deer," and "goat" all "push" "up" and also "ride" "down" the "hill" in The Lazy Bear and how the "owl" and "woodpecker" "live" and "move" and also "sleep" and "wake up" in The Owl and the Woodpecker. Thus, each analysis shows aspects of each text's "constitutive" nature,

and in doing so, it exemplifies the register of story discourse. The analysis of the children's texts enables us to see the ways and the extent to which they are using this organization of the message of each book, its characteristic written textual patterns. And, since the analysis of children's reading texts captures the ways they are approximating this coherence of each book's message, it taps their development of familiarity with this written register.[2]

Description of token types. The analysis of the children's three readings distinguished seven types of tokens: approximate tokens, ambiguous tokens, and five kinds of extrapolated tokens. Below are definitions and explanations of these seven tokens. More specific examples from children's texts for each book can be found in Appendix C.

Tokens were considered to be approximate tokens when they met a two-pronged criterion: (1) when they could be placed in the same chains as those determined in the analysis of the book; and, (2) when tokens in the chains in the child's text were related to (or interacted with) each other in the same way as those found in the analysis of the book.

Ambiguous tokens arose when children used referent items in such a way that someone who did not know the story would have difficulty in determining the source of interpretation for them. Unclear Identity Chain tokens as

well as tokens from other chains related to them in a clause were designated as ambiguous tokens.

Five types of extrapolations were distinguished in the analysis of children's readings. The first three were termed 'extrapolated misplaced' tokens. They were very similar to approximate tokens, but some feature about them barred them from being approximate tokens. These features will be described below. The other kinds of extrapolated tokens were called 'extrapolated tangential' tokens. These two types had to do only with the first criterion for approximate tokens-- namely whether or not children's wordings could be placed in the Identity and Similarity Chains of the book.

Misplaced Extrapolations.

An extrapolated misplaced element (EME) token is an extrapolated misplaced token which would have been an approximate token, but it was found in the wrong global structure element. For example, children sometimes introduced the owl with the woodpecker in the Placement in their readings of The Owl and the Woodpecker, which is not consistent with the book. In these cases the 'Owl' token was coded as extrapolated misplaced element (EME) token.

An extrapolated misplaced contradictory (EMC) token is an extrapolated misplaced token which could be placed in any of the Identity or Similarity Chains established for the book and could be found in the same global structure element, but it also contradicts information that is

realized in the book. A frequent use of an extrapolated misplaced contradictory token, for example, was children's stating incorrectly that characters other than the goat character "had an idea" at the beginning of the Final Event of The Lazy Bear.

An extrapolated misplaced redundant (EMR) token, the third type of misplaced tokens, has to do with redundancy. It is a token which can be placed in the same chain established during the analysis of the book and enters in the same semantic role relationship as that of the book, and would have been coded as an approximate token, except that the child has already realized that token and relationship in that global structure element. The process "push" was involved in many extrapolated misplaced redundant tokens in both books. In The Lazy Bear, they occurred in all three obligatory global structure elements-- for example, when the bear pushed the wagon up the hill over and over again in the Initiating Event, when the raccoon, deer and goat repeatedly pushed the bear up the hill in the Sequent Event, and when the bear pushed his friends up the hill too frequently in the Final Event. In The Owl and the Woodpecker, the extrapolated misplaced redundant 'push' tokens were found in the Sequent Event when the animals of the forest attempt to push down the owl's tree to get him to leave.

Tangential Extrapolations.

The two extrapolated 'tangential' tokens have to do with children's inferences explicitly realized in their

reading texts. Extrapolated tangential relevant tokens deal with direct inferences and the extrapolated oblique ones concern more indirect inferences. These tangential inferences appear to be to similar to what Bruner (1986) calls "triggers" of presuppositions or implicit meanings in narratives. (More will be said about Bruner's work and how it is related to an interpretation of children's token patterns in their readings in the last section of the report.)

An extrapolated tangential relevant (ETR) token is relevant because it can be placed in one of the chains established during the analysis of the book, but it is also tangential in that we cannot find it relating to or interacting with another token in a similar way as in the book. Extrapolated tangential relevant tokens were frequently found in the beginning of the Initiating Event of The Lazy Bear. The first unit of this global element is: and one day, at the top of a hill, he found a wagon. Children frequently preceded approximate tokens for this unit with a statement like "one day the bear went for a walk" or "one day he climbed a hill." In other words, a direct inference of finding a wagon on a hill is first going for a walk or climbing that hill.

Extrapolated tangential oblique (ETO) tokens are involved in inferences, but they are more indirect than extrapolated tangential relevant tokens. They are considered oblique (or more indirect) because they cannot be

placed in any of the chains established during the texture analysis of the book. The most variability among children was seen with respect to extrapolated tangential oblique tokens. However, one oblique token-- 'play'-- was found in some children's readings of both books.

Summary

What do these seven indices tell us regarding what and how children learn the story genre? Increases of approximate tokens are clear indicators of how children learn the language and register of the books. Ambiguous tokens reflect their use of exophoric implicit encoding devices (Halliday & Hasan, 1976) common in oral language communication, but not appropriate in typical written language which is more "constitutive" (Halliday, 1977; Hasan, 1984c). In typical written language the sources of interpretation for pronouns or other implicit devices must be found in the text itself, not in the situation in which the language is being used. Although some wordings of the book may have been learned, the fact that such wordings are related to unclear referents indicated a child's lack of control of conventional registers of written language.

It may be argued that use of exophoric references is appropriate in the context of reading a picture storybook, especially if such a reference seemed to be a character/animal in a picture on a page the child was reading. This argument, however, does not account for certain evidence obtained in children's readings.

Certainly, one characteristic of a good picture storybook is that its pictures extend and enrich the linguistic message. It was expected, therefore, that children would use the pictures to sustain their pretend readings. However, there is ample evidence in children's protocols of their intention to read a message. Distinctive "voice" shifts occurred when they were "reading" as opposed to when they were having a conversation with the adult about aspects of the book. The fact that the task taken on by the children was one of "reading" the book, not telling the story that the researcher had read to them (where the use of exophoric references would be appropriate), argues that a decrease of ambiguous tokens across the three readings of a book indicates a greater reliance on the linguistic message of the book-- it shows something about their learning of the written story register.

While individual differences may be found in the use of approximate and ambiguous tokens in individual children's readings, the most variability was observed for extrapolated tokens. They provide clear evidence that the reading-like behavior of young children is not a matter of simple recall, even though most studies of prose recall have dismissed or have not even counted children's so called "extraneous" elaborations (e.g., Paris, 1975) or what are being called here extrapolations. However, from my perspective, it is the patterns of these extrapolations, along with children's patterns of approximate and ambiguous tokens across the

three readings, that will enable us to see what kinds of strategies children have used to learn about the organization of the message of the books read to them. In different ways the extrapolated misplaced element (EME), extrapolated misplaced contradictory (EMC), extrapolated misplaced redundant (EMR), and extrapolated tangential relevant (ETR) tokens show how a child is utilizing the resources of the text; they might be seen as overextensions of certain aspects of the texture patterns, a phenomenon seen in many other areas of children's cognitive and linguistic development. Extrapolated misplaced redundant tokens are clear cases of such overextensions since they are repetitions of the token-interactions identified in the analysis of the book. The same may be true for extrapolated misplaced element tokens that reflect how a child is learning to identify and classify these textural patterns of the book into the various global structure elements.

Extrapolated misplaced contradictory tokens are also approximations of the book's textural patterns, but some aspect of that approximation is inconsistent with the book. Extrapolated tangential relevant tokens draw on the Identity and Similarity Chains established for each book and since they depict reasonable inferences of the book, they may be only a different kind of redundancy, a different kind of approximation of the linguistic message. Thus, only extrapolated tangential oblique tokens go beyond text

resources altogether-- here the interaction between reader and text is more biased toward the reader.

Reliability

Thirteen texts were randomly drawn from the corpus of children's reading texts for each book. In order to furnish inter-rater reliability for the text-analysis scheme described in the paper, the thirteen texts of each book were coded by myself and a graduate research assistant trained in the use of the scheme. The inter-rater correlation coefficients for two total variables-- total tokens and total extrapolated tokens-- and the seven types of tokens, which served as dependent variables in the study, can be found on Table 1.

Insert Table 1 about here

As Table 1 indicates, all of correlations were significant for both books. Moreover, most of the coefficients were quite high; the lowest were .77 for the ambiguous token variable in The Lazy Bear texts and .75 for the extrapolated misplaced contradictory token variable in The Owl and the Woodpecker texts.

Results/Discussion

Three sets of analyses were performed on the data. Analyses A examined children's readings of The Lazy Bear; Analyses B examined their readings of The Owl and the

Woodpecker; Analysis C compared children's readings of both books.

Analyses A: Analyses on The Lazy Bear Data

Two MANOVAs were performed on children's readings of The Lazy Bear. MANOVA 1A was a one-factor repeated measure design with Reading (One, Two, Three) serving as the within-subjects treatment comparison. MANOVA 1B was a two-factor repeated measure design: it included the Reading comparison, but also included a Global factor (Initiating Event, Sequent Event, Final Event) to examine token patterns in the three obligatory global structure elements within each Reading. (Since the Placement of both books was the same in that each consisted of 13 tokens, and because Finale was an optional global element realized in The Owl and Woodpecker, but not in The Lazy Bear, it was decided to restrict the inquiry just to the obligatory elements.) The dependent variables for both MANOVAs were frequencies of the seven token types described in the preceding section: approximate (APP) tokens, ambiguous (AMB) tokens, extrapolated misplaced element (EME) tokens, extrapolated misplaced contradictory (EMC) tokens, extrapolated misplaced redundant (EMR) tokens, extrapolated tangential relevant (ETR) tokens, and extrapolated tangential oblique (ETO) tokens.

MANOVA 1A: Total tokens by Reading. Manova 1A examined the total token patterns used by the children who read The Lazy Bear (N = 27: 13 boys; 14 girls). MANOVA 1A

resulted in a significant effect for Reading: $F(14,92) = 3.44$, $p < .0002$. Table 2 shows the means (and standard deviations) for each token type by Reading.

Insert Table 2 about here

Reading Factor Follow-Up: To determine the nature of the reading factor differences, a discriminant analysis was performed. Both standardized discriminant function coefficients and canonical or structure coefficients were determined. However, since standardized discriminant scores are unstable if two or more of the dependent variables are highly correlated (which is the case here), the structure coefficients-- which are the correlations between the original variables and the discriminant scores-- were used for interpretation.[3] Both kinds of discriminant scores, as well as univariate ANOVAs, are presented in Table 3.

Insert Table 3 about here

Taken together these follow-up techniques indicate that the best discriminators for Reading differences were first, the use of the approximate token variable, and second the ambiguous token variable. As Table 2 shows, approximate tokens increased across the three readings ($\bar{X} = 103.81$ for Reading 1; $\bar{X} = 130.89$ for Reading 2; $\bar{X} = 149.56$). The ambiguous token variable, however, showed decreased use from

Reading 1 (X = 7.07) to Readings 2 and 3 (X = 4.41 and X = 4.81, respectively). A third variable, the ETO token type--which decreased across the three readings-- also contributed to discrimination, but not nearly as strongly as the other two. (It had the third highest structure coefficient value, the second highest standardized coefficient value, and an ANOVA level of significance of .18.)

Discussion: Simultaneously considering the mean differences, structure coefficients, and significance tests, several conclusions can be entertained. Learning to read by reading is characterized by an increase use of "book language." Although children were not initially familiar with The Lazy Bear, their increased use of approximate tokens across three pretend readings indicates that they are extremely sensitive to the wording patterns of it. Although children did not use ambiguous tokens as nearly as frequent as approximate tokens (indeed, the value of the structure coefficient is much lower relative to the one for the approximate token variable), it is significant that, at the same time their approximate tokens increased, their initial lack of control with respect to their use of implicit encoding devices was replaced by more clear and considerate ones in subsequent readings. Many of the pronouns, for example, initially appeared to refer exophorically to characters in illustrations. Presumably not needing the illustrations as much to sustain the story monologue in the subsequent readings, they began to use more endophoric

references (Halliday & Hasan, 1976) whose sources of interpretation were provided in the discourse they were constructing.

Since the extrapolated tangential oblique (ETO) token variable was a much weaker discriminator for reading differences, an interpretation of its decreased use (from $\bar{X}$ = 15.07 in Reading 1 to 8.30 and 6.14 to Readings 2 and 3) can only be speculative. Recall that ETO tokens are ones which cannot be placed in any of the Identity or Similarity Chains established for the book. They are idiosyncratic constructions, but are evidence of the constructive nature of reading-like behavior (and reading, in general). The characters "playing ring around the rosies," and the raccoon/deer/goat being "excited" or "sterious" (instead of their being "curious") are some examples of oblique tokens. They are indicators of how aspects of the message of the book trigger reader schemata for individual children. Again, perhaps to aid their construction of the message of a new book or to tackle how written story registers are realized, children rely on their world knowledge and knowledge of other books on their initial reading. Then, as they become more familiar with a particular book at hand, or the written story register in general, these oblique tokens from their reader-schemata become constrained to focus more on the specific clues provided by the author to comprehend the particular message and the ETO tokens are either dropped

altogether or replaced by approximate tokens in the later readings.

MANOVA 2A: Tokens by Global and Reading. MANOVA 2A examined how children used tokens within the global structure elements in their three readings. The effects for Reading, Global, and Reading X Global were all significant. However, only interpretation for the Reading effect-- $F(14,92) = 3.30$, $p < .0003$-- and the Reading-Global interaction-- $F(28,348) = 1.58$, $p < .04$-- will be evaluated. Each global element consisted of a different number of tokens: the Initiating Event was 90 tokens long; the Sequent Event consisted of 183 tokens; and the Final Event had 194 tokens. Thus, the fact that the Global effect was significant was irrelevant. Table 4 shows the means (and standard deviations) for this MANOVA 2A analysis.

Insert Table 4 about here

Reading Factor Follow-Up/Discussion: Table 5 provides the results of the discriminant analysis and univariate tests of significance.

Insert Table 5 about here

As in MANOVA 1A, the best discriminators for reading differences were approximate and ambiguous variables. Once again the approximate tokens increased across the three

readings and the use of ambiguous tokens decreased from Reading 1 to Readings 2 and 3. Moreover, the extrapolated tangential oblique (ETO) variable again acted as a weak discriminator. It had the same discriminant score ranking as it had in the MANOVA 1A analysis, but since its univariate level of significance was even higher than before, its contribution for discrimination must again be offered with great caution. Interpretation for these results are as stated in the preceding section.

Reading X Global Interaction Follow-Up/Discussion: Table 6 presents the discriminant analysis and univariate tests of significance for the reading-global interaction.

Insert Table 6 about here

The analyses indicate that three variables appear to contribute to the interaction differences. Once again, approximate tokens is the best discriminator. As Table 4 indicates, the approximate tokens increased in all three global elements, but the increase in the Initiating Event was a small gradual one, whereas the increases for the Sequent and Final Event were larger.

The second discriminator was the ambiguous variable. Most of the ambiguous tokens occurred in the Final Event, but even then the number was small and its use decreased only a little in the second and third readings (approximately 5 in Reading 1 and around 3 in Readings 2 and

3). Two factors seemed to be responsible for the greater use of ambiguous tokens in the Final Event. When reading the text about the bear landing in a shallow pond, many children referred to the pond exophorically by using the definite article plus noun (the pond). The illustration of the pond is predominant-- it is a two-page display. Thus, although some children did shift to a pond in subsequent readings, many continued to use the definite form. The other reason for the ambiguous tokens observed in the Final Event was children's not being clear about what animals were involved in the events subsequent to the bear landing in the pond. According to the text, the other animals of the forest come into the scene and begin laughing at the bear. These are not the raccoon, deer, or goat, who had to endure pushing the bear up the hill in the Sequent Event and had been responsible for pushing the bear into the pond in the Final Event, but many children-- by just using "the animals...laughing"-- did not clearly distinguish which animals were involved in their texts. Also, children frequently were not clear about what animals the bear pushed up the hill-- the raccoon, deer, and goat or the other animals of the forest, who at this stage in the text were "on stage."

The third discriminator for reading-global interaction differences was the extrapolated tangential relevant (ETR) variable. As Table 4 indicates, small decreases in the use of ETR tokens occurred in the Initiating Event and Sequent

Event across the the three readings. In the Final Event the opposite was seen-- small increases were observed across the readings. Interpretation of decreased use of ETR tokens (and their relation to increased use of approximate tokens) will be postponed and will be discussed under the analyses for The Owl and the Woodpecker data. Two features of the Final Event text seemed to be involved for the increased use of ETR tokens. Recall that ETR tokens reflect direct inferences explicitly stated. It is in the Final Event that resolution of the conflict between the bear and his friends (the raccoon, deer and goat) about who should be pushing the wagon up the hill gets resolved. The goat gets an idea-- namely, to push the bear over the hill-- which he shares with the raccoon and the deer and which they all finally act upon. Nothing, however, is in the text which states what the plan is, but children increasingly added information about the plan as ETR tokens. In addition, language expressing that the raccoon, deer, and goat pushed the bear over the hill was not stated in the text (the book only states: "Over the top with him."), yet many children, as they got clearer about the animals' actions being the cause for the bear landing in the pond, included these agent-action wordings.

Analyses B: Analyses on The Owl and the Woodpecker Data

The same two kinds of analyses performed on The Lazy Bear data were utilized on The Owl and the Woodpecker data. That is, MANOVA 1B consisted of the Reading repeated measure

and MANOVA 2B was a two-factor repeated design which included the Global factor (again using only the three obligatory structure elements). The seven token types (as frequencies) served as dependent variables.

MANOVA 1B: Total tokens by Reading. MANOVA 1B examined the total token patterns employed by children who read The Owl and the Woodpecker (N = 20: 10 boys; 10 girls). The Reading factor was significant: $F(14,64) = 3.47$, $p < .0003$. Table 7 presents the means for each of the dependent variables by Reading.

Insert Table 7 about here

Reading Factor Follow-Up/Discussion: Table 8 shows the results of the discriminant analysis and univariate ANOVAs.

Insert Table 8 about here

Taken together, these follow-up techniques indicate that the best discriminator for the observed reading differences are the use of approximate tokens, followed next by the use of extrapolated tangential relevant (ETR) tokens. As Table 7 indicates, approximate tokens once again increased across the three readings, with the most increase observed in Reading 2. The ETR tokens showed a decreased use across the three readings, again with the greatest decrease found in the second reading. ETR tokens are direct

inferences expressed in terms of wordings which can placed in Identity or Similarity Chains established for the book. They are a kind of paraphrase of the textural patterns of the book. Thus, they do reflect children's approximations of the text, but not as directly as the approximate, ambiguous, and extrapolated misplaced tokens. The ETR tokens frequently occurred in different places in children's three readings. Moreover, there were many instances where the ETR tokens in an earlier reading were replaced by approximate tokens in subsequent readings. Decreases of ETR use were also due to simple omission of certain ETR tokens in subsequent readings. This appeared to occur when the tokens seemed to be motivated by one of the illustrations. Thus, these two patterns-- replacing ETR tokens with approximate ones and simply dropping them-- accounted for the decreased use of the token for many children. These two patterns regarding ETR tokens were observed in The Lazy Bear data, but because the ambiguous and ETO tokens were stronger discriminators for the reading differences, this variable's contribution for the apparent differences was not as evident. Of course, the ETR variable was a factor in the reading-global interaction in The Lazy Bear data, but the increased use of the token in the Final Event (for the reasons suggested earlier) appeared to mask the presence of two patterns in that element, as well as in the Initiating and Sequent Events.

A third, but much weaker (and therefore much more tentative), discriminator for reading differences was the extrapolated misplaced element (EME) variable. The number of EME tokens used by children were small in comparison to the approximate and ETR tokens, and their use decreased across the three readings with the greatest decrease observed in the second reading. What was interesting was that the EME tokens were the same kind for most children, especially in the first reading. Most EME tokens consisted of the introduction of the owl in the Placement (instead of the Initiating Event) and the inclusion of certain language patterns from the Sequent Event in the Initiating Event--the owl hunting, animals pushing down owl's tree, and that the woodpecker had been there first. Elsewhere (Pappas & Brown, in press b) I have suggested that these EME tokens may reflect children's strategies to deal their misunderstanding about the social conflict, plans and actions of the characters in the story (Bruce, 1980).

MANOVA 2B: Tokens by Global and Reading. MANOVA 2B examined how children used tokens within the three obligatory global elements (the number of tokens of each element is: IE, 144; SE, 71; FE, 81) across their three readings. Only the Reading effect was significant-- $F(14, 64) = 4.09$, $p < .0000$. (That is, the Reading-Global interaction was not significant and the effect for Global was significant, but is not relevant.)

Reading Factor Follow-up/Discussion: Table 9 shows the means for this MANOVA 2B analysis and Table 10 presents the follow-up results for the significant Reading effect.

Insert Tables 9 and 10 about here

As in the MANOVA 1B analysis, the best discriminators for the observed Reading differences were the approximate and ETR variables-- approximate tokens increased across the three readings, with the most increase observed in the second reading, and ETR tokens decreased gradually across the three readings.

As Tables 9 and 10 show, there were three "weak" discriminators. The means for the EME, EMC, and ETO variables indicate that children did not use these much-- only the ETO token use went down gradually, the use of the other two stayed the same across the readings. These three variables had structure coefficients of about the same value; their univariate levels of significance were also about the same. The EMC tokens usually occurred when children had the wrong character saying something in the story.

Analysis C: Comparing the Two Books

Nineteen children (9 boys; 10 girls) read both books and MANOVA C, with Book and Reading serving as within-subjects treatments, was performed on these data. Since the total number of tokens of each book was different-- 480

tokens for The Lazy Bear and 331 for The Owl and the Woodpecker-- proportions (frequencies of token type/total number of tokens of book) were used here. No Book, Reading, Global MANOVA was performed because such a complex design was not appropriate for such a small number of subjects.

MANOVA C: Tokens by Book and Reading. Only the effect for Reading was significant-- $F(14,60) = 4.54$, $p < .0000$. Table 11 shows the means for the MANOVA C analysis and Table 12 presents the Reading factor follow-up results.

Insert Tables 11 and 12 about here

The approximate variable, and then the ETR one, were the best discriminators for the observed reading differences. Approximate tokens increased across all three readings, with the most increase observed in the second reading. ETR tokens decreased gradually across the three readings. The three "weak" discriminators noted in the MANOVA 2B analysis-- ETO, EMC, and EME variables-- were also observed as "weak" discriminators in the MANOVA C analysis. All three variables decreased in the second and third readings. Thus, there might have been a book influence in this analysis, but not strong enough to result in a significant effect for the book factor or the book-reading interaction.

General Discussion

The aim of the study was to identify and describe textual indices to answer questions about the early stages of literacy, more specifically to answer questions about how young children learn about the registers of the written story genre. This process of learning about the registers of written language is inherently interrelated to children's comprehension of, and memory for, written language.

The two most consistent token patterns observed across the analyses were children's increased use of approximate tokens across the three readings (with the greatest increase frequently found in the second reading) and their decreased use of extrapolated tangential relevant (ETR) tokens across the three readings. They also used extrapolated tangential oblique (ETO) tokens less and less across the three readings, but since that token was always a "weak" discriminator in the analyses, its role in learning about the registers of story language must be seen as being only speculative. The use of ambiguous tokens and two of the extrapolated misplaced tokens-- extrapolated misplaced element (EME) tokens and extrapolated misplaced contradictory (EMC) tokens-- appeared to be involved differently in children's reading of the two books. For example, the use of ambiguous tokens occurred more in The Lazy Bear, especially in the Final Event. EME and EMC tokens, on the other hand, seemed to be used more in The Owl and the Woodpecker. All three types of tokens decreased

across the readings. However, since there was no significant book (or book-reading) effect in the analysis that compared children's token patterns in the two books, and because the EME and EMC tokens were very weak discriminators, any book differences must be considered extremely tentative.

The books that children read in this study were initially unfamiliar to them, yet by the third reading, their reading texts were already close approximations of them. These findings indicate that we may have underestimated young children's sensitivity to written language registers. Green (1982), who has explored the literary discrimination of kindergarteners, has come to a similar conclusion. In her study, children were read books written by five different authors (two books per author), and then were asked to identify the authors by listening to tapes of a third book written by each author. They were also asked to say why they chose the author they did. Six of the ten children were able to identify the authorship of three or more of these five stories. According to Green, her results meant "that the children understood a whole lot more than the bare outlines. . . of plot. Making the correct judgments almost certainly entailed not only noticing and abstracting from very fine details of wordcraft, but also attending to and abstracting from global structure matters of form and content" (p. 159).

The results indicate that the approximation observed in the reading-like behavior here, however, cannot be explained simply in terms of rote memory. The onotogenesis of the registers of written language appears to be just as much a constructive process as has been seen in other areas of children's cognitive/linguistic development-- the language of books appears to be a problem-space for young children (Karmiloff-Smith, 1979) and the route they travel in learning about it is characterized by various kinds of approximations and overextensions.

A predominant pattern seen in the children's readings was the use of ETR tokens in an early reading which were then replaced by approximate tokens in a subsequent reading(s). Such a pattern was also observed to a lesser degree for the extrapolated tangential oblique (ETO) tokens. In his recent book, Bruner (1986) suggests that "genre seems to be a way of both organizing the structure of events, and organizing the telling of them-- a way that can be used for one's own storytelling or, indeed, for "placing" stories one is reading or hearing. Something in the actual text "triggers" an interpretation of genre in the reading..." (p. 6). Using Iser's (1978) term, Bruner calls this interpretation that the reader's creates a "virtual" text. He argues that a major feature of narrative discourse which is crucial in this creative process is the triggering of "presupposition," the creation of implicit rather than explicit meanings. Thus, as stated inferences, children's

ETR (and ETO) tokens appear to represent presuppositions "triggered" by aspects of the text they read. The interplay between approximate and extrapolated tangential tokens in children's texts indicates again that learning the registers of written story language entails both learning about the nature of the triggers that are provided in story texts and learning about the nature of the constructive interpretive processes that are required by those triggers.

Reading has been so narrowly defined (as "decoding" or letter/word recognition) in so much of the research and instruction in the early years that we know very little about a crucial factor in literacy development-- namely, how children go about learning about the characteristics of the written linguistic message. More traditional models of the beginning stages of reading-- for example, those of Chall (1979) and Mason (1980)-- put comprehension matters "on hold" while orthographic information is emphasized. However, the findings of this report and the growing body of research on emergent literacy indicate that these message aspects are extremely relevant in "natural" (Holdaway, 1986) written language development. That is, the message dimension of written language may provide an important continuity from pre-reading to reading (Pappas, in press), and the more traditional views about early literacy development and instruction will need to be re-evaluated in order to create successful literacy learning in early childhood classrooms.

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Footnotes

[1]Sulzby (1985) has asked young children (two-, three-, four-year-olds, and kindergarteners) to "read" to an adult from familiar, or "favorite" books, and based on the children's attempts, has identified ten types of reading behavior. I have not seen the variation of responses from my kindergarteners that she has reported for her kindergarteners. Differences of procedures existed between Sulzby's and the present study, however-- children here were encouraged to "pretend read" the book at the very onset of the reading session (and knew that they would have three turns at reading), were always read the book before they took their turn reading, and read a book initially unfamiliar to them, not a favorite, well-known one. Thus, the lack of response variation from my kindergarteners may be due to these procedural differences.

All of the pretend readings analyzed in the study are similar to Sulzby's two highest sub-categories of written language-like story-- "reading similar-to-original-story" (except that the children in the present study do self-correct when departing from actual wording of the book, which is not a characteristic behavior of this category in Sulzby's scheme) and "reading verbatim-like story."

[2]Of course, I do not claim that the analysis scheme employed in the study captures every aspect of coherence or the registers of written story language. The scheme does not analyze conjunctions, linguistic devices that tie

organic relationships between clauses (in the books and in the children's reading texts), nor does it examine the thematic structure of the clauses of the texts, and so forth.

[3]J. J. Kennedy. Personal communication, May, 1980.

Appendix A

The Lazy Bear (Wildsmith, B., 1973)

GSE	Unit	
P	1	Once upon a time, there was a bear who was so kind and thoughtful that all his neighbors were his friends.
	2	The bear liked to go for long walks,
IE	3	and one day, at the top of a hill, he found a wagon.
	4	It had been left there by the woodcutter.
	5	The bear had never seen a wagon before,
	6	and he walked all round it, and sniffed it, and at last sat in it.
	7	To his surprise the wagon began to move.
	8	As it rolled downhill, the bear felt rather frightened.
	9	But, by the time it reached the bottom, he was enjoying the ride.
	10	He liked it so much that he pushed the wagon right back up the hill, and rode down again.
	11	Time after time he pushed the wagon up the hill and rode down at great speed.
	12	"This is fun," he thought.
	13	"But I don't like having to push the wagon up the hill much."

14 Every day he rode the wagon from morning till night,

15 but the more he enjoyed the rides, the more he hated the hard work of pushing the wagon uphill.

SE 16 Then he had an idea.

17 He went to look for his friend the racoon.

18 He told him all about the wagon, and the wonderful rides, and invited the racoon to come and see for himself.

19 The racoon was naturally curious,

20 so he went along with the bear.

21 On the way, they met the deer.

22 "Come with us," said the bear,

23 "and have a ride in my wagon."

24 The deer was naturally curious,

25 so he went along with the bear and the racoon.

26 On the way, they met the goat.

27 "Come with us," said the bear,

28 "and have a ride in my wagon."

29 The goat was naturally curious,

30 so he went along with the bear, the racoon and the deer.

31 In a very short time they were all riding down the hill at a wonderful speed.

32 "This is lovely," said the racoon.

33 "This is marvelous," said the deer.

34 "Great, just great!" said the goat.

35 At the bottom, they all got out-- except the bear, who sat tight.

36 "Hey!" Come and help push," cried the racoon, the deer and the goat.

37 "What, me?" said the bear

38 If I let you ride in my wagon, the least you can do is to push me back up the hill, don't you think?"

39 And he looked so fierce, that his friends were too frightened to argue.

40 So they all went on riding downhill,

41 and the racoon, the deer and the goat went on pushing the bear back to the top.

42 "What shall we do?" they whispered to each other.

43 "This is very tiring,

44 but if we give up, the bear will get us.

45 He's not his usual kind self at all."

FE 46 Then, when they were pushing the bear uphill for the hundredth time, the goat had an idea.

47 "Listen," he whispered, urgently.

48 "I know what we'll do."

49 The others bent their heads towards him and listened to his plan.

50 The bear was busy enjoying the scenery and noticed nothing-- until they reached the top of the hill.

51 Then-- "Right!" shouted the goat.

52 "Over the top with him."

53 And the wagon, with the bear in it, went hurtling down the other side of the hill.

54 Faster and faster sped the wagon, until it crashed at the bottom.

55 The bear was flung out, head over heels, and landed right side up in a shallow pond.

56 But, worst of all, when he looked round, he saw all the other animals of the forest standing on the bank, and laughing at him.

57 "It serves you right," they said.

58 "It was very unkind of you to bully your friends like that."

59 But they helped him out of the pond, and set the wagon upright for him.

60 "Now you must push the racoon, the deer and the goat uphill," they said.

61 "Then you will know how they felt having to push a great, heavy animal like you."

62 So the bear pushed his friends up the hill, not once, but many times,

63 and each time he understood a little more how badly he had behaved.

64 At last, he said, "I am truly sorry for what I did,

65 and I won't do it ever again."

66 At that, the racoon, the deer and the goat invited the bear to climb into the wagon,

67 and they all rode downhill at a glorious pace.

68 And at the bottom, they all got out and pushed the wagon back again, together.

Appendix

The Owl and the Woodpecker (Wildsmith, B., 1971)

GSE	Unit	
P	1	Once upon a time, in a forest, far away, there lived a Woodpecker.
	2	The Woodpecker lived in a tree in which he slept all night and worked all day.
IE	3	In the tree next door, there came to live an Owl who liked to work all night and sleep all day.
	4	The Woodpecker worked so hard and made so much noise that his tapping woke the Owl.
	5	"I say, you, there!" screeched the Owl.
	6	"How can I possibly sleep with all that noise going on?"
	7	"This is my tree," the Woodpecker said,
	8	"and I shall tap it as I please."
	9	The Owl lost his temper.
	10	His screeches and hoots echoed through the forest,
	11	and animals for miles around came running to see what was the matter.
	12	"You carry on tapping, Master Woodpecker," squeaked the mouse.
	13	"Owl is always bossing and chasing us about."
	14	"Oh, do be quiet," growled the Bear.
	15	"Woodpecker, stop tapping, and let Owl sleep.
	16	We like a peaceful life around here."

17 Angrily, the Owl swooped down on the small animals, who ran for their lives and hid in all kinds of curious places.

18 "Bully," they shouted, when they were sure they were safe.

19 Then the Owl asked the bigger animals what he could do to stop the noise,

20 but they all shook their heads.

21 "How should we know?" they said.

22 "You are the wise and clever one.

23 Perhaps you could move to another tree."

24 "Why should I?" snapped the Owl.

25 "I like living in this tree.

26 That noisy Woodpecker must move."

27 But the Woodpecker would not move.

28 Day after day his noisy tapping kept the Owl awake.

29 And day after day the Owl became more tired and more and more bad-tempered.

30 He began to be so crotchety and rude that all the animals decided that something must be done.

SE 31 So they held a meeting.

32 "Something must be done," said the Badger.

33 "Woodpecker was here first,

34 so Owl must leave."

35 "But he says he will not leave his tree," replied the Deer.

36 "In that case we shall have to push down the tree,

37 and then he will have to leave," said the crafty Fox.

38 That night while the Owl was out hunting they all tried to push down his tree.

39 But no matter how hard they pushed and puffed and and panted they could not move the tree the smallest bit.

40 So they gave up, and went back home.

41 Some time later two strangers came to the forest.

42 They were a pair of beavers,

43 and they took a fancy to the Owl's tree, and started to gnaw at the trunk.

44 Every day they gnawed a little more, until it seemed as if they would gnaw the trunk right through.

FE 45 Then one day a great storm shook the forest.
46 The wind roared through the trees.
47 It was so strong the Woodpecker gave up tapping,
48 and so for once the Owl slept in peace.
49 The Owl`s tree began to creak and crack and groan as the wind grew more and more fierce,
50 but the tired Owl slept soundly on.
51 Suddenly the Woodpecker saw the Owl's tree begin to sway and fall.
52 At once he struggled bravely through the storm and tapped loudly close to the Owl's ear to wake him.
53 The Owl woke up in a fury, hearing the Woodpecker tapping on his tree,
54 but when he realized his tree was being blown down his anger quickly disappeared.
55 Together the Woodpecker and the Owl struggled to safety just as the tree crashed to the ground.
56 Then the storm died away,
57 and the Owl thanked the Woodpecker for saving his life.
58 Now he was glad that the Woodpecker had been his neighbour.

F 59 So the Owl and Woodpecker became good friends,

60 and the Woodpecker helped the Owl to find another tree in a quiet part of the forest, where he could sleep all day without being disturbed.

61 Peace and quiet returned to the forest

62 and the Owl and the Woodpecker remained good friends all the rest of their lives.

Appendix C

Coding Examples of the Token Types for each Book.

The Lazy Bear (LB); The Owl and the Woodpecker (OW)

The lines between tokens represent semantic role relations.

APPROXIMATE TOKENS

LB Unit 6 and he walked all round it,...

he{B}-----walked-round-----it{wagon}

Child Unit 6 and he went around the wagon

he{B}-----went-around-----wagon

(The tokens in the child's reading are approximate tokens because both criteria are met: The tokens can be placed in the Identity and Similarity Chains established for the book; and, the tokens relate to or interact with each other in the same way as in the book (i.e., 'B' token interacts with the material process 'walked-around' as an action-action relationship like the book, and this process token interacts with the spatial circumstance token 'wagon' in the same way.)

OW Unit 2 ...he slept all night and worked all day

he{W}------slept-----all-night

(W) all-day------worked

Child Unit 2 and the woodpecker liked to work all day

and sleep all nignt

W all-day----to-work--⟨liked⟩ ETR

(W)---(to-)sleep---all-day ⟨(liked)⟩ ETR

(The 'W' tokens are related to the material process of 'sleep' and 'work' in the same way as in the book; moreover, these processes are related to temporal circumstances ('all-night' and 'all-day') in a similar way. All these tokens are therefore approximate tokens. The 'liked' tokens do not, however, relate to the other tokens like the book. Thus, because they are members of a Similarity Chain from the book, they are coded as extrapolated tangential relevant (ETR) tokens. See other ETR examples below.)

AMBIGUOUS TOKENS

LB Unit 56 ...all the animals of the forest

standing on the bank, and laughing at him

(animals)------laughing------him{B}

Child Unit 33 all the animals were laughing

animals?----were-laughing

(The child does not specify what 'animals' are involved--the raccoon, deer, and goat, who had been "on stage" in the child's text, or other animals ("all the animals of the forest"). Consequently, the 'animals' token is coded as being ambiguous and so is the token related to it in the clause.)

OW Unit 2 ...The Woodpecker lived in a tree...

W------lived------tree

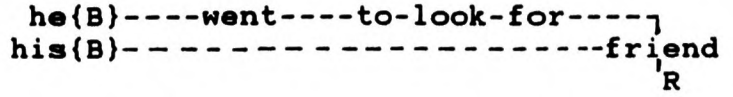
Child Unit 1 ...a woodpecker lived in the tree

W------lived-----tree?

(The child uses the definite article plus noun (the tree)--probably motiviated by the illustration in the book--instead of introducing the tree with the indefinite article form. The 'tree' token is therefore ambiguous.)

EXTRAPOLATED MISPLACED ELEMENT (EME) TOKENS

LB Unit 17 (SE) he went to look for his friend the raccoon



Child Unit 2 (P) he found.....raccoonie

(The child's tokens are like those of the book (are in the same Identity and Similarity Chains and interact in the same way), but they are found in the wrong global structure element-- in the Placement instead of the Sequent Event. All tokens are therefore coded as extrapolated misplaced element (EME) tokens.)

OW Unit 1 ....there lived a Woodpecker

W--------lived

Child Unit 1 there lived a woodpecker and a owl

(The child introduces the woodpecker and the owl in the Placement, which is not consistent with the book. That is, the 'O' token is related to the same material process 'lived' in the same way (as and actor-action relation) in the book, but that relationship in the book occurs in the Initiating Event. The 'O' token is therefore coded as an EME one.)

EXTRAPOLATED MISPLACED CONTRADICTORY (EMC) TOKENS

LB Unit 46 ....the goat had an idea

G---------had-an-idea

Child Unit 14 then they had a idea

they{G}---------had-a-idea
EMC they{D}
EMC they{R}

(The child is credited with approximate tokens for 'G' and 'had-a-idea' because they are like the book, but because only the goat had the idea in the book, the tokens for other animals (the the deer and raccoon) included in the child's reading were coded as extrapolated misplaced contradictory (EMC) tokens.)

OW Unit 2 ...he slept all night...

he{W}-------slept-------all-night

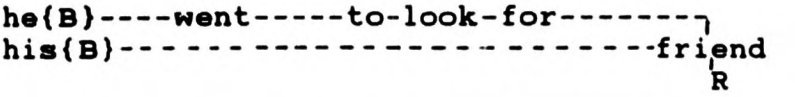
Child Unit 3 and sometimes in the night he would go to sleep

he{W}----would-go-to-sleep---sometimes-in-night (EMC)

(The book has the 'W' token relating to the material process 'sleep' which is in turn related to the circumstance of 'all-night.' In the child's reading, the 'W' and 'sleep' tokens are realized in the same way (and therefore are approximate tokens), but because the circumstance that is related to 'sleep' provides contradictory information, it is coded as an EMC token.)

EXTRAPOLATED MISPLACED REDUNDANT (EMR) TOKENS

LB Unit 17 he went to look for his friend the raccoon

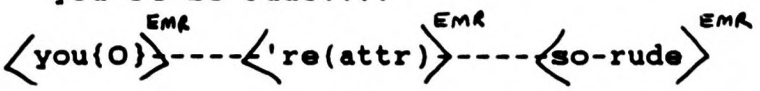


Child Unit 18 ...he found the raccoon

(The child has already included "...I'll go get the raccoon..." in an earlier unit and has been credited with approximate tokens for them. These subsequent tokens are therefore redundant and are coded as extrapolated misplaced redundant (EMR) tokens.)

OW Unit 30 he began to be so crotchety and rude...

Child Unit 11 "you're so rude...."



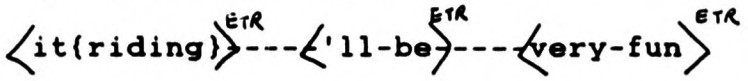
(The child has already included this same clause several times and has been credited with approximate tokens for them. These subsequent ones, therefore, are EMR tokens.)

Because extensive text would be required to illustrate extrapolated tangential tokens, no excerpt of the text of the book is provided.

EXTRAPOLATED TANGENTIAL RELEVANT (ETR) TOKENS

LB

Child Unit 17 ..."it'll be very fun"



(After inviting the deer to come and have a ride in the bear's wagon in his text, the child adds a reason for the deer to come along. All tokens can be placed in one of Similarity Chains established for the book, so these tokens are coded as extrapolated tangential relevant (ETR) tokens.)

OW

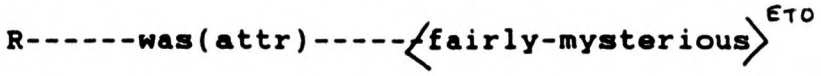
Child Unit 5 ...he could not stand the noise...

(The child includes a direct inference that the owl hated the woodpecker's tapping noise in the Initiating Event. This reaction was not stated explicitly in the book, but since the tokens that the child uses are from Identity and Similarity Chains of the book, they are coded as ETR ones.)

EXTRAPOLATED TANGENTIAL OBLIQUE (ETO) TOKENS

LB

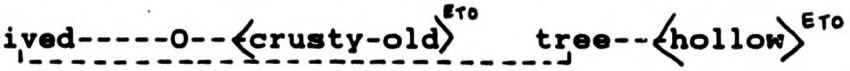
Child Unit 18 ...the raccoon was fairly mysterious



(The token 'fairly-mysterious' cannot be placed in any Chain established for the book-- it is therefore coded as an extrapolated tangential oblique (ETO) token.)

OW

Child Unit 6 ...lived a crusty old owl in a hollow tree



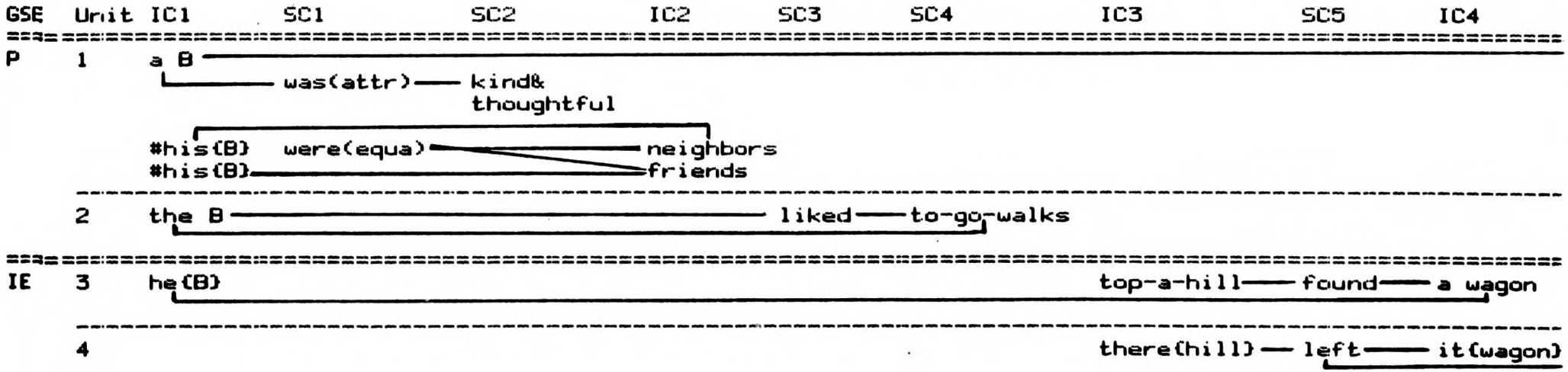
(The two modifiers-- 'crusty-old' and 'hollow'-- cannot be placed in any Chain from the book and are coded as ETO tokens. The above excerpt is from the child's second reading. The 'crusty-old' appears to be an intermediate step from 'rusty-old' (also an ETO token found in the child's first reading) and 'crotchety & rude' (realized as an approximate token in the child's third reading). The 'hollow' token was probably motivated by a feature of the owl's tree depicted in a picture on the page the child was reading.)

Figure Captions

Figure 1A. The text and an illustration of the text analysis for the first four units of The Lazy Bear (Wildsmith, 1973).

Figure 1B. The text and an illsutration of the text analysis for the first three units of The Owl and the Woodpecker (Wildsmith, 1971).

Global Structure Element	Page	Unit	Text of <u>The Lazy Bear</u>
Placement	1	1	Once upon a time, there was a bear who was so kind and thoughtful that all his neighbors were his friends.
	2	2	The bear liked to go for long walks,
Initiating Event	2	3	and one day, at the top of a hill, he found a wagon.
	2	4	It had been left there by the woodcutter.



Global Structure Element	Page	Unit	Text of <u>The Owl and the Woodpecker</u>
Placement	1	1	Once upon a time, in a forest, far away, there lived a Woodpecker.
	2	2	The Woodpecker lived in a tree in which he slept all night and worked all day.
Initiating Event	3	3	In the tree next door, there came to live an Owl, who liked to work all night and sleep all day.

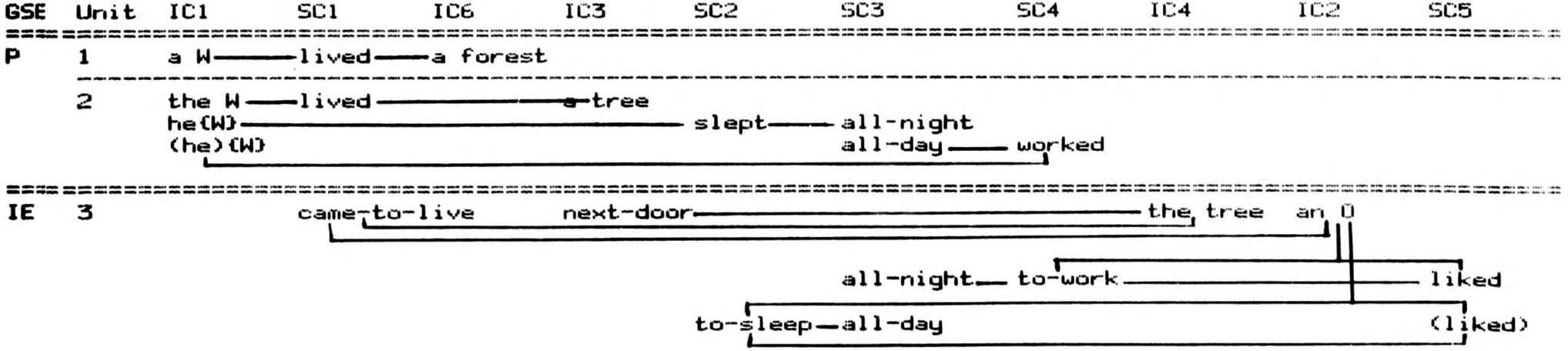


Table 1

Inter-rater Correlation Coefficients for Coding Variables by Book

Variable	Book: The Lazy Bear		Book: The Owl and the Woodpecker	
	Correlation Coefficient	Level of Significance	Correlation Coefficient	Level of Significance
Total tokens	.99	< .0001	.99	< .0001
Approximate tokens	.99	< .0001	.99	< .0001
Ambiguous tokens	.77	< .0022	.84	< .0004
Total Extrapolated tokens	.99	< .0001	.97	< .0001
Extrapolated Misplaced Element tokens	.81	< .0009	.81	< .0008
Extrapolated Misplaced Contradictory tokens	.93	< .0001	.75	< .0030
Extrapolated Misplaced Redundant tokens	.93	< .0001	.91	< .0001
Extrapolated Tangential Relevant tokens	.97	< .0001	.88	< .0001
Extrapolated Tangential Oblique tokens	.98	< .0001	.93	< .0001

Table 2

Means (and Standard Deviations)[a,b] for MANOVA 1A (The Lazy Bear Data) by Reading

	Reading		
Token Type	One	Two	Three
Approximate	103.81 (38.58)	130.89 (61.41)	149.56 (69.02)
Ambiguous	7.07 (5.40)	4.41 (3.62)	4.81 (4.30)
Extrapolated Misplaced Element	2.19 (4.68)	1.15 (3.15)	0.85 (1.75)
Extrapolated Misplaced Contradictory	4.30 (4.87)	3.56 (2.69)	2.85 (3.47)
Extrapolated Misplaced Redundant	7.00 (7.46)	9.70 (8.49)	8.89 (7.76)
Extrapolated Tangential Relevant	51.78 (25.07)	49.85 (29.54)	47.22 (25.92)
Extrapolated Tangential Oblique	15.07 (30.38)	8.30 (11.55)	6.15 (9.03)

[a]Token Frequencies

[b]N = 27

Table 3

Discriminant Analysis and Univariate ANOVAs on Token Types for Reading for MANOVA 1A (The Lazy Bear Data)

Token Type	Standardized Discriminant Function Coefficients	Canonical Variables (Structure Coefficients)	Univariate F Tests (2,52)	p <*
Approximate	1.197	.688	14.01	.0001
Ambiguous	-.388	-.360	4.93	.01
Extrapolated Misplaced Element	-.108	-.211	1.33	.27
Extrapolated Misplaced Contradictory	-.284	-.214	1.38	.26
Extrapolated Misplaced Redundant	.173	.181	1.52	.23
Extrapolated Tangential Relevant	-.542	-.133	0.56	.57
Extrapolated Tangential Oblique	.611	-.247	1.82	.18

* Level of significance for Geisser-Greenhouse conservative F test.

Table 4

Means (and Standard Deviations)[a,b] for MANOVA 2A (The Lazy Bear Data) by Reading and Global

Global Element	Reading	Token type						
		APP	AMB	EME	EMC	EMR	ETR	ETO
Initiating Event	1	24.37 (8.39)	0.67 (1.11)	0.70 (2.25)	0.48 (1.22)	0.63 (1.60)	10.19 (6.95)	2.96 (5.69)
	2	28.67 (9.93)	0.26 (0.45)	0.19 (0.68)	0.48 (1.01)	1.74 (2.14)	9.70 (7.47)	2.56 (4.59)
	3	31.33 (11.53)	0.52 (0.85)	0.07 (0.38)	0.19 (0.48)	0.96 (1.43)	7.37 (5.26)	1.81 (4.36)
Sequent Event	1	45.26 (16.94)	1.44 (2.26)	1.22 (3.00)	1.89 (2.90)	3.81 (4.26)	25.96 (15.90)	6.52 (19.31)
	2	55.63 (26.16)	1.07 (2.40)	0.78 (3.11)	2.04 (2.16)	4.68 (4.67)	22.15 (14.09)	2.26 (2.43)
	3	62.15 (30.17)	1.07 (1.96)	0.63 (1.62)	1.41 (2.66)	4.48 (6.19)	20.56 (14.20)	1.04 (2.56)
Final Event	1	31.56 (16.21)	4.89 (4.15)	0.07 (0.38)	1.89 (2.62)	2.52 (3.82)	12.44 (8.06)	3.93 (3.93)
	2	42.22 (28.60)	2.96 (2.36)	0.11 (0.58)	1.04 (1.60)	3.07 (4.63)	13.44 (11.33)	2.41 (6.95)
	3	50.78 (28.97)	3.15 (2.91)	0.15 (0.77)	1.37 (1.74)	3.33 (4.28)	15.89 (11.08)	2.48 (4.34)
Reading Overall	1	33.73 (16.66)	2.33 (3.33)	0.67 (2.20)	1.42 (2.43)	2.32 (3.63)	16.20 (12.97)	4.47 (12.23)
	2	42.17 (25.36)	1.43 (2.25)	0.36 (1.87)	1.19 (1.76)	3.16 (4.11)	15.10 (12.32)	2.41 (4.95)
	3	48.09 (27.85)	1.58 (2.35)	0.28 (1.08)	0.99 (1.92)	2.93 (4.61)	14.60 (12.03)	1.78 (3.84)

[a]Token Frequencies

[b]N = 27

Table 5

Discriminant Analysis and Univariate ANOVAs on Token Types for Reading for MANOVA 2A (The Lazy Bear Data)

Token Type	Standardized Discriminant Function Coefficients	Canonical Variables (Structure Coefficients)	Univariate F Tests (2,52)	p <*
Approximate	1.236	.676	12.86	.0002
Ambiguous	-.387	-.376	5.10	.01
Extrapolated Misplaced Element	-.016	-.189	1.02	.36
Extrapolated Misplaced Contradictory	-.293	-.196	1.08	.33
Extrapolated Misplaced Redundant	.096	.174	1.27	.29
Extrapolated Tangential Relevant	-.536	-.160	0.72	.48
Extrapolated Tangential Oblique	.624	-.230	1.50	.23

* Level of significance for Geisser-Greenhouse conservative F test.

Table 6

Discriminant Analysis and Univariate ANOVAs on Token Types for Reading and Global for MANOVA 2A (The Lazy Bear Data)

Token Type	Standardized Discriminant Function Coefficients	Canonical Variables (Structure Coefficients)	Univariate F Tests (4,104)	p <*
Approximate	-.549	-.595	3.66	.02
Ambiguous	.603	.561	2.27	.09
Extrapolated Misplaced Element	-.340	-.275	0.54	.61
Extrapolated Misplaced Contradictory	.280	.184	1.12	.34
Extrapolated Misplaced Redundant	-.055	-.038	0.16	.90
Extrapolated Tangential Relevant	-.369	-.506	2.96	.03
Extrapolated Tangential Oblique	-.018	-.076	1.72	.20

* Level of significance for Geisser-Greenhouse conservative F test.

Table 7

Means (and Standard Deviations)[a,b] for MANOVA 1B (The Owl and the Woodpecker Data) by Reading

	Reading		
Token Type	One	Two	Three
Approximate	77.40 (29.54)	98.00 (8.30)	108.60 (42.16)
Ambiguous	4.05 (2.98)	2.90 (2.94)	3.55 (3.87)
Extrapolated Misplaced Element	5.15 (7.24)	3.00 (3.40)	2.45 (3.28)
Extrapolated Misplaced Contradictory	3.65 (3.72)	2.15 (2.30)	2.30 (2.23)
Extrapolated Misplaced Redundant	4.90 (5.61)	5.20 (8.23)	5.50 (7.03)
Extrapolated Tangential Relevant	34.80 (24.95)	29.05 (20.25)	26.10 (23.57)
Extrapolated Tangential Oblique	10.20 (14.09)	7.80 (8.62)	6.85 (10.29)

[a]Token Frequencies

[b]N = 20

Table 8

Discriminant Analysis and Univariate ANOVAs on Token Types for Reading for MANOVA 1B (The Owl and the Woodpecker Data)

Token Type	Standardized Discriminant Function Coefficients	Canonical Variables (Structure Coefficients)	Univariate F Tests (2,38)	p <*
Approximate	.943	.814	23.86	.0000
Ambiguous	-.107	-.110	0.89	.40
Extrapolated Misplaced Element	-.003	-.260	2.45	.12
Extrapolated Misplaced Contradictory	-.377	-.223	2.07	.16
Extrapolated Misplaced Redundant	-.134	.036	0.05	.93
Extrapolated Tangential Relevant	-.384	-.283	2.88	.07
Extrapolated Tangential Oblique	-.148	-.226	1.83	.18

* Level of significance for Geisser-Greenhouse conservative F test.

Table 9

Means (and Standard Deviations)[a,b] for MANOVA 2B

(The Owl and Woodpecker Data) by Reading and Global

Global Element	Reading	Token type						
		APP	AMB	EME	EMC	EMR	ETR	ETO
Initiating Event	1	29.05 (11.00)	1.60 (1.85)	3.10 (5.75)	1.90 (2.43)	2.80 (3.68)	18.10 (12.29)	3.95 (7.59)
	2	38.20 (16.69)	1.60 (2.16)	1.65 (2.58)	1.25 (1.86)	2.90 (3.75)	16.95 (12.18)	4.65 (5.01)
	3	44.00 (18.80)	1.85 (2.54)	1.15 (2.23)	1.35 (1.46)	2.95 (4.90)	13.35 (12.34)	2.60 (4.91)
Sequent Event	1	19.40 (8.94)	1.65 (1.53)	0.10 (0.45)	0.90 (2.43)	0.75 (1.41)	5.35 (6.78)	2.30 (4.67)
	2	26.30 (12.40)	1.10 (1.77)	0.35 (1.09)	0.20 (0.52)	1.45 (3.98)	5.85 (5.58)	1.95 (4.06)
	3	28.75 (14.12)	1.00 (1.45)	0.80 (2.09)	0.60 (0.94)	1.40 (2.06)	4.00 (4.17)	2.00 (4.01)
Final Event	1	17.00 (9.17)	0.35 (0.67)	0.65 (1.76)	0.65 (1.60)	0.65 (1.31)	6.20 (5.99)	2.05 (2.04)
	2	21.00 (9.00)	0.00 (0.00)	0.00 (0.00)	0.25 (0.55)	0.45 (1.23)	4.85 (3.90)	0.90 (1.68)
	3	23.05 (10.36)	0.40 (0.88)	0.00 (0.00)	0.25 (0.55)	0.15 (0.49)	4.90 (6.97)	0.40 (0.88)
Reading Overall	1	21.82 (10.92)	1.20 (1.54)	1.28 (3.66)	1.15 (2.22)	1.40 (2.56)	9.88 (10.46)	2.77 (5.26)
	2	28.50 (14.76)	0.90 (1.72)	0.67 (1.74)	0.57 (1.24)	1.60 (3.34)	9.22 (9.66)	2.50 (4.10)
	3	31.93 (17.09)	1.08 (1.83)	0.65 (1.80)	0.73 (1.13)	1.50 (3.24)	7.42 (9.40)	1.67 (3.75)

[a]Token Frequencies

[b]N = 20

Table 10

Discriminant Analysis and Univariate ANOVAs on Token Types for Reading for MANOVA 2B (The Owl and the Woodpecker Data)

Token Type	Standardized Discriminant Function Coefficients	Canonical Variables (Structure Coefficients)	Univariate F Tests (2,38)	p <*
Approximate	.945	.828	24.95	.0000
Ambiguous	-.181	-.077	0.61	.54
Extrapolated Misplaced Element	-.239	-.230	2.06	.16
Extrapolated Misplaced Contradictory	-.374	-.228	2.64	.11
Extrapolated Misplaced Redundant	-.198	.031	0.08	.92
Extrapolated Tangential Relevant	-.247	-.317	4.72	.02
Extrapolated Tangential Oblique	.039	-.223	2.41	.11

* Level of significance for Geisser-Greenhouse conservative F test.

Table 11

Means (and Standard Deviations)[a,b] for MANOVA C by Book and Reading

Book	Reading	Token type						
		APP	AMB	EME	EMC	EMR	ETR	ETO
Lazy Bear	1	.227 (.09)	.012 (.01)	.004 (.01)	.011 (.01)	.015 (.01)	.114 (.05)	.039 (.07)
	2	.298 (.14)	.008 (.01)	.003 (.01)	.008 (.01)	.019 (.01)	.107 (.06)	.015 (.02)
	3	.336 (.16)	.010 (.01)	.001 (.00)	.007 (.01)	.019 (.02)	.100 (.05)	.011 (.02)
Book Overall:		.287 (.14)	.010 (.01)	.003 (.00)	.008 (.01)	.018 (.01)	.106 (.05)	.022 (.02)
Owl and Woodpecker	1	.234 (.09)	.012 (.01)	.016 (.02)	.011 (.01)	.016 (.02)	.107 (.08)	.032 (.04)
	2	.297 (.16)	.009 (.01)	.010 (.01)	.007 (.01)	.016 (.03)	.089 (.06)	.025 (.03)
	3	.297 (.13)	.009 (.01)	.010 (.01)	.007 (.01)	.016 (.02)	.089 (.08)	.025 (.02)
Book Overall		.287 (.12)	.011 (.01)	.011 (.02)	.008 (.01)	.016 (.02)	.093 (.07)	.026 (.03)
Reading Overall	1	.231 (.09)	.012 (.01)	.010 (.02)	.011 (.01)	.015 (.02)	.111 (.07)	.036 (.06)
	2	.298 (.13)	.009 (.01)	.006 (.01)	.007 (.01)	.018 (.02)	.098 (.06)	.020 (.02)
	3	.333 (.15)	.011 (.01)	.004 (.01)	.007 (.01)	.018 (.02)	.089 (.06)	.016 (.03)

[a]Token Proportions

[b]N = 19

Table 12

Discriminant Analysis and Univariate ANOVAs on Token Types for Reading for MANOVA C (The Lazy Bear and The Owl and the Woodpecker Data)

Token Type	Standardized Discriminant Function Coefficients	Canonical Variables (Structure Coefficients)	Univariate F Tests (2,38)	p <*
Approximate	1.044	.651	19.29	.0000
Ambiguous	-.320	-.198	4.12	.03
Extrapolated Misplaced Element	-.208	-.267	3.24	.06
Extrapolated Misplaced Contradictory	-.348	-.278	3.66	.06
Extrapolated Misplaced Redundant	.141	.087	0.35	.70
Extrapolated Tangential Relevant	-.622	-.324	4.88	.02
Extrapolated Tangential Oblique	.375	-.292	3.91	.06

* Level of significance for Geisser-Greenhouse conservative F test.