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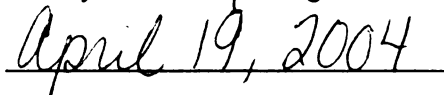presented by

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EFFECTS OF TEXT LEVEL AND PRESENTATION FORMAT ON INFERENCE-
MAKING PROCESSES WITH NARRATIVE TEXTS

By

Carolyn Amanda Jaynes

A DISSERTATION

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ABSTRACT

EFFECTS OF TEXT LEVEL AND PRESENTATION FORMAT ON INFERENCE-
MAKING PROCESSES WITH NARRATIVE TEXTS

By

Carolyn Amanda Jaynes

This study examined the relationship between text difficulty, mode of text
presentation, and inference-making, and was guided by the following questions: What
inference-making processes do students engage in as a narrative text varies according to
level of difficulty and presentation format? What types of inferences do students make
and how frequently are they generated? The project involved 27 fourth and fifth graders
from the San Francisco Bay Area whose comprehension was at the third grade
instructional level. These students participated in two 3-part, one-on-one sessions. In the
first session, students provided verbal reports of their thinking as they attempted to
comprehend three different narrative texts at their instructional reading level. One text
was presented in audio form, another text was presented in print form, and a third text
was presented in video form. The text presentation format as well as the sequence of
texts and presentation formats varied by student and were counterbalanced to assure that
there were comparable numbers of students who experienced the same text-format match,
sequence of texts, and sequence of presentation formats. In the second session, students
repeated the process with three texts at two grade levels above their instructional reading
level. Students' verbal protocols were segmented into lists of propositions that were
categorized according to the types of cognitive processes they represented. Analyses
focused on the types of inferences students made, and how frequently they were
generated. While findings suggest that format effects on inference-making were

significant and text level effects were not, a format by level interaction effect complicates these findings. Most notably, it appears that individual differences play an important role, especially since the influence of story, format, sequence, and story-format combinations was not significant. That is, determining which condition (print, audio, or video) was more helpful or problematic, overall, was an impossible task. For example, while some students appeared to have an easier time generating inferences within the audio context, others clearly struggled. Similarly, findings associated with recall-level data also resulted in an interaction effect that prompted a closer consideration of individual differences since there was no significant effect due to text level or presentation format. It is interesting to note that for some students print texts elicited more recall-level propositions with easier texts, while video texts prompted more recall with more challenging texts.

To Mom and Dad

ACKNOWLEDGMENTS

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INTRODUCTION

Perhaps the entire range of plausible models of the reading process that have been put forward by scholars of reading can be observed by noting the individual differences encountered when working with children on a daily basis. Matching one's observation of a child's reading process with a particular model may be relatively easy—so long as the observation remains within a single slice of time and the range of activity does not vary too much. For example, consider which models of reading may be supported by the stories of Maria, age 11, and Grayson, age 10.

> ### Maria's Story
> Maria is a sixth grader who is riveted to the television each week day at four o'clock to watch her favorite animated series Pokemon. Maria is equally enthralled with the Harry Potter novels that her mother reads to her each night. It is not unusual for Maria to talk at length about the various characters and storylines portrayed in these programs and novels, and oftentimes, she is able to generate rather astute inferences about characters' motives and causal relationships. When I observed Maria reading to herself, however, she decoded at the third grade level, and demonstrated limited understanding. Was the effort expended on decoding encroaching on her ability to infer and construct meaning?
>
> ### Grayson's Story
> During a tutoring session earlier that week Grayson had clearly struggled to make inferences about a text he had just read. So later on, perhaps it should have been expected when he asked several inference-based questions about the plot of the movie he was watching. But didn't this viewing context free Grayson up to focus on constructing meaning from the audio-visual 'text,' a film entitled The Rookie? Since decoding was not an issue, and the vocabulary was not terribly sophisticated, would not his ability to make inferences improve?

One cannot attempt to explain stories like Maria's and Grayson's without revealing an inclination toward particular models of reading, or at least, certain elements

within those models. While some models present reading as a sequence of processes one develops over time and experience, with higher level cognitive activities building upon a foundation of lower level processes, other models de-emphasize sequence in favor of the interaction of those processes at every stage of development. Although models in this second general category may deem some processes more influential or integral, the hierarchy is not sequential, but rather, based on what accounts for more of the variance in reading ability. In the following section a range of reading models are discussed in attempting to explain the observations of Grayson and Maria.

Limited Capacity Models

Some theories of reading development suggest that one's attentional resources have a limited capacity, and that there exists a hierarchy of processes from lower order perceptual and decoding processes to higher order comprehension processes (LaBerge & Samuels, 1974; Thurlow & van den Broek, 1997). Proponents of this view assert that text comprehension involves two levels of information processing. The first level involves the technical process of decoding and word recognition, while the second level entails the comprehension process of 'creating a coherent representation of meaning of the text' (Beishuizen, Grand, & Schalk, 1999). Some researchers suggest that the cognitive flexibility required to balance the activities at these levels and manage more than one aspect of the reading task at a time is something that develops over time (Cartwright, 2002). This same line of theoretical work asserts that as readers begin to perform lower order processes more automatically, they can allocate more attention to comprehension processes (LaBerge & Samuels, 1974).

It appears that this limited capacity model of reading helps to explain Maria's story. If, indeed, it is the case that an individual is more capable of attending to higher order processes when the lower order processes are more automatic, or even done *for* the individual, it would follow that the individual would be more proficient at engaging in higher level processes like making inferences when decoding is not required because a story is presented in either video form, as with a television program, or in audio form, as when text is read aloud by a proficient reader. In this example, it appears that Maria had an easier time generating inferences within the viewing and audio contexts (watching the Pokemon television program, and listening to her mother read aloud) where decoding was not a factor, as opposed to the independent reading task where decoding was required. Maria's story, and others like it, illustrate the notion underlying Laberge and Samuel's limited capacity model, that readers possess a finite amount of cognitive capital available for higher level processes. Meanwhile, this model does not help to explain the story of Grayson who appeared to struggle with inference-making regardless of whether or not any of his cognitive resources were occupied by lower level processes such as decoding. An alternative model must be used to account for this observation.

Reading as Thinking Models

In contrast to these sequential, limited capacity models of reading, other theorists view reading more as a general cognitive processes. As early as 1917, E. L. Thorndike defined reading as reasoning and prompted investigations of reading as a thinking process guided by symbols (Powell, 1989; Thorndike, 1917). With its roots in the early 20th

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century, this idea of reading as a reflective, purposeful, and constructive thinking process is what Paris calls the 'new-old' interactive view of reading as thinking (Paris, 1991).

In general, it may be that a reading as thinking model would best explain Grayson's story. If reading and thinking processes are comparable, then it would be reasonable to predict that an individual would experience comparable levels of ease or challenge with higher level processes across a range of contexts. For Grayson, generating inferences was equally challenging when he was reading a book and watching a movie. In this instance, the view of reading as thinking makes sense. For Maria, however, this overall perspective does not seem to fit as well. Nevertheless, some views of reading that fall within this general reading as thinking category might help to explain elements of both Maria's and Grayson's stories.

Schema Theory

For example, schema theory proposes that comprehension involves the interaction of new information with knowledge already stored in memory as the reader's schemata (Anderson & Pearson, 1984). This model suggests that in the act of comprehending, the reader must either find a mental home for information in the text *or* modify an existing mental home in order to accommodate new information (p. 255). These mental homes, or schemas, influence three basic processes in comprehension: 1) determining *which* inferences the reader makes during comprehension as well as *when* these inferences are made, 2) determining how the reader allocates attention to various elements in the text, and 3) determining what the reader remembers about the text. (Anderson & Pearson, 1984).

In Maria's case, then, it could be that the new information from the independent reading text was more difficult to accommodate, simply because it was less familiar than the information from the Pokemon program and the Harry Potter novels that were very familiar to Kayla who was exposed to these storylines on a regular basis. It may be that the mode of text presentation did not account for the difference, but simply that, for Maria, the Pokemon and Harry Potter content had an easier time finding a mental home. And in Grayson's case, it could be that the new information presented by both the novel and the film were equally difficult to accommodate given Grayson's available schemata. It may be that what made inference-generation equally challenging across these media contexts was more closely tied to the content within each media context than to the possibility that inference-making is a challenge for him in general.

Construction-Integration Model

Similarly, Kintsch's construction-integration model can be used to explain parts of both Maria's and Grayson's stories. This model combines a *construction* process in which a text base is constructed from linguistic input as well as from the comprehender's knowledge base, with an *integration* phase in which this text base is integrated into a coherent whole, which Kintsch calls the "construction-integration model" (Kintsch, 1994). In this model, word identification processes are embedded within the process of discourse understanding, and the lexical node serves as just one entry point into the readers' prior knowledge and experience (p. 973). Merging these construction and integration phases, rather than assigning them a particular sequence or level, makes it possible to use this model to explain both Maria's and Grayson's stories. As with schema

theory, apparent differences or consistencies in inference-generation across media may be attributed to background knowledge and experience, and it is not clear that text presentation format would either facilitate or hinder these processes.

While one version of the reading as thinking model is supported by Grayson's story, which implies that higher level processes like inference-making occur similarly regardless of the need for cognitive activity at the decoding level, other reading as thinking models are supported also by Maria's story. In the section that follows a third set of views can be applied to both readers as well.

Versions of the Simple View of Reading

Models related to Gough and Tunmer's (1986) Simple View of Reading are difficult to classify as either limited-capacity or reading as thinking models. The Simple View of Reading asserts that an individual's reading comprehension ability (R) is a function of the product of two factors: decoding (D) and language or listening comprehension (L), or $R = D \times L$ (Gough & Tunmer, 1986). This model suggests that if an individual struggles with either decoding *or* general language comprehension, reading comprehension will suffer. And according to Gough and Tunmer, individuals who struggle with both components are considered to be "garden-variety" poor readers.

This simple view of reading can be used to explain elements of both Grayson's and Maria's stories. For Grayson, who appeared to experience similar challenges with inference-making whether he was required to decode a printed text or to comprehend the audio and visual content presented in a film, this model might identify him as a "garden variety" poor reader who struggles with both decoding and listening comprehension. Or,

it could be that he has difficulties with general language comprehension, so whether or not decoding is required, comprehension is limited. For Maria, who appeared to generate more inferences with content presented in audio and video forms than with content presented in print, it might be said that the audio and video contexts enhanced her language comprehension which contributed to her ability to engage in more higher-level processes.

Finally, Chen and Vellutino (1997) offer a version of the original Simple View of Reading that includes a linear combination, decoding *plus* listening comprehension (D + L), which they say explains more of the substantive variance in comprehension ability. This linear combination is added to Gough and Tunmer's multiplicative combination, decoding *times* listening comprehension, which Chen and Vellutino claim accounts for more of the unique variance in comprehension ability. In other words, with the Chen and Vellutino model (R = (D + L) + (D x L)) the linear term, decoding plus listening comprehension, is able to identify the main effects, while the multiplicative term, decoding times listening comprehension, is able to determine the interaction effects. Therefore, this version of the model helps to explain those occasions when the interaction term is significant but none of the main effects is significant (Chen & Vellutino, 1997).

Although the limited nature of both Grayson's and Maria's observations prevents an analysis of the levels of effects addressed in Chen and Vellutino's model, it remains evident that both versions of the Simple View of Reading can be used to explain elements of both students' stories. And while these versions of the Simple View of Reading model combine both decoding and language comprehension, they do not suggest that these factors are limited in nature, or that the use of one is necessarily at the expense of the

other. Nor do they imply a particular sequence of development. Instead, these models propose the notion that less skilled readers may be struggling due to a) nonautomated lower level processing, b) deficits in language comprehension, *or* c) a combination of the two (Curtis, 1980). The apparent range of possible factors influencing one's ability to construct meaning underscores the importance of considering what models best explain comprehension. It must be acknowledged that decisions related to comprehension instruction, curriculum, assessment, and intervention are grounded in models of reading to which teachers, administrators, and policy-makers subscribe—consciously or not.

Models of Reading in the Classroom

Attempts to map observations of students reading onto existing models of reading highlight the distinctions among a range of well-respected theories reflected in current policy and practice. While most models explain the influence of context, the role of background knowledge and prior experience with text, as well as the effect of the reader's attention and self-monitoring, two apparent differences among these models are related to sequence and cognitive capacity. In today's educational climate, much of the current reading policy reflects an inclination toward a more sequential, limited capacity model. For example, many early reading interventions imply that the initial emphasis should be on making sure that students can decode, presumably because once this is done more automatically, they can move on to improving comprehension (AutoSkill, 2003; Waterford, 2000). This implicit message is conveyed by measures used to determine the success of such interventions in which oral reading accuracy and rate scores outweigh comprehension scores. For example, in the San Francisco bay area, some low-

performing schools have implemented an assessment system called RESULTS that determines students' instructional reading level with three equally weighted measures: oral reading accuracy; oral reading fluency (i.e., rate only); and comprehension, as determined by responses to three vague questions (CRLP, 1996). The temptation, then, is to shift instructional focus away from the thinly measured meaning-level component to the more skills-based components in order to get students up to 'grade level.'

Concerns about how limited capacity models get instantiated in commercial reading programs and then played out in schools, particularly with students who are reading below grade level expectations, underlie the present study, which was designed to add some insight into contrasting models of reading through an examination of struggling readers' comprehension processes within a range of media contexts.

First, by looking at how weaker readers engage in the comprehension process of inference-making with narrative texts presented in three formats—text, audio, and video—this study takes a closer look at this concept of "limited cognitive capacity." Admittedly, limited capacity models of reading are not designed to address comprehension beyond the print context, however, this study questions the general notion that individuals possess finite cognitive resources that are employed at one another's expense. That is, if it is true that individuals have a limited capacity for engaging in various levels of cognitive processing, texts that vary according to difficulty level and presentation format might help or hinder one's ability to engage in higher level activities. On the one hand, it might be expected that students would be able to engage in more inference-making processes with texts at their instructional reading level, and with audio and video text formats that free up some of the cognitive load by alleviating the student's

need to focus on decoding. On the other hand, it might be that comprehending audio texts, which "go in one ear and out the other," may be more challenging, for some students, than comprehending texts that appear in black and white. In other words, it could be the case that even when decoding is not necessary, comprehending audio texts may require more of the limited resources than comprehending texts in print. For instance, the rate of textual input may differ with listening and reading. When an individual is listening to a text, the rate of textual input is determined by the speaker, or in this study, by the audiotape. Alternatively, when an individual is reading a text, the rate is controlled by the reader, and the reader has the option of rereading portions of the text (Carlisle & Felbinger, 1991). Therefore, it could be that within the audio context, even when cognitive resources are not being spent on lower level processes like decoding, the individual's inability to monitor the speed of input or reread, or at least rescan, portions of text, however small, may actually increase the cognitive load, leaving the individual with fewer attentional resources to devote to higher level processes like inference-making.

Finally, there is the possibility that the video context may actually require more cognitive resources as an individual synthesizes both audio and visual information. One could argue that as incoming information increases, the cognitive load intensifies. For example, audio and video versions of texts contain additional prosodic or visual information that the reader must integrate. While this additional information could enhance understanding and increase one's ability to engage in higher level processes, it also could be that integrating this supplementary content could be using up the

supposedly limited cognitive supply, leaving fewer attentional resources available for inference generation.

In addition, this study attempts to investigate the usefulness of the reading as thinking models. If it is the case that reading is thinking, then it would be expected that a student's ability to generate inferences would be similar across text levels and presentation formats. While this study does not control for the potential influence of background knowledge and prior experience, it does use six distinct texts with each student making this less of a concern. That is, with a variety of unique texts, students' knowledge is likely to be distributed across the set of narratives. This provision diminishes the possible effect of prior knowledge, and highlights the effects of text level and presentation format.

Finally, this study has the potential to examine the usefulness of the Simple View of Reading. If it is true that comprehension is a function of an individual's decoding skills and language comprehension, then it would be likely that within the audio and video contexts or with easier texts, where decoding is less challenging or not even required, students whose weakness is related to decoding would have an easier time engaging in higher level comprehension processes. Furthermore, students who can decode but struggle with language comprehension would be expected to demonstrate equal levels of challenge across all three formats and with both easy and difficult texts. Finally, the so-called garden-variety poor readers, those who struggle both with decoding and language comprehension, would most likely do better within the audio and video contexts or with easier texts where at least one of their problem skills, decoding, is less challenging or not even required.

In an attempt to shed some light on the utility of these various models of reading, this study analyzed verbal protocols from 4th and 5th grade students and was guided by two questions: *What inference-making processes do students engage in with narrative texts varying according to level of difficulty and presentation format? What types of inferences do students make and how frequently are they generated?*

Investigating Inference Generation

As defined in this study, inferences require an individual to integrate prior knowledge with new information in an effort to construct coherent meaning (Rickheit, 1985; Beal, 1990; Thurlow, 1997) The importance of investigating the inference-making processes of upper elementary students is grounded in research demonstrating that as readers advance beyond the beginning stages, higher level processes account for a more substantial proportion of the variance in reading comprehension ability than do lower level word recognition processes (Hannon & Daneman, 2001). In addition, generating and evaluating inferences is considered to be an essential comprehension-fostering activity (Brown, Palincsar, & Armbruster, 1994). And according to Trabasso and Magliano, inference-level processes work together with memory to help readers construct a coherent representation of text (Trabasso & Magliano, 1996).

This study examines not only students' overall inference-making, but a range of specific inference-level processes through verbal protocol analysis. It was anticipated that students would generate various types of inferences noted in protocols from previous studies of comprehension. For example, Trabasso and Magliano identified three categories of inferences including explanations, associations, and predictions. Although

they found that, for the most part, comprehension was most closely linked to explanation-based inferences that provide the rationale and conditions for various events and behaviors (Trabasso & Magliano, 1996), the purpose of the present study is to identify the types of inferences that were generated most often by struggling readers across different presentation formats and text difficulty levels. Understanding more about inference generation in struggling readers may have instructional implications. For example, we may learn that there were certain types of inferences that struggling readers tend to avoid or gravitate toward within particular comprehension contexts, and these might be the types of inferences that need to be either reinforced or supplemented.

In addition, this study takes into account the possibility that different types of inferences call upon different sorts of cognitive activity. For example, Trabasso and Magliano suggest that association-level inferences are activated by other inferences as well as the content of the text (Trabasso & Magliano, 1996). Given this finding, one reasonable prediction would be that associations would occur with a certain level of frequency due to the fact that that these types of inferences are connected to both content and other inferential processing. While these sorts of predictions were not formally tested as part of the research questions, the discussion of the data acknowledges that categories of inference-making may require different types of cognitive resources and that there may be occasions when inference-level activity might overlap.

Similarly, the within-subjects design of the study, which allowed for analyses of individuals' inference-making across a range of presentation formats and text levels, permitted an examination of readers' relative use of certain inference-making processes. For instance, Trabasso and Magliano's data suggest that readers may be consistent with

their use of one inference strategy over that of others (Trabasso & Magliano, 1996). The design of this study made it possible to investigate the inference-making processes of an individual within while encountering six "texts" that varied by presentation medium and difficulty level. These categories of inferences are defined in the Methods chapter. Finally, in the sections that follow the rationale is presented for choosing to investigate inference generation across a range of presentation formats and with different levels of text difficulty.

Inference Generation across Presentation Formats: Audio, Print, and Video

While many studies have investigated inference-making as readers interact with printed text, fewer have examined these processes across a range of media. Furthermore, the research that has investigated inference-generation with various presentation formats offers conflicting findings.

Some results indicate that higher level reading processes remain consistent whether an individual is reading or viewing a text. For example, Neuman's 1989 study of 44 third grade students indicated no significant differences in retellings of groups who a) watched two video versions of stories, b) watched a video version and read a picture book version, and c) read two picture book versions (Neuman, 1989). Likewise, in 1992, Neuman found no significant differences of inference strategy use among 83 fifth grade high and low achieving students who either read or watched brief episodes of stories (Neuman, 1992).

Other scholars assert that while this consistency may occur with older readers, the same does not hold true for younger readers. For example, Pezdek and her colleagues

(Pezdek et al., 1987) found that reading and television comprehension of non-illustrated news stories was significantly correlated for high school students. These findings were contrary to those from their previous study with elementary students. These results suggest that for older readers, who may well have strong decoding processes under automatic control, comprehension may be a general cognitive construct that operates similarly across various types of media. For younger readers format does have an effect.

A third line of work claims that while presentation format does not influence the number of inferences, it does affect the bases upon which the inferences are generated. Meringoff compared 48 children's apprehensions of a story either read to them from an illustrated book or presented as a televised film. She found that while there were no systematic differences between groups in the inferences themselves, the children who watched the televised story relied more on visual content as a basis for inferences (Meringoff, 1980). In addition, Beagles-Roos and Gat exposed 48 first through fourth grade students to a television and audio story and found that children's ability to generate inferences based on actions improved in the television context, while their ability to make inferences based on verbal sources or knowledge unrelated to the story improved in the audio context (Beagles-Roos & Gat, 1983).

Finally, a fourth line of work supports the notion that presentation format does affect students' ability to provide plausible answers to a higher level comprehension questions that require inferential reasoning. Pezdek and her colleagues compared comprehension scores of third and sixth grade students who read an illustrated storybook and then were presented with either the televised or audio version. Based on students' responses to sixteen comprehension questions including those requiring inference

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generation, the researchers found that overall performance was better in the television and reading conditions than in the audio-only condition (Pezdek, Lehrer, & Simon, 1984). Finally, Ricci and Beal compared comprehension scores of 66 first graders who were exposed to stories in an audio only, audiovisual, or interactive media formats. They found that students in the audio only group performed more poorly on a set of inference-level questions (Ricci & Beal, 2002).

While some findings suggest that presentation format does affect students' inference-making processes, others suggest just the opposite. And although some results indicate that inference generation is consistent across media contexts with older readers, but varies with younger students, other findings indicate consistency or variation across presentation formats is the same across age levels. These contradictory results prompted the present study, which was designed to examine the effect of presentation format with older readers who comprehend below grade level.

Additional reasons for investigating the influence of presentation format were, once again, related to observed trends within the current educational climate. For example, within schools the notion that the print-only context is the most challenging is evident in various methods used for accommodating the needs of weaker readers. Teachers working with struggling readers, or with students who are learning to read in English, oftentimes are encouraged to incorporate audio or visual components to reading instruction. In addition, teachers may be encouraged to read aloud to students, to have students use listening centers, to provide both oral and written forms of test questions, and to include pictures or video representations of the content they are attempting to teach. The present study was designed to examine the assumptions that underlie such

interventions by investigating higher level processes across various media contexts. Based on the assumptions underlying these common intervention strategies, it might be predicted that this study would find more students struggling within the print-only context, and having an easier time generating inferences when audio and video information was added. The study was created, however, to leave the possibilities open and actually call such predictions into question.

Inference Generation across Text Difficulty Levels

Along with considering the medium of text presentation, this study takes into account students' instructional reading levels. The potential influence of students' instructional reading level and relative text difficulty is examined in a way that builds upon existing research investigating how inference-making processes vary among "skilled" and "unskilled" readers (Curtis, 1980; Hannon & Daneman, 1998) and how text difficulty bears on inference-making (Pezdek et al., 1987). This study attempts to look at readers at the same instructional reading level in all three medium contexts, using three presentation formats.

While earlier work has considered the inference-making processes of both "skilled" and "unskilled" readers, using the same text, this study examines students' inference-making processes first with texts that are accessible (matching students' instructional level in terms of silent reading comprehension), and again with texts that present a challenge (above students' instructional level in terms of silent reading comprehension). Students reading below grade level were selected in an effort to examine individual differences in a group that often experiences standardized

interventions. This close consideration of students' instructional reading level and its match to text difficulty, builds upon the relatively small body of work that investigates individual differences in inference-generation (Thurlow & van den Broek, 1997).

According to van den Broek and his colleagues, a reader's ability to engage in higher level process such as inference-making may depend on the relative ease of the reading context. For example, van den Broek et al suggest that when individuals are attempting to comprehend within a context that is not necessarily conducive to meaning construction, they tend to engage in limited inferential activities. Within these sorts of circumstances, readers engage in van den Broek et al's interpretation of something called Minimalist reading, when the context may be less than conducive to comprehension based on a number of factors including unfamiliar or challenging text structure, content, or vocabulary. On the other hand, Maximalist reading, which involves deep processing and plenty of inferential activity, occurs within contexts that are more conducive to meaning construction because they may involve well-structured texts, content familiarity, and so on (van den Broek, Fletcher, & Risden, 1993).

This study was designed to examine students' abilities to generate inferences in two contexts that may have been more or less conducive to meaning construction based on the difficulty levels of the texts. While one might predict that students would participate in more Maximalist reading with the easier texts that contain more familiar vocabulary and more concrete story lines, one might expect more Minimalist reading, with limited inferential activity, while students engage with texts that are more abstract and contain more challenging vocabulary and sentence structures.

Overall, this study was designed to investigate how text level and presentation format influences struggling readers' abilities to generate inferences. And ultimately, the investigation was intended to shed light on factors that are identified in various models that attempt to explain reading comprehension processes.

METHODS

This study was designed to examine the nature and frequency of readers'
inferences as they engage in texts that vary according to level of difficulty and
presentation format. Verbal protocols were collected during two 3-part, one-on-one
research sessions. Analyses of these protocols focused on the types and frequencies of
inferences generated with both accessible and more challenging texts in all three
presentation formats.

Data Collection

Research Sites and Participants

Elementary School Sites

The study was conducted at five public elementary schools in the San Francisco
Bay Area. Table 2.1 provides general information about each school site.

Table 2.1

School Information

School	No. of Participants	2002 Base API*	2002 Statewide Rank**	Title 1	% Free /Reduced Lunch	% ELL	% American Indian	% Asian	% Pacific Islander	% Filipino	% Hispanic	% African American	% White	% Multiple /No Response
Parker	13	561	1	Program Improve-ment (1996) No Child Left Behind (year 2)	83	37	0.4	1.7	0.6	7.6	41.0	41.2	7.2	0.4
Wiley	6	658	4	II/USP (2001)	67	22	0.0	5.0	2.9	18.1	22.6	47.3	4.2	0.0
Donner	5	496	1	School-wide	92	68	0.0	8.1	1.0	2.1	74.0	9.3	3.2	2.3
Harper	2	645	4	II/USP (1999)	56	34	0.6	6.3	6.3	6.2	52.4	13.9	14.4	0.0
Oliver	1	868	10	Not school-wide	18	20	0.5	33.0	0.2	0.9	10.8	8.0	37.5	8.9

*Academic Performance Index (API) which measures the performance and growth of California schools using a numeric scale that ranges from a low of 200 to a high of 1000. The interim statewide API performance target for all schools is 800. A school's growth is measured by how well it is moving toward or past that goal. A school's base year AOU is subtracted from its growth API to determine how much the school grew in a year. For elementary schools, the 2002 Base API incorporates the results of 1) the Stanford 9 in all content areas, and 2) the California Standards Tests in English-Language Arts, Mathematics and Social Science.

** API scores are divided into deciles numbered from 1 (the lowest) to 10 (the highest).

These sites were selected in an effort to study inference-making processes with students in schools that are performing below the average on standardized reading measures. In the state of California, many underperforming schools are in high poverty communities with students that are ethnically and linguistically diverse. Previous studies have shown that students in high-poverty schools with populations that are ethnically and linguistically diverse often experience reading instruction that is oriented more toward a skills-based approach and less toward a meaning-making approach (Allington, 1991; Fitzgerald, 1995). For this reason it is particularly important to represent such schools in studies that examine meaning-making processes. Twenty-six of the twenty-seven participants attended schools that rank below the state average on standardized measures, have a high proportion of students who qualify for free and reduced lunch, and serve a large number of English language learners.

<u>Students</u>

Participants included 4th and 5th grade students who comprehend at the 3rd grade level as measured by the *Reading Inventory for the Classroom* (Flynt & Cooter, 1998). Teachers were asked to provide a list of students that were likely to fall within this window. During the one-on-one assessment sessions for the *RIC*, students silently read narrative passages and responded to a set of comprehension questions including literal, inferential, and evaluative questions related to character, setting, story problem, and theme (see Appendix A). Those who comprehended at the third grade instructional level were asked to read the third grade level passage aloud for a measure of oral reading fluency. Students who fell into the third grade comprehension level were given consent

forms to take home and complete with their parents (see Appendix B). All students who returned consent forms participated in the study. Participants included sixteen fourth graders and eleven fifth graders. There were twenty girls and seven boys, and ten students spoke English as a second language. Participants included fourteen African American students, eight Latino students, two Asian students, two White/Caucasian students, and one Filipino student, all comprehending below grade level expectations. While earlier work has compared inference-making processes of 'good' and 'poor' readers (Neuman, 1990) and older and younger children (Meringoff, 1980) (Beal, 1990), this study examines older students all comprehending at the third grade level in an effort to highlight the possible effects of text format and text level on inference-making strategies. In addition, struggling readers are underrepresented in studies using protocol analysis, as researchers are inclined to use talented readers for such work because they are often more verbal (Afflerbach & Johnston, 1984; Afflerbach, 2000). The present study analyzes verbal reports of struggling readers in an attempt to add these voices to the existing research.

Parents

Students' parents were asked to complete a survey about their child's reading, listening, and viewing habits, as well as how verbal they tend to be one-on-one, as well as in small and large group settings. Surveys were sent home with each participant (see Appendix C). Although the survey was brief, offered a phone survey option, and included an addressed, stamped envelope, only five surveys were returned. As a result, survey data was not included in analysis.

Materials

Think Aloud Training Materials

In whole-class or one-on-one sessions, students learned how to engage in the think aloud process that was used in the two research sessions. For the one-on-one sessions, the poem "If I Were In Charge of the World" by Judith Viorst was used to introduce the process of 'thinking aloud.' This poem was selected because previous experience has taught me that its content generates interest and provokes lively discussion with upper elementary students (see Appendix D). For the whole class sessions, the video version of Mwenye Hadithi and Adrienne Kennaway's *Hot Hippo* was used in addition to the poem. Additional explanation of the think aloud training is included in the procedures section.

Research Session Texts

The six narrative texts used for the research sessions were selected for a number of reasons. First, since the aim of the study was to investigate readers' inference-making, texts were chosen based on van den Broek's suggestion that investigations of mental models usually involve stories that revolve around the intentions of the protagonist (van den Broek, Fletcher, & Risden, 1993). In addition, texts were selected because they also appear in video formats (versions that last about ten minutes) that closely match the original written text, include animation, and fall within the third or fifth grade levels of difficulty and interest.

While text leveling can be a rather subjective venture, involving a number of factors including vocabulary, number of syllables and characters per word, number of words per sentence, and sophistication of content and concepts, to name a few, these texts were leveled based on one or more of the following leveling systems: Fountas and Pinnell leveled texts lists, Fry Readability scale, Flesch-Kincaid Grade Level scale, and/or Reading Recovery/Early Intervention levels. Finally, texts were evaluated using the Literature Scale in Chall's Qualitative Assessment of Text Difficulty, and this information was added to the synthesis resulting in the final grade level determination (Chall, 1996). Table 2.2 lists the texts used in the research sessions.

Table 2.2

<u>Texts Used in Research Sessions</u>

Text	Reading Recovery rating	Foutas & Pinnell rating	Fry Readability rating	Flesch-Kincaid rating	Final rating (incorporating Chall's Qualitative Assessment of Text Difficulty)	Rationale
The Amazing Bone (Steig, 1976)	29	N	4.0	3.9	3.0	Familiar settings and plot structures
Doctor De Soto (Steig, 1983)	26	L/M	4.0	3.9	3.0	
Madeline and the Gypsies (Bemelmans, 1959)	na*	na	5.0	3.9	3.0	
Why Mosquitoes Buzz in People's Ears (Aardema, 1992)	na	na	5.0	4.6	5.0	More abstract, unfamiliar text structures, and languages other than English
Strega Nona (de Paola, 1975)	na	na	7.0	5.0	5.0	
A Story-A Story (Hayley, 1988)	na	M	7.0	5.2	5.0	

*na = not available

For the print version of the text used by the students during the research sessions, each story was typed in 14-point Times New Roman font, using the published text. In order to provide appropriate junctures for eliciting verbal protocols, each story was then divided into three episodes at natural transition points in the story. The stopping points for each episode were set at moments in the story when a new element of the plot was introduced, when there was a change of scene, and/or when a shift in the story was about to occur. In addition, transitions were placed at points when inferences would be likely to occur. Table 2.3 displays examples of transition points and their rationale. The printed texts used in the research sessions contained no illustrations because the print context was designed to examine the student's ability to generate inferences from verbal input only, without the support of illustrations. A new page was started for each episode so students held only one episode at a time and could not reread or rescan text read previously (see Appendix E).

Table 2.3

Examples of Story Transitions

Transition Example	Rationale for Transition Point	Types of Inferences Likely to Occur
...The night grew longer and longer. The animals of the forest knew it was lasting much too long. They feared that the sun would never come back. ■■■■■■■■■■■■■■■■■■■■ At last King Lion called a meeting of the animals. They came and sat down, *pem, pem, pem,* around a council fire...	Introduction of the main problem in the story Shift in time and place	Predictions (e.g. about whether/why Mother Owl will decide to once again wake the sun) Evaluations (e.g. about whether Mother Owl's actions are justified) Personal connections (e.g. about fears of the dark)
...And Strega Nona called Big Anthony in for supper. But too bad for Big Anthony, because he didn't see Strega Nona blow three kisses to the magic pasta pot. And this is what happened. ■■■■■■■■■■■■■■■■■■■ The next day when Big Anthony went to the town square to fetch the water, he told everyone about the pasta pot...	Introduction of the main problem of the story Shift in time and place	Explanations (e.g. about why Big Anthony is tempted by the pot) Associations (e.g. about Strega Nona's relationship with Anthony) Inferences Based on Knowledge/Beliefs about the World (e.g. about why people show off)

Finally, audio versions of each text were recorded in three parts onto a compact disc. These CD's along with the DVD video versions of five of the texts, acquired through Weston Woods, were played on a laptop computer. One text, *Madeline and the Gypsies*, was not available in DVD, so a VHS version was used instead. While the video versions omitted some descriptors and functional words (e.g. *said Strega Nona*) and shifted some word order, they were very similar to the original print text, with minimal textual omissions and substitutions. Participants used headphones to listen to the audio and video versions.

<center>Procedures</center>

Think Aloud Training

Students were introduced to the think aloud process in either whole class or individual settings. The 13 students from Parker Elementary School participated in whole class training sessions for the think aloud procedure. The think aloud process was modeled using the video version of Mwenye Hadithi and Adrienne Kennaway's *Hot Hippo*, a text not used in the research sessions. Next, students had the opportunity to participate in guided and independent practice of the think aloud procedure using the poem "If I Were In Charge of the World" by Judith Viorst. At the other school sites, there was no opportunity to conduct the think aloud training in a whole-class format. Instead, students were introduced to the think aloud procedures during one-on-one sessions. The same poem was used to model and practice the process of thinking aloud.

Research Sessions

At the start of each session students were reminded that this study was being conducted in order to learn more about how people figure out what is going on in a story, and how individuals help themselves understand what they are reading, what they are listening to, and what they are watching. Students participated in two 3-part research sessions. In Session 1, students were exposed to three third grade level texts, each presented in a different format. In Session 2, the process was repeated with three fifth grade level texts. The more accessible third grade level texts were used in the first

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session in an effort to develop trust and comfort among participants who already

struggled with reading. Table 2.4 presents a sample of how these sessions were

organized for three of the participants.

Table 2.4

Sample of Session Schedule

	Session 1 Third Grade Level Texts			Session 2 Fifth Grade Level Texts		
	Part 1	Part 2	Part 3	Part 1	Part 2	Part 3
Student 1	Amazing Bone VIDEO	Doctor De Soto PRINT	Madeline AUDIO	A Story PRINT	Mosquitoes VIDEO	Strega Nona AUDIO
Student 2	Madeline PRINT	Amazing Bone AUDIO	Doctor De Soto VIDEO	Strega Nona VIDEO	A Story AUDIO	Mosquitoes PRINT
Student 3	Doctor De Soto AUDIO	Madeline VIDEO	Amazing Bone PRINT	Mosquitoes AUDIO	Strega Nona PRINT	A Story VIDEO

The design was counterbalanced for story-format combinations as well as

sequence of story and presentation format in order to control for the effects of particular

story-format, story-order, and format-order combinations (see Appendix F for story-

format-order selection matrices).

At the beginning of each session students were provided with a brief introduction

reminding them of the purpose of the task (i.e., I want to learn more about how kids

figure out what's going on in a story and how they help themselves understand what they

are reading, what they are listening to, and what they are watching). Then, as each story

was presented, students were asked to indicate whether it was familiar. They were asked

again at the end of the story. This information was noted and used as a covariate in

analysis because earlier work has shown a prior knowledge effect on inferable knowledge (Pearson, Hansen, & Gordon, 1979).

Students started by reading, viewing, or listening to the first part, or episode, of the first story. When they were done, they were asked to talk about what they were thinking at this point in the story (i.e., Okay, (student name), what are you thinking at this point in the story?"). If any responses required clarification or elaboration, students were asked follow-up questions (e.g., Why do you say that? Why do you think so? Whom do you mean when you say 'they'?) . This process was repeated after the students read, viewed, or listened to the second and third parts of the story.

Probes were kept general and non-directive following Ericsson's suggestion that this design avoids the possibility of induced effects, affecting the think aloud process less (Ericsson & Simon, 1980). Moreover, follow-up questions and probes were used in a flexible, but mindful manner in response to students' individual differences. For example, if a student's initial report supplied the rationale or support for earlier statements, the prompt 'Why do you say that?' was not used. If a student did not supply such information, the follow-up prompts were used. Sometimes it was the case that students did not have any support or rationale for earlier statements and did not respond to the prompt. Other times, the prompt allowed more reticent or less verbal students the opportunity to offer rationale or support not stated in the initial report. This limited probe-when-necessary technique is similar to that used in other studies of reading-related phenomena (Phillips, 1988; Neuman, 1992), and was designed to result in more complete verbal reports from students. Afflerbach suggests that the value of verbal report data for investigating reading related processes is demonstrated through both methodological

rigor and flexible use (Afflerbach, 2000). The process used in this study was designed to be rigorous in its attempt to gather rationale or support whenever available, but also flexible in its attempt to respond to individual differences related to how verbal students were in the interview situation. In addition, readers were stopped just two times during the reading of the narrative in an attempt to maintain the flow of reading required to engage in inference-level processes.

When students finished thinking aloud after the third and final part of the story, they were asked three inference-level questions. The first question for each story was an explanation based question, requiring students to make inferences about what motivated a main character's actions, thoughts, or emotions. The second question was an association based question, asking students to make inferences about a main character's traits, features, qualities, and/or characteristics. The third question for each story was an evaluation question, requiring students to make infer any lessons learned by the characters in the story. Table 2.5 contains the questions for each story.

Table 2.5

Inference Questions

The Amazing Bone	Doctor De Soto	Madeline and the Gypsies
Why does Pearl think that her parents will say that she only imagined that the bone was talking to her? Why do you say that?	Why does Doctor De Soto decide to let the Fox into his office? Why do you say that?	Why does Madeline suggest that they write Miss Clavel a letter? Why do you say that?
How would you describe Pearl? What sorts of things seem important to her? Why do you say that?	How would you describe Doctor De Soto? What sorts of things seem to be important to him? Why do you say that?	How would you describe Madeline? What sorts of things seem to be important to her? Why do you say that?
Do you think any of the characters in this story learned a lesson or will do things differently in the future? Who? Why do you say that?	Do you think of the characters in this story learned a lesson or will do things differently in the future? Who? Why do you say that?	Do you think any of the characters in this story learned a lesson or will do things differently in the future? Who? Why do you say that?
Strega Nona	A Story-A Story	Why Mosquitoes Buzz in Peoples' Ears
Why does Big Anthony decide to use the pasta pot? Why do you say that?	Why does Ananse want to buy the Sky God's stories? Why do you say that?	Why does the mosquito feel guilty? Why do you say that?
How would you describe Strega Nona? What sorts of things seem to be important to her? Why do you say that?	How would you describe Ananse? What sorts of things seem to be important to him? Why do you say that?	How would you describe King Lion? What sorts of things seem to be important to him? Why do you say that?
Do you think any of the characters in this story learned a lesson or will do things differently in the future? Who? Why do you say that?	Do you think any of the characters in this story learned a lesson or will do things differently in the future? Who? Why do you say that?	Do you think any of the characters in this story learned a lesson or will do things differently in the future? Who? Why do you say that?

After responding to the inference questions, students proceeded to the second part of the interview, following the same procedures with a different text and presentation format. Finally, students completed the final part of the interview with a third text/presentation format. Each part of the interview took about 20 minutes. Students' think aloud segments and responses to inferences questions were audio-taped and transcribed.

Segmenting Verbal Protocols into Propositions

To begin, each verbal protocol was divided into a list of idea units, or propositions using a procedure similar to those used in earlier studies of reading related processes (Phillips, 1988; Rickheit & Strohner, 1985; Ericsson & Simon, 1993). Each proposition consisted of one predicate and one or more arguments conveying its meaning. While arguments were considered independent linguistic expressions that can stand alone, predicates were viewed as inherently dependent expressions of the arguments, elements such as qualities, relations, acts, properties, and states (Frawley, 1992). Table 2.6 presents an example of how a section of one protocol was segmented. The main predicates have been underlined.

Table 2.6

<u>Example of Protocol Segmentation</u>

Original protocol (R = Researcher; S = Student)	Segmented protocol (R = Researcher; S = Student)
Amazing Bone R: So, (Student A), what I'd like you to do is tell me what you're thinking at this point in the story. S: About, how is, how she's gonna tell her parents about the bone. R: Okay, anything else? S: (shakes head) R: Okay, why are you wondering about that? S: Because, her parents, her parents aren't gonna believe her because they're gonna just say that she's imaginary stuff. — R: Okay, (Student A), what are you thinking now? S: Uh, the bone is gonna find a way to get them outta the room. R: Why do you think that? S: Because he stood up for hisself when the fox um took him, but he got back to Pearl and now I think that he's gonna do it again and get outta the room. R: Okay, we shall see...	Amazing Bone R: So, (Student A), what I'd like you to do is tell me what you're thinking at this point in the story. About, how is, how she's <u>gonna tell</u> her parents about the bone. R: Okay, anything else? (shakes head) R: Okay, why are you wondering about that? Because, her parents, her parents <u>aren't gonna believe</u> her because they're <u>gonna</u> just <u>say</u> that she's imaginary stuff. — R: Okay, (Student A), what are you thinking now? Uh, the bone is <u>gonna find</u> a way to get them outta the room. R: Why do you think that? Because he <u>stood up</u> for hisself when the fox um <u>took</u> him, but he <u>got</u> back to Pearl and now I think that he's <u>gonna do it</u> again and <u>get</u> outta the room. R: Okay, we shall see..

While there was variation among students and stories, the average number of propositions per protocol was 34.6 per story. Table 2.7 summarizes the average number of student-generated propositions for each story.

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Table 2.7

Average number of student-generated propositions for each story

Story	Mean	N	Standard deviation	Range
The Amazing Bone	43.3	27	22.6	91
Doctor De Soto	34.7	27	15.8	60
Madeline and the Gypsies	30.3	27	11.7	40
A Story-A Story	31.8	27	15.3	47
Why Mosquitoes Buzz in Peoples' Ears	32.2	27	16.7	63
Strega Nona	35.4	27	13.7	44
TOTAL	34.6	162	16.6	93

In order to check for reliability of this segmenting process, external raters segmented 10% of the protocols. Interrater agreement was 82.14%. Raters included three students in the Developmental Teacher Education program at the University of California, Berkeley. Each rater was provided with one example protocol in both original and segmented form, along with directions for segmenting the protocols into a list of propositions.

Coding Propositions

While Ericsson suggests that the process of encoding of verbal protocols cannot be made thoroughly objective (Ericsson & Simon, 1993), efforts were made to avoid problems that can arise when coding is affected by the coder's knowledge of the student, the context, and memories of previous encodings. Each segmented 3-part interview protocol was divided into three separate files, one for each story interview, and given a 6-digit identification number. The student names, as well as presentation format and

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sequence information were removed. Coding of each story protocol was done in a random order, with no knowledge of the student, presentation format, or sequence. This way the protocols contained an interview associated with an entire story, offering enough context to permit more of the semantic content of the protocol to be retained. At the same time, coding decisions were made independent from knowledge about the student, presentation format, and sequence.

Coding Propositions into General Categories

Next, these propositions were mapped onto a set of general categories. The first step was to encode each proposition in terms of the simplest process that could account for it, keeping in mind Ericsson's assertion that processes themselves cannot be encoded directly from verbalizations, but must be inferred. This analysis reflected an iterative process involving two passes through the data. While some propositions mapped onto existing categories from earlier research, others formed novel or modified categories. For the first pass through the data, each proposition was read alongside lists of general verbalization categories from earlier work (Ericsson & Simon, 1993; Meringoff, 1980; Neuman & Roskos, 1992; Pressley & Afflerbach, 1995; Trabasso & Magliano, 1996). The categories, along with definitions and examples are displayed in Table 2.8.

Table 2.8

General Proposition Categories

Category	Definition	Examples
Recall	Verbalizations that match or paraphrase content found in the text	and she put him in her purse and she felt the breeze
Inference	Verbalizations that require generating processes	'Cause she probably thought that they was worried. so he was trying to prove his point.
Reiteration	Reiterating a previous verbalization or question	(response to the question 'Why does the mosquito feel guilty?') It feels guilty because um…it feels guilty
Metacomment	Verbalizations about one's thinking	I forgot the rest… That, I read it but I didn't understand it.
Unrelated/contrived	Verbalizations that are not related to the task or purely making up story content	Is there a queen animal in the jungle? and then they gave the bone back to the witch.
Unintelligible	Verbalizations that are incomplete, inaudible, or syntactically confusing	and then after they scared people, they um, they could (inaudible) but I'm not so sure I think once the fox gets like, like fine, he gets okay,
Refrain	Not responding or stating that one cannot or will not respond	Um… Because um he liked, um, I don't know.

While verbalizations were placed into these broad categories, those that fell into

the seventh category, *Refrain*, were noted, but not included as propositions. Likewise,

recall and inference level propositions that were either inaccurate or implausible were

noted, but not included in the overall analyses. Applying a process similar to that used in

McCormick's study of disabled readers' erroneous responses to inferential

comprehension questions, propositions were considered inaccurate or implausible if they

were wild guesses, erroneous information, or illogical inferences unsupported by the

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story content (McCormick, 1992). Examples of inaccurate and implausible propositions are displayed in Table 2.9.

Table 2.9

<u>Examples of Inaccurate and Implausible Propositions</u>

Context (e.g. question, prompt)	Proposition	Rationale for Rating as Inaccurate or Implausible
Student's response to the question "How would you describe Ananse, what sorts of things seem to be important to him?" (*A Story-A Story*)	He (Ananse) was showing off that his dad was a sky god,	The Sky God was not Ananse's father. Ananse wanted to buy the Sky God's stories.
Student's open response to the first segment of the story (*Doctor De Soto*).	And he (Dr. De Soto), it was his patient that became his wife	Dr. De Soto's wife is his assistant, not his patient.
Student's open response to the first segment of the story (*The Amazing Bone*).	Um, it's about this girl (Pearl) who's going to school	Pearl is on her way home from school.
Student's open response to the last segment of the story (*Madeline and the Gypsies*).	That Miss (Clavel), the teacher got lost.	The teacher did not get lost. Madeline and Pepito were left on the Ferris Wheel.
Student's response to the question "Why did Big Anthony decide to use the pasta pot?" (*Strega Nona*)	but she (Strega Nona) didn't like give him (Big Anthony) that much—he didn't get that much food.	Strega Nona gave him food to eat and a place to sleep. Big Anthony's curiosity and desire to prove himself to the villagers prompts him to use the pot.
Student's response to the question "Why did Madeline suggest that they write Miss Clavel a letter?" (*Madeline and the Gypsies*)	Because she, Miss Clavel's sick.	Miss Clavel was not sick. Madeline wrote the letter because she feared that Miss Clavel was worried.
Student's open response to the second segment of the story (*Doctor De Soto*).	because he (The Fox) thought his tooth wasn't gonna get better,	The fox reconsiders eating the De Soto's because they have helped his tooth feel better.
Student's response to the question "Do you think any of the characters in this story learned a lesson or will do things differently in the future?" (*Doctor De Soto*)	No.	The Fox learns a lesson about kindness and honesty.

Such inaccurate and implausible responses were not included in the analysis because this study was designed to examine the effects of presentation format and text level on struggling readers' ability to generate inferences that would allow them to construct coherent meaning of narrative texts. While other studies have analyzed students' errors in comprehension responses (McCormick, 1992; Williams, 1993), this study examined effective inference-making across text levels and presentation formats. Although other work has suggested that students who have a difficult time with comprehension may be more inclined to make wild guesses, provide erroneous responses, and generate illogical inferences (McCormick, 1992; Williams, 1993), the present study made comparisons, across levels and formats, of students' inference-making, not their lack of inference-making.

Table 2.10 displays the sums and means of the following: accurate recall propositions, inaccurate recall propositions, total recall propositions (both accurate and inaccurate), plausible inference-level propositions, implausible inference-level propositions, total inference-level propositions (both plausible and implausible). Again, only accurate recall propositions and plausible inference-level propositions were included in the data analyses.

Table 2.10

Recall and Inference-Level Propositions, Accuracy and Plausibility

	N	Sum	Mean
Accurate Recall propositions	27	2651	98.19
Inaccurate Recall propositions	27	176	6.52
Total Recall propositions (accurate + inaccurate)	27	2827	104.70
Plausible Inference-Level propositions	27	2316	85.78
Implausible Inference-Level propositions	27	126	4.67
Total Inference-Level propositions (plausible + implausible)	27	2442	90.44

Table 2.11 reports on the sums and means of the various proposition categories.

Table 2.11

General Propositions Sums and Means (Excluding Inaccurate/Implausible Propositions)

	N	Sum	Mean
Recall	27	2651	98.19
Inference	27	2316	85.78
Reiteration	27	90	3.33
Metacomment	27	68	2.52
Unrelated/contrived	27	37	1.37
Unintelligible	27	15	.56

Coding Inference-level Propositions into Subcategories

Next, propositions labeled "inferences" were examined and compared with the types of inferences delineated in earlier studies (Graesser & Kreuz, 1993; Meringoff, 1980; Neuman, 1990; Pressley & Afflerbach, 1995; Thurlow & van den Broek, 1997; Trabasso, 1981; Trabasso & Magliano, 1996). Again, this analysis involved an iterative

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process with two passes through the data, with some propositions mapping onto existing categories and others forming novel or modified categories. The resulting six subcategories included inferences related to predictions, explanations, associations, evaluations, world knowledge or beliefs, and personal connections. Table 2.12 displays the subcategories along with definitions and examples.

Table 2.12

Inference Subcategories Definitions and Examples

Inference Subcategory	Definition	Example
Prediction	Verbalizations that predict future events or causal consequences	Um, I'm thinking that like something's gonna happen when the fox is gonna try to eat Pearl
Explanation	Verbalizations that provide the basis, rationale, motive, condition, or occasion of events, states, or actions	Because he wants to be like, he wants to be himself,
Association	Verbalizations that provide information about who does what to whom with what, when, and where, or provide information on features, properties, relations, and functions of persons, objects, or concepts	but in the story, I thought the mosquito was happy in a way
Evaluation	Verbalizations that evaluate the style or content of the text or evaluate characters' actions or behaviors	Because he, he, he lear-, he should learn not to mess with other people
World knowledge or beliefs	Verbalizations based on one's knowledge or beliefs about the world	Because no regular bone could talk
Personal connection	Verbalizations based on a personal association or connection to the characters or events	Because I wouldn't let nobody take my stories

The first three categories (prediction, explanation, and association) are borrowed from Trabasso and Magliano's investigation of eight readers' conscious understanding of

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eight narrative texts using think-aloud methodology (Trabasso & Magliano, 1996). The

first two types of inferences (predictions and explanations), integrate sentences across the

text. For example, predictions are forward-oriented and are conveyed as expectations of

what is to come, based on what has been read. Predictions that are substantiated then

serve to link sentences or thoughts. Trabasso and Magliano hypothesized that if

comprehension is expectation-based, it seems likely that readers would generate a

relatively high proportion of prediction-level inferences (Trabasso & Magliano, 1996).

What they found, however, is that while readers did make a number of predictions, the

majority of the readers' inferences were backward-oriented explanations that link what is

being read to prior knowledge or text information. These findings suggesting that

comprehension is more explanation-based are aligned with assumptions based on earlier

work that consider explanations to be the main form of understanding in various theories

about comprehension (e.g. Graesser, Singer, & Trabasso, 1994; Trabasso & Suh, 1993).

According to this earlier work, explanations may serve to guide comprehension as

readers pursue a need to know the reasons for story events.

Finally, Trabasso and Magliano noted readers' use of associations which are

concurrent and usually elaborate the text, adding new information which may or may not

be used again. For example, a prior association may be retrieved and used to integrate

text through a prediction or explanation. It is important to note, then, that in the present

study, inference-level propositions were coded only once, with only one category per

proposition. So, associations that may have served explanatory or predictive functions in

the readers' mind are recognized as associations only (Trabasso & Magliano, 1996).

The fourth category, evaluation, is found in Trabasso's earlier work (Trabasso, 1981) and also classified by Pressley and Afflerbach as one of three types of activities readers engage in during constructively responsive reading: constructing meaning, monitoring, and evaluating (Pressley & Afflerbach, 1995). In Pressley and Afflerbach's scheme, evaluating includes readers' assessments of the text style (e.g., Is the writing good or bad? Are the examples effective and compelling?), as well as the text content (e.g., Is the content plausible? Is the storyline surprising? Is the main character doing the 'right' thing?) (Pressley & Afflerbach, 1995). And as with Trabasso and Magliano, Pressley and Afflerbach recognize the existence of a dynamic interplay among the three activities and admit that it borders on reductionistic to separate these three activities. Nevertheless, the present study codes the propositions only once.

The fifth and sixth categories, inferences based on beliefs or knowledge about the world and personal connection are borrowed from Trabasso's earlier work (Trabasso, 1981) as well as Meringoff's investigations of the bases of readers' inferences as they attempted to comprehend stories presented in both video and storybook formats (Meringoff, 1980). Meringoff found that some inferences were based on the readers' general beliefs or knowledge about the world, while others were based on their personal association with a character or a particular situation. For this study, the term personal connection was used (rather than personal association) to avoid any confusion with the general association category.

In addition, two aggregate variables were created: text-connected inferences and self-connected inferences. The text-connected inferences variable combined the three subcategories of prediction, explanation, and association, since such inferences required

the students make predictions, offer explanations, and designate associations directly related to the story events and characters. The self-connected inferences variable combined the three subcategories of evaluation, world knowledge or beliefs, and personal connection, since these inferences required students to assert evaluations and make connections based on their own experiences, background knowledge, opinions, and value systems.

The frequencies with which the various types of inferences occurred were noted. As reported in Table 2.13, the types of inference that were most prevalent were associations. The second most frequent inferences were evaluations, followed by explanations, predictions, inferences based on knowledge or beliefs about the world, and personal connections. And on average, students generated more text-connected than self-connected inferences. This frequency trend is one that continues across additional analyses reported in the Results section, and may be not surprising based on the nature of the follow-up questions described above that may have prompted students to make more associations, evaluations, and explanations. It is interesting to note, however, that students' overall inference-making was not significantly influenced by the order of the story. In other words, in discussing the sixth story, having heard similar questions throughout the previous interviews, students' inference-making did not necessarily increase. This is surprising given that van den Broek and his colleagues found that questioning may benefit comprehension when the need for decoding is eliminated (van den Broek et al., 2001). In this study inference-generation did not appear to increase with each successive story, regardless of whether the format required decoding. Finally, I noted the number of inferences that were made spontaneously as well as those prompted

by explicit questions or follow-up prompts such as 'Why do you say that?' This information was used as a covariate in the analysis.

Table 2.13

Inference Subcategories Sums and Means

	N	Sum	Mean	Std. Deviation
Prediction	27	195	7.22	10.32
Explanation	27	436	16.15	5.26
Association	27	804	29.78	14.24
Evaluation	27	755	27.96	24.68
World knowledge/beliefs	27	105	3.89	5.71
Personal connection	27	21	0.78	2.17
Text-connected inferences	27	1435	53.15	20.77
Self-connected inferences	27	881	32.63	29.37
TOTAL inferences	27	2316	85.78	44.36
Prompted inferences	27	1582	58.59	21.83
Spontaneous inferences	27	734	27.19	25.16

In order to check for reliability of this coding process, external raters coded 10% of the protocols. Interrater agreement was 80.88%. Raters included the same three students in the Developmental Teacher Education program at the University of California, Berkeley used to assess interrater agreement of protocol segmentation. Raters coded segmented protocols that were different from the ones they had segmented, but randomly selected from those that remained. Each rater was provided with a sample segmented protocol that had been coded, along with definitions and examples of the various types of propositions as defined in Table 2.8 and 2.11.

Data Analysis

Analyses of data gathered in the form of audio-taped and transcribed verbal reports, were examined in light of the research questions: What inference-making processes do students engage in with narrative texts varying according to level of difficulty and presentation format? What types of inferences do students make, and how frequently are they generated? Means of the six types of inferences generated within the three presentation formats at the two levels of text difficulty were analyzed using a within-subjects 2x3x6-way analysis of variance. Noted differences among means (described in the next section) prompted a post hoc analysis using the Least Significant Difference test with a 6-level variable (1=Grade 3 text in print, 2=Grade 3 text in audio, 3=Grade 3 text in video, 4=Grade 5 text in print, 5=Grade 5 text in audio, 6=Grade 5 text in video). Three mean differences were significant and are discussed in the section that follows. Finally, follow-up analyses were conducted to determine whether the story, the order of story or presentation format, and the counterbalanced story-format combinations had significant effects on students' inference-making.

RESULTS

In this chapter, data gathered from students' verbal protocols are presented in three parts. The first set of results reports the main effects of presentation format and text level on students' inference-making. A second set of analyses examines the potential influence of story, the order of story or presentation format, and story-format combinations on students' inference-making. A third set of results reports students' recall-level data. In addition, student examples are woven throughout the chapter to illustrate the findings in a more descriptive manner.

Effects of Text Level and Presentation Format on Inference-Making

Preliminary analyses examined the main effects of text level and presentation format on students' inference-making. Table 3.1 reports the means of students' total inferences based on text level and presentation format.

Table 3.1

Total Inferences Based on Text Level and Presentation Format

	Print	Audio	Video	All Formats
Level 3 Texts	M: 12.52 SD: 7.71	M: 14.70 SD: 10.11	M: 16.78 SD: 7.33	M: 44.00 SD: 22.96
Level 5 Texts	M: 14.19 SD: 9.13	M: 12.52 SD: 7.80	M: 15.07 SD: 9.04	M: 41.78 SD: 23.50
All Texts	M: 26.70 SD: 15.89	M: 27.22 SD: 16.71	M: 31.85 SD: 14.50	M: 85.78 SD: 44.36

Means of the total number of inferences generated with the three presentation formats at the two levels of text difficulty were analyzed using a within-subjects 2 (text level) x 3 (presentation format) way analysis of variance. Variability in students'

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inference-making attributed to presentation format was significant, (F = 5.031, p = .010)[1]. As the data in Table 3.1 indicate, when numbers of inferences were combined across both text levels, students generated the fewest number of inferences with texts presented in print format (26.70), more with texts presented in audio format (27.22), and the greatest number of inferences with texts presented in video format (31.85). While some students showed gains of just a small percentage of propositions, others showed more notable increases (from 30% to over 100%) based on presentation format, regardless of the order in which the format was presented. It is important point to bear in mind is that the order in which students were exposed to print or audio or video formats was randomly assigned, and while the trend indicates increases in inference-making from print to audio to video conditions, this is not to imply that students were exposed first to print, second to audio and third to video.

While format effects were significant, variability in students' inference-making attributed to text level was not significant, (F = .699, p = .412). When inferences were combined across all three presentation formats, students generated a mean of 44.00 inference-level propositions with the level 3 texts, and a mean of 41.78 inference-level propositions with the level 5 texts.

Although it appears that the findings indicate an overall trend, with print prompting the fewest inferences and video prompting the most, it is important to note that a straightforward interpretation of the main effects is complicated by a format by difficulty level interaction (F = 3.097, p = .054). Specifically, while text difficulty performed in one way in the audio and video formats—with easier passages eliciting more inferences—this pattern was reversed in the print format, where the harder passages

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[1] p > .05

elicited more inferences. This finding associated with the print format serves as the main source of the interaction.

The sections that follow include closer examinations of the findings noted above along with a post hoc analysis prompted by the interaction effect. Examples that correspond to the most prevalent trends are presented to illustrate the main effects. In addition, examples based on findings that deviate from the overall means are presented in an effort to better understand the interaction effect.

Illustrating Predominant Patterns

In this section, patterns associated with the print and video contexts are followed by analyses of data that call for a closer look at the audio context. Propositions for all participants were included in the 2 x 3 way analysis of variance noted above. Table 3.2 reports patterns of inference-making for the twenty-seven students, noting the formats that prompted the fewest to greatest numbers of inferences. These data highlight the predominant patterns further illustrated by the tables and descriptive cases that follow.

Table 3.2

Patterns of Inference-Making

Lowest—Medium—Highest (number of inferences)	No. students whose inference-making followed this pattern with Level 3 texts	No. students whose inference-making followed this pattern with Level 5 texts	No. students whose inference-making followed this pattern when inferences generated with Level 3 texts were combined with inferences generated with Level 5 texts	No. students whose inference-making followed this pattern with both Level 3 and Level 5 texts	No. instances when this pattern occurred in a single research session (out of 54 sessions—27 students, 2 sessions per student)
PATTERN 1: Print Low, Video High Print—Audio—Video	13	5	8	3	18
PATTERN 2: Print High, Video Low Video—Audio—Print	1	5	1	0	6
PATTERN 3: Audio Low Audio—Print—Video Audio—Video—Print	2 1	3 8	6 2	1 0	5 0
PATTERN 4: Audio High Print—Video—Audio	5	2	3	1	7
Print—Audio/Video (equal)	1	1	0	0	2
Print/Audio (equal)—Video	0	0	1	0	0
Audio—Print/Video (equal)	2	0	1	0	2
Audio/Video (equal)—Print	0	1	2	0	1
Video—Print—Audio	1	2	2	0	3
Video—Print/Audio (equal)	0	0	1	0	0
Video/Audio/Print (equal)	1	0	0	0	0

Predominant Patterns with Print and Video

Pattern 1: Print low, video high. As noted in Table 3.2, when inferences were totaled across text levels, eight of the twenty-seven participants made the fewest number of inferences within the print context, more within the audio context, and the greatest number within the video context, making this the most predominant trend. With just the level 3 texts, data from thirteen students followed this general pattern, and with just the level 5 texts, data from five participants matched the trend (making a total of eighteen instances when this occurred out of the fifty-four research sessions, two per student). Finally, three participants followed this overall trend with both level 3 texts *and* level 5 texts. Table 3.3 reports the data from these three students, including information about the story-format combinations and sequence of presentation. Such information is provided in this first table in order to illustrate how story-format combinations and sequences varied by individual and will not be included in each subsequent table. The table is followed by a case designed to illustrate the data from one of the students in a more descriptive manner.

Table 3.3

Pattern 1: Print Low, Video High

Student	Level	Print	Audio	Video
Len	3	Madeline and the Gypsies (presented THIRD) 4	The Amazing Bone (presented SECOND) 6	Doctor De Soto (presented FIRST) 16
	5	A Story-A Story (presented SECOND) 3	Strega Nona (presented THIRD) 6	Why Mosquitoes Buzz in Peoples' Ears (presented FIRST) 9
Clarissa	3	The Amazing Bone (presented THIRD) 10	Madeline and the Gypsies (presented SECOND) 13	Doctor De Soto (presented FIRST) 18
	5	A Story-A Story (presented FIRST) 4	Why Mosquitoes Buzz in Peoples' Ears (presented THIRD) 14	Strega Nona (presented SECOND) 17
Ravelle	3	The Amazing Bone (presented THIRD) 20	Doctor De Soto (presented FIRST) 24	Madeline and the Gypsies (presented SECOND) 25
	5	Why Mosquitoes Buzz in Peoples' Ears (presented SECOND) 27	A Story-A Story (presented THIRD) 29	Strega Nona (presented FIRST) 31

Before presenting the descriptive case of one student, Len, it is necessary to make one disclaimer about these illustrative data. The within-subjects design employed in this study meant that each student responded to a different text for each format; thus these examples can only be regarded as generally illustrative of the patterns observed in the full analyses across all students—an analysis in which texts are balanced across formats. The example of Len follows.

Len. Len is one of three students who generated the fewest number of inferences within the print context, more within the audio context, and the greatest number within the video context with both level 3 *and* level 5 texts. For example, when the level 3 text,

Madeline and the Gypsies, was presented in print format (the third text presented), Len was able to generate just a few inferences such as predicting that Madeline might become a scientist because she is smart. When *The Amazing Bone* was presented in audio format (the second text presented), Len was prompted to make more inferences such as suggesting that the bone must be important to the main character, Pearl, because she went out of her way to take care of it, and predicting that the bone might return to the witch and turn into a boy. And when *Doctor De Soto* was presented in video format (the first text presented), Len generated the greatest number of inferences. He surmised that Doctor De Soto was a good dentist who was motivated to help the fox because he felt sorry for him. In addition, Len determined that Doctor De Soto and his wife were smart because they devised a plan to ensure their safety. Finally, Len concluded that Doctor De Soto valued doing his job well and was motivated to take good care of his family because he was the husband.

Like Len, Clarissa and Ravelle also generated the fewest number of inferences within the print context and the greatest number within the video context, a pattern that matches the trend when inferences are combined across text levels. Nevertheless, other students' inference-making patterns followed a slightly different course.

Pattern 2: Print high, video low. While the first pattern of print low, video high was more prevalent with level 3 texts for thirteen participants, this trend was reversed for one student with level 3 texts, and for five students with level 5 texts. The numbers of inferences these latter five students generated within each context are reported in Table 3.4, which is followed by a more descriptive illustration of one case.

Table 3.4

Pattern 2: Print High, Video Low

Student	Level	Print	Audio	Video
Katrina	5	35	30	25
Akisha	5	11	7	3
Lily	5	39	35	31
Roberta	5	12	10	6
Rosanna	5	8	6	5

Katrina. Katrina is one of five students who generated the greatest number of

inferences within the print context, and the fewest within the video context with level 5

texts. For example, when _Strega Nona_, was presented in print format (the third text

presented), Katrina generated the greatest number of inferences. She was able to surmise

why Strega Nona lived alone, and why Anthony decided to disobey her instructions.

When _A Story-A Story_ was presented in audio format (the first text presented), Katrina

made fewer, more general inferences related to the moral of the story. And when _Why_

Mosquitoes Buzz in Peoples' Ears was presented in video format (the second text

presented), Katrina generated even fewer inferences, simply evaluating the structure of

the text. It appears that Katrina, like four of her peers, had an easier time generating

inferences when more difficult texts were presented in print, which is a shift from the

first, most prevalent pattern (print low, video high).

Predominant Patterns with Audio Text: Feast or Famine

Additional findings deviate from the most predominant trend (print low, video

high), and illustrate the interaction effect noted above. While data from some students

correspond with the most prevalent pattern on an individual basis at either or both text levels, data from other students reveal two alternative patterns that are hidden within the overall analysis of the main effects. It is interesting to note that analyses of the numbers of inferences generated by some students followed an alternative pattern that calls for a closer consideration of the audio context. Since the overall trend suggests that, across both text levels, there were more inferences generated within the video context than the audio context, and more inferences generated within the audio context than the print context, an analysis was run on the discrepancies between video over audio, and audio over print. In other words, calculations were conducted to determine the differences between the numbers of inference-level propositions generated within the video and audio contexts. Likewise, differences were noted between the numbers of inferences generated within the audio and print contexts. Figure 3.1 portrays these discrepancies graphically.

Figure 3.1

Discrepancies Based on the Overall Trend of Increases from Print to Audio to Video
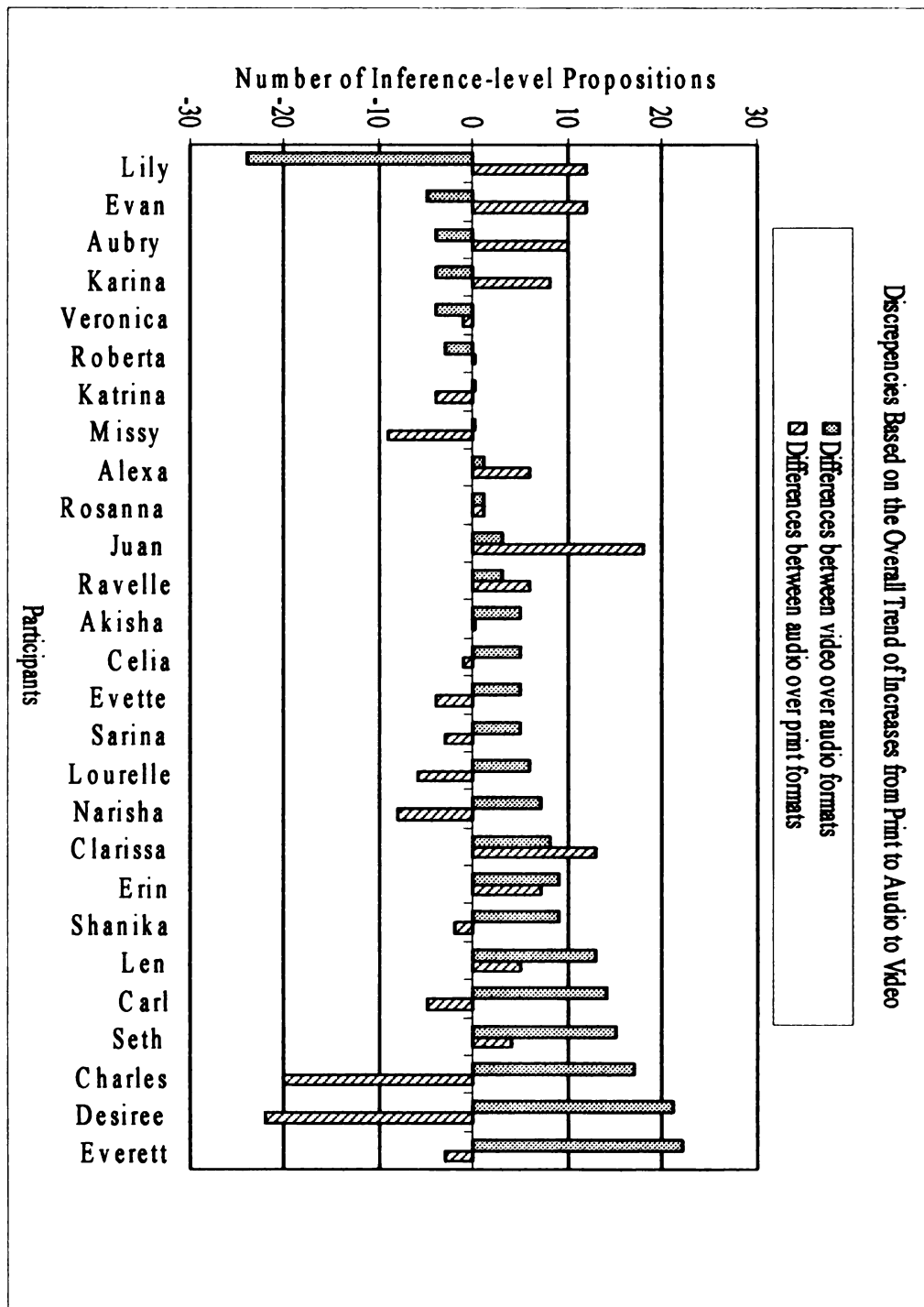
It appears that for those students with the greatest variation in inference-generation due to presentation format, the audio context was either particularly conducive or problematic. For the students represented at the far ends of the graph, the audio versions of the texts prompted notably greater or fewer numbers of inferences. That is, students at the far right of the graph had a more difficult time generating inferences within the audio context. While they were more successful within the video context, which corresponds to the general trend, they also were more successful within the print context, which deviates from the overall trend. Alternatively, students at the far left of the graph appeared to have an easier time making inferences within the audio context. While they were less successful within the print context, which matches the general trend, they also were less successful within the video context, which deviates from the overall findings. Students from both sides of the spectrum are represented in the sections that follow.

Pattern 3: Audio as an inference suppressing condition. Along with Figure 3.1, Table 3.5 presents additional data on students for whom the audio context was noticeably less fruitful in terms of inference-generation with both easy and more difficult texts. While there were three students for whom this was true with level 3 texts, and eleven students for whom this was the case with level 5 texts (for a total of fourteen instances across fifty-four research sessions), there were three students for whom audio texts prompted the fewest number of instances with both levels of text. For example, Charles generated less than half the inferences with texts presented in audio format at both Level

3 and Level 5. The audio context appeared to present similar challenges for Desiree and Everett.

Table 3.5

Pattern 3: Audio Low

Student	Level	Print	Audio	Video
Charles	3	13	5	14
	5	20	8	16
Desiree	3	24	9	24
	5	16	9	15
Everett	3	9	8	12
	5	14	12	30

Pattern 4: Audio as an inference enhancing condition. Finally, for some students the audio context appeared to enhance their ability to generate inferences. While there were five students for whom this was true with level 3 texts, and two students for whom this was the case with level 5 texts (for a total of seven instances across fifty-four research sessions), there was one student for whom audio texts prompted the greatest number of instances with both easy and challenging texts. For Evan, the audio context prompted twelve more inferences than the print context, and five more inferences than the video context. Along with these findings related to presentation format, other results offer further insight into the format by text level interaction effect noted above.

Examining Text Level More Carefully

While the overall effect of text level proved not to be significant, it was involved in an interaction with format. Of particular interest is the finding within the print format

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condition, where the average number of inference-level propositions generated with the more challenging level 5 texts (14.19) was higher than the mean with the easier level 3 texts (12.52), however, the results of a simple effects ad hoc test indicate that the variation due to text level was not significant within the print condition (($F = 2.267, p = .144$).

Effects of Text Level and Presentation Format on Various Sets of Inferences

Three additional overall tests were conducted to determine the direction for further analysis. As described in the Methods section, inference-level propositions were analyzed in a variety of ways. First, propositions were coded as one of six types of inferences: predictions, explanations, associations, evaluations, inferences based on world knowledge or beliefs, and personal connections. In addition, two aggregate variables were created: text-connected inferences that combined the categories of prediction, explanation, and association; and self-connected inferences that combined the categories of evaluation, world knowledge or beliefs, and personal connection. Finally, inferences were coded as either prompted or spontaneous. The results of overall tests examining the effect of text level and presentation format on these three sets of inferences determined which line of inquiry to pursue.

The first test checked the effects of text level and presentation format on students' generation of the six types of inferences. Means of the six types of inferences generated with the three presentation formats at the two levels of text difficulty were analyzed using a within-subjects 2 (text level) x 3 (presentation format) x 6 (inference type) way analysis

of variance. Table 3.6 reports the means of the six types of inferences across both text

levels and all three presentation formats.

Table 3.6

<u>Six Categories of Inferences</u>

Level	Format		Prediction	Explanation	Association	Evaluation	World knowledge/beliefs	Personal connection	Total inference-level propositions
3	Print	Mean	0.78	2.59	4.89	3.52	0.67	0.07	12.52
		(SD)	(1.37)	(2.48)	(2.93)	(3.38)	(1.62)	(0.27)	(7.71)
	Audio	Mean	1.48	2.11	5.78	4.33	0.89	0.11	14.70
		(SD)	(3.03)	(2.19)	(5.36)	(4.59)	(1.31)	(0.42)	(10.11)
	Video	Mean	1.30	3.19	5.89	5.11	0.96	0.33	16.78
		(SD)	(2.93)	(2.20)	(3.13)	(5.10)	(1.45)	(1.21)	(7.33)
5	Print	Mean	1.11	2.63	5.26	4.56	0.59	0.04	14.19
		(SD)	(2.38)	(1.86)	(3.12)	(5.47)	(1.37)	(0.19)	(9.13)
	Audio	Mean	0.59	2.59	3.85	5.00	0.26	0.22	12.52
		(SD)	(1.01)	(1.93)	(2.96)	(5.49)	(0.81)	(1.15)	(7.80)
	Video	Mean	1.96	3.04	4.11	5.44	0.52	0.00	15.07
		(SD)	(2.95)	(1.91)	(2.74)	(6.03)	(1.31)	(0.00)	(9.04)
3	ALL Formats	Mean	3.56	7.89	16.56	12.96	2.52	0.52	44.00
		(SD)	(6.27)	(3.25)	(8.86)	(11.71)	(3.36)	(1.28)	(22.96)
5		Mean	3.67	8.26	13.22	15.00	1.37	0.26	41.78
		(SD)	(5.04)	(4.13)	(6.85)	(14.14)	(2.69)	(1.16)	(23.50)
BOTH levels	Print	Mean	1.89	5.22	10.15	8.07	1.26	0.11	26.70
		(SD)	(3.14)	(2.76)	(5.15)	(8.28)	(2.73)	(0.42)	(15.89)
	Audio	Mean	2.07	4.70	9.63	9.33	1.15	0.33	27.22
		(SD)	(3.44)	(2.76)	(7.11)	(9.12)	(1.63)	(1.21)	(16.71)
	Video	Mean	3.26	6.22	10.00	10.56	1.48	0.33	31.85
		(SD)	(5.16)	(2.83)	(4.41)	(9.76)	(2.41)	(1.21)	(14.50)

The second test examined the influence of level and format on the aggregate

variables of text-connected and self-connected inferences. Means of the two aggregate

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variables generated with the three presentation formats at the two levels of text difficulty

were analyzed using a within-subjects 2 (text level) x 3 (presentation format) x 2

(aggregate variable) way analysis of variance.   Table 3.7 reports the means of the two

aggregate of variables across both text levels and all three presentation formats.

Table 3.7

<u>Text-Connected and Self-Connected Inferences</u>

Level	Format		Text-connected inferences	Self-connected inferences	Total inference-level propositions
3	Print	Mean	8.26	4.26	12.52
		(SD)	(4.36)	(4.32)	(7.71)
	Audio	Mean	9.37	5.33	14.70
		(SD)	(7.63)	(5.48)	(10.11)
	Video	Mean	10.37	6.41	16.78
		(SD)	(4.29)	(5.84)	(7.33)
5	Print	Mean	9.00	5.19	14.19
		(SD)	(5.22)	(6.44)	(9.13)
	Audio	Mean	7.04	5.49	12.52
		(SD)	(3.76)	(5.94)	(7.80)
	Video	Mean	9.11	5.96	15.07
		(SD)	(5.26)	(6.28)	(9.04)
3	ALL Formats	Mean	28.00	16.00	44.00
		(SD)	(11.94)	(14.20)	(22.96)
5		Mean	25.15	16.63	41.78
		(SD)	(11.05)	(16.20)	(23.50)
BOTH levels	Print	Mean	17.26	9.44	26.70
		(SD)	(8.29)	(10.40)	(15.89)
	Audio	Mean	16.41	10.81	27.22
		(SD)	(9.42)	(10.42)	(16.71)
	Video	Mean	19.48	12.37	31.85
		(SD)	(6.68)	(11.02)	(14.50)

Finally, a third overall test checked the variation in students' spontaneous and

prompted inference-making due to text difficulty and presentation format. Means of

spontaneous and prompted inferences generated with the three presentation formats at the

two levels of text difficulty were analyzed using a within-subjects 2 (text level) x 3

(presentation format) x 2 (response type) way analysis of variance.   Table 3.8 reports the

means of both spontaneous and prompted inferences across text levels and presentation formats.

Table 3.8

Spontaneous and Prompted Inferences

Level	Format		Spontaneous inferences	Prompted inferences	Total inference-level propositions
3	Print	Mean	3.77	8.74	12.52
		(SD)	(4.06)	(4.46)	(7.71)
	Audio	Mean	4.93	9.78	14.70
		(SD)	(5.77)	(5.00)	(10.11)
	Video	Mean	6.22	10.56	16.78
		(SD)	(5.39)	(3.83)	(7.33)
5	Print	Mean	4.63	9.52	14.19
		(SD)	(5.83)	(4.74)	(9.13)
	Audio	Mean	3.19	9.33	12.52
		(SD)	(3.74)	(5.61)	(7.80)
	Video	Mean	4.44	10.67	15.07
		(SD)	(4.68)	(5.91)	(9.04)
3	ALL Formats	Mean	14.93	29.07	44.00
		(SD)	(13.49)	(10.94)	(22.96)
5		Mean	12.26	29.52	41.78
		(SD)	(12.68)	(12.64)	(23.50)
BOTH levels	Print	Mean	8.41	18.26	26.70
		(SD)	(9.03)	(8.12)	(15.89)
	Audio	Mean	8.11	19.11	27.22
		(SD)	(8.66)	(9.40)	(16.71)
	Video	Mean	10.67	21.22	31.85
		(SD)	(9.22)	(7.93)	(14.50)

As expected, in all three tests, variability in students' inference-making attributed to presentation format was significant, ($F = 5.031, p = .010$), ($F = 5.031$, p = .010), and ($F = 5.186$, p = .010), respectively. Likewise, as with the previous 2 x 3 way ANOVA, variability in students' inference-making attributed to text level was not significant in any of the three tests, ($F = .696, p = .412$), ($F = .696, p = .412$), and ($F = .695, p = .412$), respectively.

The first test, the 2 (level) x 3 (format) x 6 (inference type) way ANOVA, was identified as having the potential to explain more of the variation since it was the only

test that showed significant effects associated with text level or presentation format (a text level by inference-type interaction). Therefore, the section that follows takes a closer look at the six subcategories of inferences identified in the Methods chapter.

Effects of Text Level and Presentation Format on Six Inference Subcategories

The six types of inferences were part of the within-subjects 2x3x6-way analysis of variance which identified a format effect, a type of inference effect, and a text level by inference type interaction. Noted differences among means presented above in Table 3.6 prompted a post hoc analysis using the Least Significant Difference test with a six-level variable (1=Grade 3 text in print, 2=Grade 3 text in audio, 3=Grade 3 text in video, 4=Grade 5 text in print, 5=Grade 5 text in audio, 6=Grade 5 text in video). This test was used to determine which means were significantly different. The six-level variable was created because post hoc analyses on general linear models with repeated measures require a designated between-subjects factor. It was not possible to run this sort of analysis with just format and text difficulty because there are only two text levels, thus the six-level variable was created. Three mean differences were statistically significant, and all three differences were associated with the audio versions of the more challenging level 5 texts.

First, students generated fewer association inferences with the audio versions of the level 5 texts than with the video versions of the level 3 texts. On average, students generated 3.85 association inferences with the level 5 audio versions, but 5.89 with the video versions of the easier level 3 texts, and these differences were significant (p = .033)

Second, students generated fewer association inferences with the audio versions of the level 5 texts than with the audio versions of the level 3 texts. Again, on average students generated 3.85 association inferences with the level 5 audio versions, but 5.78 with the audio versions of the easier level 3 texts, and these differences were significant $(p = .044)$.

Finally, students generated fewer prediction inferences with the audio versions of the level 3 texts than they did with the video versions of the level 5 texts. On average, students generated 0.59 prediction inferences with the level 5 audio versions, but 1.96 with the video versions of the more challenging level 5 texts, and these differences were significant $(p = .039)$.

Association-level inferences with the audio format. Two student cases illustrate instances when the level 5 audio texts prompted significantly fewer association-level inferences than level 3 audio or video texts. For example, with the level 5 audio text, *A Story-A Story*, Evette was unable to make a single association. On the other hand, with the level 3 video text, *The Amazing Bone*, and the level 3 audio text, *Doctor De Soto*, she was able to generate a total of 16 associations related to the roles that characters played in the respective plots. Similarly, when Roberta listened to the level 5 text, *A Story-A Story*, she was unable to generate more than 3 association-type inferences. However, with the level 3 video text, *Madeline and the Gypsies* and the level 3 audio text, *Doctor De Soto*, Roberta was able to make 16 associations related to character's personalities. For Evette and Roberta, it seems that the audio form of the more challenging level text presented a particular challenge with making association-related inferences, and the overall findings

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represented by these two examples help to explain the text level by inference type interaction.

Predictions with the audio format. Two additional cases illustrate occasions when notably fewer predictions were made with the audio versions of level 5 texts than with the video versions of level 5 texts. For example, when Juan was working with the level 5 audio text, *A Story-A Story*, he made just 2 predictions. On the other hand, with the level 5 video text, *Strega Nona*, he was able to generate 9 predictions about future story events. Likewise, when Narisha was engaged with the level 5 audio text, *Why Mosquitoes Buzz in Peoples' Ears*, she was unable to make a single prediction. However, with the level 5 video text, *A Story-A Story*, she was able to make 7 predictions. For Juan and Narisha, it appears that with difficult texts, the audio format presented a particular challenge when making predictions.

Given earlier analyses of how the audio condition influenced overall inference-making, these findings on how this condition appeared to influence these specific categories of inferences is perhaps not surprising, nevertheless the results help to identify the type of inferences that were more affected by this medium.

Analyses of Effects of Story, Order, & Story-Format Combinations

A second set of analyses was conducted to rule out any spurious effects of story, and particular story-by-format, order-by-story, or order-by-format combinations that might compromise a straightforward interpretation of the main effects. These secondary analyses indicated that the influence of story, story order, format order, and story-format

combination on students' overall inference-making was not significant. The results of

these analyses are presented in Tables 3.9 through 3.12.

Effect of Story on Inference-Making

Table 3.9 reports the means of students' total inference-level propositions by

story, however, a test of between-subjects effects indicates that the variability in students'

overall inference-making based on story was not significant ($F = .413, p = .839$).

Table 3.9

Inferences by Story

Level	Story	N	Mean	Std. Deviation
3	The Amazing Bone	27	14.37	8.43
	Doctor De Soto	27	14.93	9.51
	Madeline and the Gypsies	27	14.70	7.95
5	A Story-A Story	27	12.89	10.64
	Why Mosquitoes Buzz in Peoples' Ears	27	13.33	6.83
	Strega Nona	27	15.56	8.08

Effect of Story Order on Inference-Making.

Table 3.10 reports the means of students' total inference-level propositions by the

order in which the story was presented. For example, *The Amazing Bone* was the first

story for nine of the participants. For those nine students, the mean number of total

inference-level propositions was 16.33. A test of between-subjects effects indicates that

the variability based on the order in which a story was presented was not significant ($F = 1.287, p = .247$).

Table 3.10

Inferences by Order of Story

Order	Story	Mean	N	Std. Deviation
First	The Amazing Bone	16.33	9	7.70
	Doctor De Soto	19.38	8	14.96
	Madeline and the Gypsies	11.90	10	5.11
	A Story-A Story	7.56	9	5.61
	Why Mosquitoes Buzz in Peoples' Ears	15.90	10	8.28
	Strega Nona	15.13	8	8.58
Second	The Amazing Bone	13.44	9	10.49
	Doctor De Soto	11.89	9	5.30
	Madeline and the Gypsies	16.78	9	8.93
	A Story-A Story	13.67	9	11.19
	Why Mosquitoes Buzz in Peoples' Ears	12.88	8	7.68
	Strega Nona	16.80	10	7.18
Third	The Amazing Bone	13.33	9	7.43
	Doctor De Soto	14.10	10	5.88
	Madeline and the Gypsies	15.88	8	9.58
	A Story-A Story	17.44	9	12.45
	Why Mosquitoes Buzz in Peoples' Ears	10.89	9	2.80
	Strega Nona	14.56	9	9.32

Effect of Presentation Format Order on Inference-Making

Table 3.11 reports the means of students' total inference-level propositions by order of presentation format. Participants were exposed to each presentation format two times—once with a Level 3 text, and again with a Level 5 text. For example, there were seventeen instances when the first text was presented in print format, and as stated in the

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Methods section, students were never assigned the same order of presentation format for both research sessions. A test of between-subjects effects indicates that the variability of students' inference-making based on the order of presentation format was not significant $(F = 2.327, p = .061)$.

Table 3.11

Inferences by Order of Presentation Format

Order	Presentation format	Mean	N	Std. Deviation
First	Print	11.41	17	5.73
	Audio	17.56	18	12.69
	Video	13.63	19	6.64
Second	Print	15.32	19	10.46
	Audio	11.89	18	5.84
	Video	15.76	17	8.32
Third	Print	13.11	18	8.10
	Audio	11.39	18	5.77
	Video	18.50	18	9.20

Effect of Story-Format Combinations on Inference-Making

Finally, Table 3.12 reports the means of students' total inference-level propositions by story-presentation format combinations. For example, ten participants were exposed to the print version of *The Amazing Bone,* nine participants were assigned to the audio version of this same text, and so on. A test of between-subjects effects indicates that the differences based on the particular combinations were not significant $(F = 1.453, p = .167)$.

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Table 3.12

Inferences by Story-Format Combinations

Story	Presentation format	Mean	N	Std. Deviation
The Amazing Bone	Print	14.40	10	10.05
	Audio	13.56	9	9.29
	Video	15.25	8	5.82
Dr. De Soto	Print	12.50	8	7.07
	Audio	17.90	10	13.60
	Video	13.78	9	4.84
Madeline and the Gypsies	Print	10.44	9	5.15
	Audio	12.00	8	4.34
	Video	20.70	10	8.93
A Story-A Story	Print	13.89	9	13.84
	Audio	11.56	9	8.13
	Video	13.22	9	10.34
Why Mosquitoes Buzz in Peoples' Ears	Print	15.75	8	5.90
	Audio	13.10	10	8.16
	Video	11.44	9	6.04
Strega Nona	Print	13.20	10	6.34
	Audio	12.88	8	7.95
	Video	20.56	9	8.34

Given that the effects of story, and particular story-by-format, order-by-story, or order-by-format combinations were not significant, a straightforward interpretation of the main effects and interactions of interest was possible.

Finally, while this study was designed to investigate the main effects of text level and presentation format on students' higher level processing, the last section of this

chapter examines the influence of difficulty and medium on students' recall-level

processing.

Analyses of Recall-Level Data

This last section examines the main effects of text level and presentation format

on students' recall using a 2 (text level) x 3 (format)ANOVA. As defined in Table 2.8 of

the Methods section, recall-level propositions refer to verbalizations that either match or

paraphrase content found in the text. Table 3.13 reports the means of recall-level

propositions for both text levels and each presentation format.

Table 3.13

Within-Subjects Analysis of Recall Based on Text Level and Presentation Format

	Print	Audio	Video	All Formats
Level 3 Texts	M: 20.37 SD: 23.07	M: 18.04 SD: 16.16	M: 13.74 SD: 13.50	M: 52.15 SD: 43.98
Level 5 Texts	M: 14.67 SD: 14.27	M: 13.19 SD: 14.56	M: 18.19 SD: 18.99	M: 46.04 SD: 42.24
All Texts	M: 35.04 SD: 32.42	M: 31.22 SD: 28.74	M: 31.93 SD: 32.00	M: 98.19 SD: 82.69

While neither text level ($F = 1.684, p = .206$) nor format ($F = .358, p = .701$)

elicited a statistically reliable effect on recall, they did produce a significant interaction

effect ($F = 4.254, p = .019$). The source of the interaction is illustrated in Table 3.13; for

level 3 texts, video proved to be the least effective format for promoting the recall-level

propositions, while it was the most effective for level 5 texts. It appears that for easy

texts, the print condition prompted more recall, whereas for harder texts, the video was

more conducive to recall.

This chapter has presented three sets of findings related to a) the effects of presentation format and text difficulty, b) the potential influences of story, the order of story or presentation format, and story-format combinations, and c) recall-level data. While format effects were significant and text level effects were not, it is important to bear in mind that the interaction effect complicates these findings, and it appears that individual differences play an important role, especially since the influence of story, format, sequence, and story-format combinations was not significant. That is, determining which condition (print, audio, or video) was more helpful or problematic, overall, was an impossible task. While some students appeared to have an easier time generating inferences within the audio context, others struggled. Similarly, findings associated with recall-level data, also resulted in an interaction effect that prompted a closer consideration of individual differences since there was no significant effect due to text level or presentation format. It is interesting to note that for some students print texts elicited more recall-level propositions with easier texts, while video texts prompted more recall with more challenging texts. In the following chapters, possible explanations for such findings are presented, along with potential limitations of the study.

LIMITATIONS

The limitations of this study reflect many of the general limitations associated with the use of verbal reports as data. First, one must consider the potential effects due to the nature of the one-on-one interview context. Afflerbach states that there is "no more intimate reading research methodology than protocol analysis," and suggests that students' verbalizations may be influenced by the student-interviewer relationship, cultural differences in using language, and differences in how students view their roles as reporters of reading processes (Afflerbach, 2000, p. 172). In addition, the interview context may have created a sense of pressure to elaborate on stories which, as Beishuizen suggests, may cause readers to infer more, or even fewer, relationships than they would in a natural reading situation (Beishuizen et al., 1999).

In addition, the transcribed verbal reports did not include data related to the differences inherent in spoken discourse. During the interviews students made use of intonation, inflection, and pauses that were not accounted for in the transcribed protocols (Afflerbach & Johnston, 1984).

Finally, although there was an attempt to gather an additional source of data in the form of student and parent surveys, the low percentage of return resulted in a failure to compare these data with those gathered from the interviews. Moreover, there was no opportunity to demonstrate correlations between more objective measures of inference-making and the students' verbal reports (Afflerbach, 2000).

An additional limitation is related to the difficulty in finding students willing to participate that fit within the small window of comprehending at the 3rd grade level according to a single measure, Flynt & Cooter's *Reading Inventory for the Classroom*.

Although seven school sites were approached, only five sites had one or more teachers who were willing to have their students pre-assessed to see if they qualified for the study. While a total of 145 students were pre-assessed, only 63 students qualified and were invited to participate. The 27 students that returned signed consent forms participated in the two research sessions. As a result, there were not the 36 students required to fill every cell within the story-format-order matrices displayed in the Methods section in Table 2.4 and Table 2.5. Therefore, while the random selection process was counterbalanced to ensure maximally comparable groups, the matrix, or block, remained incomplete.

DISCUSSION

Despite the limitations acknowledged in the previous chapter, findings from this study do advance our understanding of the role of text difficulty and presentation format on inference-level processes, especially for populations of students experiencing difficulty in mastering reading. They also provide direction for further investigations and may contribute to our knowledge of how such higher level processes might be fostered in elementary classrooms, although the study was not intended to provide any direct test of instructional interventions. This study set out to build upon the existing research on students' comprehension, focusing on the higher order process of inference-making. The within-subjects design of this investigation allowed for the efficient analyses of a range of factors: presentation format, text level, story, format order, story order, and format-story combinations. In addition, this study examined the influence of these factors on students' overall inference-making, as well as students' generation of various types of inferences and recall-level propositions. A discussion of the results is presented in three parts, beginning with a closer look at the findings related to presentation format, followed by results associated with text level, and concluding with a set of implications for both research and practice. The discussion examines the findings in light of concepts associated with the various models of reading outlined in the introduction.

The Influence of Presentation Format

The overall test, a 2x3x6-way analysis of variance, concluded that the mode of presentation had a statistically significant effect on students' generation of inferences,

albeit complicated by an interaction between format and text difficulty level. The following section examines this finding with a discussion of the most prevalent patterns of inference-making by presentation format as well as an examination of the real numbers at both text levels.

On one hand, the most predominant pattern —students generating the fewest inferences within the print context—lends support to the notion that individuals possess a limited capacity for different levels of cognitive processing. That is, with the struggling readers in this study, as the need for lower order perceptual processes like decoding decreased, engagement in higher order processes like inference-making increased. In this way, it appears as though these results help explain the story of Maria, a student from the introduction. Observations of Maria's inference-making resemble the data on students' overall inference-making. Like several students in this study, Maria appeared to generate more inferences within the audio and video conditions than within the print condition. Nevertheless, while the variation for many students followed this general pattern, other students followed somewhat different paths that are masked by the main effects and visible only through an analysis of the real numbers.

While the analysis of variance determined that the effect of presentation format on overall inference-making was statistically significant when the numbers of inferences with both text levels were combined, the actual numbers suggest alternative patterns. This section takes a closer look at the actual numbers of inferences generated by the twenty-seven participants at each text level across the various presentation formats.

In the Results chapter, Table 3.2 reported the numbers of students whose inferences increased according to various format-related progressions. For example, with the easier texts, several students (thirteen total) generated the fewest number of inferences within the print condition and the greatest number within the video condition, when the numbers for both text levels were combined (Level 3 + Level 5). On the other hand, for eight students, the progression shifted with the more difficult level 5 texts. That is, with the level 5 texts, these eight students generated the fewest number of inferences within the audio context, and greater numbers within the video and print contexts.

This shift in the progression warrants a closer look at the concept of "limited capacity." While this general notion offers an explanation for the findings associated with the easier level 3 texts, it is unable to account for the results associated with the more challenging level 5 texts in the same way. When students were interacting with the more difficult texts, it appears that the print context—which places a burden on lower level decoding processes and presumably leaves fewer cognitive resources available for higher level processes—prompted the greatest number of inferences for thirteen students. On the one hand, these findings challenge the limited capacity idea which implies that eliminating the need for lower level perceptual processes leaves more attentional resources available for higher level processes.

On the other hand, these findings can lend support to a general limited capacity notion which acknowledges the possibility that although audio and video may alleviate the need for decoding, these media may require other perceptual and integrative processes that leave fewer resources available for inference-making. As Magliano and his colleagues suggest, understanding a story depicted in video form requires an

individual to integrate visual, auditory, and discourse information (Magliano, Dijkstra, & Zwaan, 1996), and this integration process may make the video context all the more challenging.

And finally, it also could be the case that inference-making is more of a compensatory move that readers employ when their understanding is more, rather than less, tenuous. In this way, findings related to the predominant trends are difficult to apply to particular comprehension models, or even to general concepts upon which they are based. Instead, these findings appear to highlight the ways in which presentation format had a range of effects for different students.

Just as the print context rendered variable results for different students, the audio context was a source of notable variation as well. When texts were presented in audio format, inference generation was influenced in a range of ways. As noted in the Results chapter, some students followed the most prevalent pattern and generated more inferences with audio than print, which required decoding, and fewer inferences with audio than video, which offered visual and auditory content. For other students, however, the audio context appeared to be particularly conducive or problematic.

Some students were able to generate notably greater or fewer numbers of inferences when texts were presented in audio format. For some students who found the print or video context to be particularly conducive to inference-level processes, they found the audio context to be much less so. Conversely, for other students, the print and video contexts were more problematic, while the audio context was much more favorable. Once again, these findings can be interpreted in more than one way. While

the first finding can support the assertion that the audio context may be more demanding than the print and video contexts (for example because of the fact that there is nothing to attract one's visual attention), it could be the case that more inferences were generated within the print and video conditions because readers were attempting to assist their own construction of meaning by engaging in more inference-level thinking aloud.

Similarly, while the second finding may suggest that the video and print contexts present more of a challenge than the audio context, it is possible that the audio context prompted more inferences because it was more, not less, challenging. For example, as mentioned in the introduction, when listening to a text, the individual is bound to the rate of textual input determined by the speaker, or in this study, by the audiotape. However, when reading a text, the individual controls the rate of textual input and has the option of rereading portions of the text (Carlisle & Felbinger, 1991). The cognitive processes required to comprehend within the constraints associated with the rate as well as the transitory nature of audio-taped text, may leave fewer resources available for inference-making and render the audio context more challenging. Moreover, the fact that some students were able to generate more inferences within the print context than within the audio context suggests that perhaps decoding processes do not occur at the expense of inference level processes, and our attentional resources are not so limited after all.

In addition, this second finding lends support to elements of Kintsch's contruction-integration model outlined in the introduction. This model suggests that a text base is constructed from linguistic input as well as from an individual's knowledge base, and then integrated into a coherent whole—what Kintsch calls the situation model

(Kintsch, 1994). Within the video context, this text base can be supplemented with additional visual input that is unavailable within the print or audio contexts.

While results related to students' overall inference-making suggest that the audio context may prompt either greater or fewer numbers of inferences with texts at different levels, it is interesting to note that the only statistically significant findings related to specific types of inferences were associated with the level 5 audio texts, which appeared to present a particular challenge. As noted in the Results chapter, students generated significantly fewer predictions and association-based inferences with the more challenging level 5 texts *only* when presented in audio form. The fact that the notable differences are related to these two types of inferences is not surprising when one considers earlier research which suggests that various types of inferences interact. For example, Trabasso and his colleagues claim that association-level inferences may be activated by other inferences (Trabasso & Magliano, 1996). This assertion provides not only a possible explanation as to why association-level inferences were most prevalent, but also a possible rationale for the finding that this type of inference was generated significantly less often within a particular media context. If association-level inferences are activated by other inferences, perhaps differences in this most prevalent inference-type within a particular context is even more noteworthy. That is, if association-type inferences are activated by other inferences, the fact that students generated significantly fewer associations within a particular context (audio), suggests that students are generating fewer activating inferences within that context as well.

Similarly, this notion of inference interaction can be used to explain the finding that students made significantly fewer prediction-level inferences within the level 5 audio context. Van den Broek and his colleagues suggest that inferences are not independent and that forward inferences, such as predictions, may affect other inferential processes (van den Broek, Fletcher, & Risden, 1993). Once again, if it is the case that predictions interact with other inference-level processes, the fact that students generated notably fewer predictions within the level 5 audio context is perhaps even more significant, and perhaps the audio context with more challenging texts presents a particular challenge.

The Influence of Text Level

While text difficulty appeared to influence the effect of presentation format in some respects, it is surprising that across all three media contexts, text level appeared to play a less significant, and sometimes even unpredictable, role. As noted in the Results chapter, the effect of text level on students' overall inference-making was not statistically significant. And a closer look at the means for each presentation format reveals even more unexpected findings that warrant further discussion.

The first surprise is that within the print context, students generated more inferences with the more challenging level 5 texts than they did with the easier level 3 texts. This finding challenges the limited capacity model, which would predict that students would engage in less inference-making with challenging texts, especially those in print format, that require them to decode unfamiliar words and comprehend longer, more complex sentences.

In addition, this finding raises additional questions about the role of inference-making in narrative comprehension. As mentioned above, while it may be true that increases in inference-making indicate a deeper level of comprehension, it may be the case that inference-making increases when students experience greater difficulty building a straightforward text base from the transparent recall of explicitly stated propositions; that is, as suggested by a compensatory view of inference-making, students have to fill in more gaps when the text information does not stay with them long enough to build that a stable model of meaning.

In essence, two possible motives for increased inferencing in this situation present themselves. On the one hand, readers may be generating inferences that are allowing them to maintain coherence and better understand the text (Thurlow & van den Broek, 1997). On the other hand, readers may be generating inferences because the knowledge required to assimilate new information is not available, and the only recourse is to make deductions that are hopefully useful (Trabasso & Suh, 1993). So while it might be expected that readers would engage in Minimalist reading with less inferential activity when they are interacting with texts that are less conducive to comprehension because the text content, structure, or vocabulary presents a particular challenge (as with the level 5 texts), and in Maximalist reading with texts that contain more familiar content and vocabulary (as with the level 3 texts), these findings call these notions into question and prompts a closer consideration of inference-making as a measure of comprehension.

Equally interesting is the finding that students generated more recall-level propositions with the level 5 video texts than the level 3 video texts. While one might

assume that the less challenging video text would have allowed for more recall, it may be the case that because there was more inference-making occurring within this context, students were less likely to include additional recall information as well. In addition, it may be the case that since video is perceived as the 'easy' medium (Beagles-Roos & Gat, 1983), less effort was invested in making recall-level responses with the easier texts and more emphasis was placed on raising the level of the task by engaging in more inference-level activity. While no data were gathered about these possibilities, it is interesting to consider what factors may have influenced students' tendencies to either recall or make inferences. Likewise, it is interesting to consider how researchers, practitioners, and students might define comprehension. That is, what proportion is recall-level activity and what proportion is inferential-level activity? The section that follows describes implications for each of these groups.

Implications

The results of this study both challenge and support elements of the various models of reading outlined in the introduction, however, the findings leave the implicit question in this study clearly unanswered—which model of reading is more accurate, complete, or worthy? While this investigation surely answers the original research questions related to the types and frequencies of inferences generated across a range of presentation formats and text levels, between the lines was the pursuit of a reasonably complete model of comprehension and one was not found. Perhaps not surprisingly, the findings remained closely tethered to the original research questions, and have simply

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initiated a journey toward a fuller understanding of the differential effects of presentation format for twenty-seven struggling readers.

Implications for further research center around pursuing this line of inquiry in an effort to broaden the definition of what it means to comprehend by examining individuals' meaning-construction processes within a range of media conditions. Ultimately, such investigations could lead to an expanded taxonomy of reading difficulties, one that includes more than just word recognition, reading comprehension, and listening comprehension—factors measured in many assessments of reading difficulty and addressed in various models of reading. For instance, as outlined above, the Simple View of Reading considers two of these three factors and suggests that weaker readers struggle with word recognition, or listening comprehension, or both (Chen & Vellutino, 1997; Gough & Tunmer, 1986). Similarly, Carlisle points out that while reading disability is identified when a student's listening comprehension is age appropriate and reading comprehension is weaker, a general comprehension problem is identified when a student's reading *and* listening comprehension are below grade level (Carlisle & Felbinger, 1991).

The findings from this study suggest that there may be more to consider. The data highlighting such a broad range of individual differences call for a closer look at how comprehension, or at least inference-making, is influenced by various media, and how this variability might offer insights into a broader range of comprehension abilities and disabilities. For example, it would be worthwhile to further investigate comprehension processes of those students who found the audio and video contexts to be either particularly conducive or problematic. Results could be plotted on a graph with the audio

data on the x-axis and the video data on the y-axis, and follow-up studies could be conducted with students falling into four broad categories (high-audio/high-video; high-audio/low-video; low-audio/high-video; and low-audio/low-video). Such investigations might lead to a broader definition of comprehension that allows for a wider range of explanations for students' struggles with comprehension

Finally, although this was not a study of classroom instruction, findings from this investigation may suggest possibilities for practice that build upon this notion of an expanded taxonomy of reading difficulties. Just as the explanations for comprehension ability expand, so must the assessments used to measure these abilities. That is, if it is the case that—as these findings suggest—students' abilities to engage in higher level processes like inference-making are significantly influenced by presentation format in rather individual ways as noted by the format by level interaction effects, it becomes important to assess these abilities in a more comprehensive manner. In other words, one could argue that a more comprehensive understanding of students' comprehension abilities with print, audio, and video texts would result in more effective instructional decisions. However, it is not yet determined that simply knowing more about a child's abilities in terms of word recognition, silent reading comprehension, listening comprehension, and viewing comprehension, and then "filling the gaps" with corresponding strategy instruction is the most effective route.

Nevertheless, the results of this study do highlight the existence of individual differences through an investigation of the nature and prevalence of various inferences generated across a range of presentation formats and levels of text. While the findings were unable to suggest a single model of reading to explain students' comprehension

processes, they do forge paths for future studies that may broaden our understanding of

inference and recall level activities that contribute to this phenomenon called

comprehension.

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APPENDICES

APPENDIX A

Consent Form

To the family of _____:

I am a graduate student at the University of California at Berkeley conducting a research study to find out how students help themselves understand what is going on in a story when they are reading to themselves, listening to someone else read, or watching a video version of a story. Ultimately, I hope this work will help educators learn more about how to foster students' reading comprehension, and I would like to invite your child to participate in the study.

If you agree to have your child participate, she will take part in two one-hour sessions at school. During the first session I will ask your child to talk about how she is helping herself understand the stories I present to her in three formats: written, audio, and video. In the second session, scheduled on another day, your child will repeat this process with three different stories. With your permission, the interviews will be tape-recorded. In addition, you and your child will complete a brief survey about her reading, listening, and viewing habits. This survey may be completed by hand or over the telephone. Parts of these interviews and surveys may appear in published reports, but your child will never be identified by name when I write down or discuss the information that I collect. Her privacy will be protected to the maximum extent allowable by law. The records of this study will be kept in a locked file.

If you will allow your child to participate, please sign the permission below. Please also ask your child to sign the form and have her return the signed form to her teacher. Keep in mind that you can withdraw your child from the study at any time. Whether or not you choose to allow her to take part in the research will have no bearing on her standing or grades at school.

If you have questions, you may contact me at (510) 407-1390 or jaynesca@uclink.berkeley.edu. In addition, you may contact my supervisor, P. David Pearson, at (510) 643-6644 or ppearson@socrates.berkeley.edu , or Richard Prawat at Michigan State University at (517) 353-6417 or rsprawat@msu.edu. Finally, you may contact Ashir Kumar, M.D. chair of the University Committee on Research Involving Human Subjects (UCRIHS) if you have questions about your rights as a human subject of research. He is at 246 Administration Building, Michigan State University, East Lansing, MI 48824-1046, by phone (517) 355-2180, by FAX (517) 353-2976, or by email at ucrihs@msu.edu.

Sincerely,

Carolyn Jaynes

You will be given a copy of this form to keep for your records.

I have read the above information. I give permission for my child to participate in the reading study.

Parent/guardian's signature: _____ Date _____

Child's signature: _____ Date _____

Assessment Protocol

Flynt, E. S., & Cooter, R. B. (1998). Reading Inventory for the Classroom. (Third ed.). Upper Saddle River, NJ: Merrill.

The Big Bad Wolf

One day Mr. Wolf was walking through the forest. He was enjoying an afternoon walk and not bothering anyone. All of a sudden it started to rain and he became wet and cold.

Just when Mr. Wolf was about to freeze to death, he saw a small house in the woods. Smoke was coming from the chimney, so he knocked on the door. No one was home, but a note on the door said:

> **Come in and make yourself warm. I'll be back about 2:00 p.m.**
> **Love,**
> **Granny**

The poor wet wolf came in and began to warm himself by the fire. He saw one of the Granny's nightgowns on the bed, so he decided to put it on instead of his wet clothes. Since he was still very, very cold he decided to get into Granny's bed. Soon he was fast asleep.

Mr. Wolf fell into a deep sleep. When he awoke, Mr. Wolf found an old woman, a little girl wearing a red coat, and a woodcutter standing around the bed. The woodcutter was yelling at Mr. Wolf and saying something about how he was going to kill him with his axe. Mr. Wolf jumped out of the bed and ran for his life.

Later that day, Mr. Wolf was finally safe at home. His wife said, "Just you wait, those humans will make up a story about how big and bad *you* were."

Questions:

1. Who was the story about? *(character/literal)*
2. Where was Mr. Wolf when he saw the house? *(setting/literal)*
3. Why did Mr. Wolf need to get into the house? *(story problem/literal)*
4. What made Mr. Wolf think it was okay to go into the house? *(problem resolution attempts/inferential)*
5. What did Mr. Wolf do after entering the house? *(problem resolution attempts/literal)*
6. Why did Mr. Wolf have to run for his life? *(problem resolution attempts/literal)*
7. What lesson did Mr. Wolf learn? *(theme/evaluative)*
8. What did Mrs. Wolf say that would make you think she didn't trust humans? *(character/literal)*

Think Aloud Training Poem

If I Were In Charge of the World
by Judith Viorst

If I were in charge of the world
I'd cancel oatmeal,
Monday mornings,
Allergy shots, and also Sara Steinberg.

If I were in charge of the world
There'd be brighter night lights,
Healthier hamsters, and
Basketball baskets forty eight inches lower.

If I were in charge of the world
You wouldn't have lonely.
You wouldn't have clean.
You wouldn't have bedtimes.
Or "Don't punch your sister."
You wouldn't even have sisters.

If I were in charge of the world
A chocolate sundae with whipped cream and nuts would be a vegetable
All 007 movies would be G,
And a person who sometimes forgot to brush,
And sometimes forgot to flush,
Would still be allowed to be
In charge of the world.

APPENDIX D

Texts Used in Research Sessions

Doctor De Soto
By William Steig

Doctor De Soto, the dentist, did very good work, so he had no end of patients. Those close to his own size—moles, chipmunks, et cetera—sat in the regular dentist's chair. Larger animals sat on the floor, while Doctor De Soto stood on a ladder. For extra-large animals, he had a special room. There Doctor De Soto was hoisted up to the patient's mouth by his assistant, who also happened to be his wife. Doctor De Soto was especially popular with the big animals. He was able to work inside their mouths, wearing rubber boots to keep his feet dry; his fingers were so delicate, and his drill so dainty, they could hardly feel any pain.

Being a mouse, he refused to treat animals dangerous to mice, and it said so on his sign. When the doorbell rang, he and his wife would look out the window. They wouldn't admit even the most timid-looking cat. One day, when they looked out, they saw a well-dressed fox with a flannel bandage around his jaw.

"I cannot treat you, sir!" Doctor De Soto shouted. "Sir! Haven't you read my sign?"

"Please!" the fox wailed. "Have mercy, I'm suffering!" And he wept so bitterly it was pitiful to see.

"Just a moment," said Doctor De Soto. "That poor fox," he whispered to his wife. "What shall we do?"

"Let's risk it," said Mrs. De Soto. She pressed the buzzer and let the fox in.

He was up the stairs in a flash. "Bless your little hearts," he cried, falling to his knees. "I beg you, *do* something! My tooth is killing me."

"Sit on the floor, sir," said Doctor De Soto, "and remove the bandage, please."

■ ■

Doctor De Soto climbed up the ladder and bravely entered the fox's mouth. "Oooo-wow!" he gasped. The fox had a rotten bicuspid and unusually bad breath.

"This tooth will have to come out," Doctor De Soto announced. "But we can make you a new one."

"Just stop the pain," whimpered the fox, wiping some tears away.
Despite his misery, he realized he had a tasty little morsel in his mouth, and his jaw began to quiver. "Keep open!" yelled Doctor De Soto.

"Wide open!" yelled his wife.

"I'm giving you gas now," said Doctor De Soto. "You won't feel a thing when I yank that tooth.

Soon the fox was in dreamland. "M-m-m, yummy," he mumbled. "How I love them raw...with just a pinch of salt, and a...dry...white wine."

They could guess what he was dreaming about. Mrs. De Soto handed her husband a pole to keep the fox's mouth open. Doctor De Soto fastened his extractor to the bad tooth. Then he and his wife began turning the winch. Finally, with a sucking sound, the tooth popped out and hung swaying in the air.

"I'm bleeding!" the fox yelped when he came to.

Doctor De Soto ran up the ladder and stuffed some gauze in the hole. "The worst is over," he said. "I'll have your new tooth ready tomorrow. Be here at eleven sharp."

The fox, still woozy, said goodbye and left. On his way home, he wondered if it would be shabby of him to eat the De Sotos when the job was done.

After office hours, Mrs. De Soto molded a tooth of pure gold and polished it. "Raw with salt, indeed," muttered Doctor De Soto. "How foolish to trust a fox!"

"He didn't know what he was saying," said Mrs. De Soto. "Why should he harm us? We're helping him."

"Because he's a fox!" said Doctor De Soto. "They're wicked, wicked creatures."

That night the De Sotos lay awake worrying. "Should we let him in tomorrow?" Mrs. De Soto wondered.

"Once I start a job," said the dentist firmly, "I finish it. My father was the same way."

"But we must do something to protect ourselves," said his wife.

They talked and talked until they formed a plan. "I think it will work," said Doctor De Soto. A minute later he was snoring.

■■■

The next morning, promptly at eleven, a very cheerful fox turned up. He was feeling not a particle of pain. When Doctor De Soto got into his mouth, he snapped it shut for a moment, then opened wide and laughed. "Just a joke!" he chortled.

"Be serious," said the dentist sharply. "We have work to do." His wife was lugging the heavy tooth up the ladder.

"Oh, I love it!" exclaimed the fox. "It's just beautiful."

Doctor De Soto set the gold tooth in its socket and hooked it up to the teeth on both sides.

The fox caressed the new tooth with his tongue. "My, it feels good," he thought. "I really shouldn't eat them. On the other hand, how can I resist"

"We're not finished," said Doctor De Soto, holding up a large jug. "I have here a remarkable preparation developed only recently by my wife and me. With just one application, you can be rid of toothaches forever. How would you like to be the first one to receive this unique treatment?"

"I certainly would!" the fox declared. "I'd be honored." He hated any kind of personal pain.

"You will never have to see us again," said Doctor De Soto.

"*No one* will see you again," said the fox to himself. He had definitely made up his mind to eat them— with the help of his brand-new tooth.

Doctor De Soto stepped into the fox's mouth with a bucket of secret formula and proceeded to paint each tooth. He hummed as he worked. Mrs. De Soto stood by on the ladder, pointing out spots he had missed. The fox looked very happy.

When the dentist was done, he stepped out. "Now close your jaws tight," he said, "and keep them closed for a full minute." The fox did as he was told. Then he tried to open his mouth—but his teeth were stuck together!

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"Ah, excuse me, I should have mentioned," said Doctor De Soto, "you won't be able to open your mouth for a day or two. The secret formula must first permeate the dentine. But don't worry. No pain ever again!"

The fox was stunned. He stared at Doctor De Soto, then at this wife. They smiled, and waited. All he could do was say, "Frank oo berry mush" through his clenched teeth, and get up and leave. He tried to do so with dignity.

Then he stumbled down the stairs in a daze.

Doctor De Soto and his assistant had outfoxed the fox. They kissed each other and took the rest of the day off.

The Amazing Bone
By William Steig

It was a brilliant day, and instead of going straight home from school, Pearl dawdled. She watched the grownups in town at their grownup work, things she might someday be doing.

She saw the street cleaners sweeping the streets and she looked in at the bakery on Parsnip Lane and saw the bakers taking hot loaves of pumpernickel out of the oven and powdering crullers with sugar dust.

On Cobble Road she stopped at Maltby's barn and stood gawking as the old gaffers pitched their ringing horseshoes and spat tobacco juice.

Later she sat on the ground in the forest between school and home, and spring was so bright and beautiful, the warm air touched her so tenderly, she could almost feel herself changing into a flower. Her light dress felt like petals. "I love everything," she heard herself say.

"So do I," a voice answered.

Pearl straightened up and looked around. No one was there. "Where are you?" she asked.

"Look down," came the answer. Pearl looked down. "I'm the bone in the violets near the tree by the rock on your right." Pearl stared at the small bone.

"You talk?" she murmured.

"In any language," said the bone. "And I can imitate any sound there is." The bone made the sounds of a trumpet calling soldiers to arms. Then it sounded like wind blowing, then like pattering rain. Then it snored, then it sneezed.

Pearl couldn't believe what she was hearing. "You're a bone," she said. "How come you can sneeze?"

"I don't know, the bone replied. "I didn't make the world."

"May I take you home with me, wonderful bone?" Pearl asked.

"You certainly may," said the bone. "I've been alone a long time. A year ago, come August, I fell out of a witch's basket. I could have yelled after her as she walked on, but I didn't want to be her bone any longer. She ate snails cooked in garlic at every meal and was always complaining about her rheumatism and asking nosy questions. I'd be happier with someone young and lively like you."

Pearl picked the bone up and gently put it in her purse. She left the purse open, so they could continue their talk, and started home, forgetting her schoolbooks on the grass. She was eager to show this bone to her parents, and she could guess what would happen when she did. She would tell about the talking bone, and her mother would say "You're only imagining it." Her father would agree, and then the bone would flabbergast them both by talking.

■■

The spring green sparkled in the spring light. Tree toads were trilling. "It's the kind of wonderful day," said Pearl, "when wonderful things happen—like finding you."

"Like finding *you*!" the bone answered. And it began to whistle a walking tune that made the going very pleasant. But not for long. Who should rush out from in back of a boulder and spoil everything but three highway robbers with pistols and daggers. Pearl couldn't tell what breed of animal they were, because they wore cloaks and Halloween masks, but they were fierce and spoke in chilling voices.

"Hand over the purse!" one commanded. Pearl would have gladly surrendered the purse, just to be rid of them, but not with the bone in it.

"You can't have my purse," she said, surprised at her own boldness.

"What's in it?" said another robber, pointing his gun at Pearl's head.

"I'm in it!" the bone growled. And it began to hiss like a snake and roar like a lion.

The robbers didn't wait around to hear the rest, in case there was any more. They fled so fast you couldn't tell which way they'd gone. It made Pearl laugh. The bone, too.

They continued on their way, joking about what had just happened and chatting about this and that. But it wasn't long before a fox stepped forth from behind a tree and barred their path. He wore a sprig of lilac in his lapel, he carried a cane, and he was grinning so the whole world could see his sharp white teeth.

"Hold everything," he said. Pearl froze. "You're exactly what I've been longing for," he went on. "Young, plump, and tender. You will be my main course at dinner tonight." And he seized Pearl in a tight embrace.

"Unhand her, you villain," the bone screamed, "or I'll bite your ears off!"

"Who is that speaking?" asked the surprised fox.

"A ravenous crocodile who dotes on fresh fox chops, that's who!" answered the bone.

The wily fox was not as easily duped as the robbers. He saw no dangerous crocodile. He peered into Pearl's purse, where the sounds seemed to be coming from, and pulled out the bone. "As I live and flourish!" he exclaimed. "A talking bone. I've always wanted to own something of this sort." And he put the bone in his pocket, where it roared and ranted to no avail.

Pushing Pearl along, the fox set out for his hideaway. Pearl's sobs were so pitiful the fox couldn't help feeling a little sorry for her, but he was determined she would be his dinner.

"Please, Mr. Fox," Pearl whimpered, "may I have my bone back, at least until I have to die?"

"Oh, all right," said the fox, disgusted with himself for being so softhearted, and he handed her the bone, which she put back in her purse.

"You must let this beautiful young creature go on living," the bone yelled. "Have you no shame, sir!"

The fox laughed. "Why should I be ashamed? I can't help being the way I am. I didn't make the world."

The bone commenced to revile the fox. "You coward!" it sneered. "You worm, you odoriferous wretch!"

These expletives were annoying. "Shut up, or I'll eat you," the fox snarled. "It would be amusing to gnaw on a bone that talks…and screams with pain."

The bone kept quiet the rest of the way, and so did Pearl.

When they arrived at the fox's hideaway, he shoved Pearl, with her bone, into an empty room and locked the door. Pearl sat on the floor and stared at the walls.

"I know how you feel," the bone whispered.

"I'm only just beginning to live," Pearl whispered back. "I don't want it to end."

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"I know," said the bone.

"Isn't there something we can do?" Pearl asked.

"I wish I could think of something," said the bone, "but I can't. I feel miserable."

. ■

"What's *that*?" Pearl asked. She'd heard some sounds from the kitchen.

"He's sharpening a knife," the bone whispered.

"Oh, my goodness!" Pearl sobbed. "And what's *that*?"

"Sounds like wood being put into a stove," answered the bone.

"I hope it won't all take too long," said Pearl. She could smell vinegar and oil. The fox was preparing a salad to go with his meal. Pearl hugged the bone to her breast. "Bone, say something to comfort me."

"You are very dear to me," said the bone.

"Oh, how dear you are to me!" Pearl replied. She could hear a key in the lock and was unable to get a word out of her throat or turn her eyes toward the door.

"Be brave," the bone whispered. Pearl could only tremble.
She was dragged into the kitchen, where she could see flames in the open stove.

"I regret having to do this to you," sighed the fox. "It's nothing personal."

"*Yibbam!*" said the bone suddenly, without knowing why he said it.

"What was that?" said the fox, standing stock-still.

"*Yibbam sibibble!*" the bone intoned. "*Jibrakken sibibble digray!*" And something quite unexpected took place. The fox grew several inches shorter.

"*Alabam Chinook beboppit gebozzle!*" the bone continued, and miraculously the fox was the size of a rabbit. No one could believe what was happening, not Pearl, not the fox, not even the bone, whose words were making it happen.

"*Adoonis ishgoolak keebokkin yibapp!*" it went on. The fox, clothes and all, was now the size of a mouse.

"*Scrabboonit!*" the bone ordered, and the mouse—that is, the minuscule fox—scurried away and into a hole.

"I didn't know you could do magic!" Pearl breathlessly exclaimed.

"Neither did I," said the bone.

"Well, what made you say those words?"

"I wish I knew," the bone said. "They just came to me, I *had* to say them. I must have picked them up somehow, hanging around with that witch."

"You're an amazing bone," said Pearl, "and this is a day I won't ever forget!"

It was dark when they reached Pearl's house. The moment the door swung open she was in her mother's arms, and right after that in her father's.

"Where on earth have you been?" they both wanted to know. "We were frazzled with worry."

Pearl didn't know what to say first. She held up the bone. "This bone," she said, "can talk!"

And just as she had expected, her mother said, "A talking bone? Why, Pearl, it's only your imagination." And her father said something similar.

And also as Pearl had expected, the bone astonished them both by remarking, "You have an exceptional daughter."

Before her parents had a chance to get over their shock, Pearl began telling the story of her day's adventure, and the bone helped out. It was all too much for Pearl's parents. Until they got used to it.

The bone stayed on and became part of the family. It was given an honored place in a silver tray on the mantelpiece. Pearl always took it to bed when she retired, and the two chatterboxes whispered together until late in the night. Sometimes the bone put Pearl to sleep by singing, or by imitating soft harp music. Anyone who happened to be alone in the house always had the bone to converse with. And they all had music whenever they wanted it, and sometimes even when they didn't.

Madeline and the Gypsies
By Ludwig Bemelmans

In an old house in Paris that was covered with vines lived twelve little girls in two straight lines. In two straight lines they broke their bread and brushed their teeth and went to bed. They left the house at half-past nine—the smallest one was Madeline. In another old house that stood next door lived the son of the Spanish Ambassador. He was all alone; his parents were away; he had no one with whom to play. He asked, "Please come, I invite you all, to a wonderful Gypsy Carnival." And so, dear reader, here we go!

Up and down and down and up—they hoped the Ferris wheel would never stop. Round and round; the children cried, "Dear Miss Clavel, just one more ride!"

A sudden gust of wind, a bolt of lightning, even the Rooster found it frightening. The big wheel stops; the passengers land. How fortunate there is a taxi stand!

"Hurry, children, off with these things! You'll eat in bed."

Mrs. Murphy brings the soup of the evening; it is half-past nine. "Good heavens, where is MADELINE?"

Poor Miss Clavel, how would she feel if she knew that on top of the Ferris wheel, in weather that turned from bad to rotten, Pepito and Madeline had been forgotten?

Pepito said, "Don't be afraid. I will climb down and get some aid."

It was downpouring more and more as he knocked on the Gypsies' caravan door.

■ ■

The Gypsy Mama with her umbrella went and got some help in the circus tent. With the aid of the strong man and the clown, Madeline was safely taken down.

The Gypsy Mama tucked them in and gave them potent medicine. The big wheel was folded, and the tent. They packed their wagons and away they went. For Gypsies do not like to stay—they only come to go away.

A bright new day—the sky is blue; the storm is gone; the world is new. This is the Castle of Fountainblue—"All this, dear children, belongs to you."

How wonderful to float in a pool, watch other children go to school, never to have to brush your teeth, and never—never—to go to sleep. The Gypsies taught them grace and speed, and how to ride the circus steed. Then Madeline said, "It's about time we sent dear Miss Clavel a line."

Poor Miss Clavel—a shadow of her former self from worrying, because, instead of twelve, there were only eleven little girls—stopped brushing their curls and suddenly revived when the postal card arrived. "Thank heaven," she said, "the children are well! But dear, oh dear, they've forgotten how to spell."

She studied the postmark, and then fast and faster they rushed to the scene of the disaster. The Gypsy Mama didn't like at all what she saw in her magic crystal ball. The Gypsy Mama said, "How would you like to try on this lovely costume of a lion?"

■ ■

With a curved needle and some string she sewed both the children in, and nobody knew what was inside the tough old lion's leathery hide. A circus lion earns his bread by scaring people half to death. And after that, he's put to bed. A lovely dawn and all was well; the lion roamed through wood and dell. He smelled sweet flowers; he came to a farm; he frightened the barnyard—intending no harm. They saw a man and said, "Please help us to get out of this old pelt."

The man was a hunter. He took his gun. He got to his feet and started to run.

Said the lion, "We'd better go back, for if we're not in a zoo or circus, we'll surely be shot."

They got to the tent in time for the show. "Look," said Madeline, "There in the first row..."

"Oh yes," said Pepito, "There are people we know!"

"Dear Miss Clavel! At last we found you! Please let us put our arms around you."

The Gypsy Mama sobbed her grief into her only handkerchief. The strong man suddenly felt weak, and tears were running down his cheek. Even the poor clown had to cry as the time came to say good-bye.

The best part of the voyage—by plane, by ship, or train—is when the trip is over and you are home again. Here is a freshly laundered shirty—It's better to be clean than dirty. In two straight lines they broke their bread and brushed their teeth and went to bed. "Good night, little girls, thank the Lord you are well! And now PLEASE go to sleep," said Miss Clavel. And she turned out the light and closed the door—and then she came back; just to count them once more!

Why Mosquitoes Buzz in People's Ears
By Verna Aardema

One morning a mosquito saw an iguana drinking at a waterhole. The mosquito said, "Iguana, you will never believe what I saw yesterday."

"Try me," said the iguana.

The mosquito said, "I saw a farmer digging yams that were almost as big as I am."

"What's a mosquito compared to a yam?" snapped the iguana grumpily. "I would rather be deaf than listen to such nonsense!" Then he stuck two sticks in his ears and went off, *mek, mek, mek, mek,* through the reeds.

The iguana was still grumbling to himself when he happened to pass by a python. The big snake raised his head and said, "Good morning, Iguana." The iguana did not answer but lumbered on, bobbing his head, *badamin, badamin.* "Now, why won't you speak to me?" said the python to himself. "Iguana must be angry about something. I'm afraid he is plotting some mischief against me!"

He began looking for somewhere to hide. The first likely place he found was a rabbit hole, and in it he went, *wasawusu, wasawusu, wasawusu.* When the rabbit saw the big snake coming into her burrow, she was terrified. She scurried out through her back way and bounded, *krik, krik, krik,* across a clearing.

A crow saw the rabbit running for her life. He flew into the forest crying *kaa, kaa, kaa!* It was his duty to spread the alarm in case of danger.

A monkey heard the crow. He was sure that some dangerous beast was prowling near. He began screeching and leaping *kili wili* through the trees to help warn the other animals. As the monkey was crashing through the treetops, he happened to land on a dead limb. It broke and fell on an owl's nest, killing one of the owlets.

Mother Owl was not at home. For though she usually hunted only in the night, this morning she was still out searching for one more tidbit to satisfy her hungry babies. When she returned to the nest, she found one of them dead. Her other children told her that the monkey had killed it. All that day and all that night, she sat in her tree—so sad, so sad, so sad!

Now it was Mother Owl who woke the sun each day so that the dawn could come. But this time, when she should have hooted for the sun, she did not do it. The night grew longer and longer. The animals of the forest knew it was lasting much too long. They feared that the sun would never come back.

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At last King Lion called a meeting of the animals. They came and sat down, *pem, pem, pem,* around a council fire. Mother Owl did not come, so the antelope was sent to fetch her.

When she arrived, King Lion asked, "Mother Owl, why have you not called the sun? The night has lasted long, long, long, and everyone is worried."

Mother Owl said, "Monkey killed one of my owlets. Because of that, I cannot bear to wake the sun."

The king said to the gathered animals. "Did you hear? It was the monkey who killed the owlet—and now Mother Owl won't wake the sun so that the day can come."

Then King Lion called the monkey. He came before him nervously glancing from side to side, *rim, rim, rim, rim.* "Monkey," said the king, "why did you kill one of the Mother Owl's babies?

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"Oh, King," said the monkey, "it was the crow's fault. He was calling and calling to warn us of danger. And I went leaping through the trees to help. A limb broke under me, and it fell on the owl's nest."

The king said to the council. "So, it was the crow who alarmed the monkey, who killed the owlet—and now Mother Owl won't wake the sun so that the day can come."

Then the king called for the crow. That big bird came flapping up. He said, "King Lion, it was the rabbit's fault! I saw her running for her life in the daytime. Wasn't that reason enough to spread an alarm?"

The king nodded his head and said to the council. "So, it was the rabbit who startled the crow, who alarmed the monkey, who killed the owlet—and now Mother Owl won't wake the sun so that the day can come."

Then King Lion called the rabbit. The timid little creature stood before him, one trembling paw drawn up uncertainly. "Rabbit," cried the king, "why did you break the law of nature and go running, running, running, in the daytime?"

"Oh, King," said the rabbit, "it was the python's fault. I was in my house minding my own business when that big snake came in and chased me out."

The king said to the council. "So, it was the python who scared the rabbit, who startled the crow, who alarmed the monkey, who killed the owlet—and now Mother Owl won't wake the sun so that the day can come."

King Lion called the python, who came slithering, *wasawusu, wasawusu,* past the other animals. "But, King," he cried, "it was the iguana's fault! He wouldn't speak to me. And I thought he was plotting some mischief against me. When I crawled into the rabbit's hole, I was only trying to hide."

The king said to the council. "So, it was the iguana who frightened the python, who scared the rabbit, who startled the crow, who alarmed the monkey, who killed the owlet—and now Mother Owl won't wake the sun so that the day can come."

Now the iguana was not at the meeting, for he had not heard the summons. The antelope was sent to fetch him. All the animals laughed when they saw the iguana coming, *badamin, badamin,* with the sticks still stuck in his ears!"

King Lion pulled out the sticks, *purup, purup.* Then he asked, "Iguana, what evil have you been plotting against the python?"

"None! None at all!" cried the iguana. "Python is my friend!"

"Then why wouldn't you say good morning to me?" demanded the snake.

"I didn't hear you, or even see you!" said the iguana. "Mosquito told me such a big lie, I couldn't bear to listen to it. So I put sticks in my ears."

"*Nge, nge, nge,*" laughed the lion. "So that's why you had sticks in your ears!"

"Yes," said the iguana. "It was the mosquito's fault."

King Lion said to the council. "So, it was the mosquito who annoyed the iguana, who frightened the python, who scared the rabbit, who startled the crow, who alarmed the monkey, who killed the owlet—and now Mother Owl won't wake the sun so that the day can come."

"Punish the mosquito! Punish the mosquito!" cried all the animals.

When Mother Owl heard that, she was satisfied. She turned her head toward the east and hooted: "Hoo! Hoooo! Hooooooo!"

And the sun came up.

Meanwhile the mosquito had listened to it all from a nearby bush. She crept under a curly leaf, *semm*, and was never found and brought before the council. But because of this the mosquito has a guilty conscience. To this day she goes about whining in people's ears: "Zeee! Is everyone still angry at me?" When she does that, she gets an honest answer.

A Story, A Story
By Gail Haley

Once, oh small children round my knee, there were no stories on earth to hear. All the stories belonged to Nayame, the Sky God. He kept them in a golden box next to this royal stool.

Ananse, the Spider man, wanted to buy the Sky God's stories. So he spun a web up to the sky. When the Sky God heard what Ananse wanted, he laughed: "*Twe, twe, twe*. The price of my stories is that you bring me Osebo, the leopard of-the-terrible-teeth, Mmboro the hornet who-stings-like-fire, and Mmoatia the fairy whom-men-never-see."

Ananse bowed and answered: "I shall gladly pay the price."

"*Twe, twe, twe*," chuckled the Sky God. "How can a weak old man like you, so small, so small, so small, pay my price?"

But Ananse merely climbed down to earth to find the things that the Sky God demanded. Ananse ran along the jungle path—*yiridi, yiridi, yiridi*—till he came to Osebo the leopard-of-the-terrible-teeth.

"Oho, Ananse," said the leopard, "you are just in time to be my lunch."

Ananse replied: "As for that, what will happen will happen. But first let us play the binding binding game."

The leopard, who was fond of games, asked: "How is it played?"

"With vine creepers," explained Ananse. "I will bind you by your foot and foot. Then I will untie you, and you can tie me."

"Very well," growled the leopard, who planned to eat Ananse as soon as it was his turn to bind him.

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So Ananse tied the leopard by his foot, by his foot, by his foot, with the vine creeper. Then he said: "Now, Osebo, you are ready to meet the Sky God." And he hung the tied leopard in a tree in the jungle.

Next, Ananse cut a frond from a banana tree and filled a calabash with water. He crept through the tall grasses, *sora, sora, sora*, till he came to the nest of Mmboro, the hornets-who-sting-like-fire. Ananse held the banana leaf over his head as an umbrella. Then he poured some of the water in the calabash over his head.

The rest he emptied over the hornet's nest and cried: "It is raining, raining, raining. Should you not fly into my calabash, so that the rain will not tatter your wings?"

"Thank you. Thank you," hummed the hornets, and they flew into the calabash—*fom*! Ananse quickly stopped the mouth of the gourd.

"Now, Mmbora, you are ready to meet the Sky God," said Ananse. And he hung the calabash full of hornets onto the tree next to the leopard.

Ananse now carved a little wooden doll holding a bowl. He covered the doll from top to bottom with sticky latex gum. Then he filled the doll's bowl with pounded yams. He set the little doll at the foot of a flamboyant tree where fairies like to dance. Ananse tied one end of a vine round the doll's head and, holding the other end in his hand, he hid behind a bush.

In a little while, Mmoatia the fairy-whom-no-man-sees came dancing, dancing, dancing, to the foot of the flamboyant tree. There she saw the doll holding the bowl of yams. Mmoatia said, "Gum baby, I am hungry. May I eat some of your yams?"

Ananse pulled at the vine in his hiding place, so that the doll seemed to nod its head. So the fairy took the bowl from the doll and ate all the yams. "Thank you, Gum baby," said the fairy. But the doll did not answer.

"Don't you reply when I thank you?" cried the angered fairy. The doll did not stir.

"Gum baby, I'll slap your crying place unless you answer me," shouted the fairy. But the wooden doll remained still and silent. So the fairy slapped her crying place—*pa*! Her hand stuck fast to the gum baby's sticky cheek.
"Let go of my hand, or I'll slap you again." *–Pa*! She slapped the doll's crying place with her other hand. Now the fairy was stuck to the gum baby with both hands, and she was furious. She pushed against the doll with her feet, and they also stuck fast.

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Now Ananse came out of hiding. "You are ready to meet the Sky God, Mmoatia." And he carried her to the tree where the leopard and the hornets were waiting. Ananse spun a web round Osebo, Mmboro, and Mmoatia. Then he spun a web to the sky. He pulled up his captives behind him, and set them down at the feet of the Sky God.

"O, Nyame," said Ananse, bowing low, "here is the price you ask for your stories: Osebo the leopard-of-the-terrible-teeth, Mmboro the hornets-who-sting-like-fire, and Mmoatia the fairy-whom-men-never-see."

Nyame the Sky God called together all the nobles of his court and addressed them in a loud voice: "Little Ananse, the spider man, had paid me the price I ask for my stories. Sing his praise. I command you."

"From this day and going on forever," proclaimed the Sky God, "my stories belong to Ananse and shall be called 'Spider Stories.'"

"*Eeeee, Eeeee, Eeeee*," shouted all the assembled nobles

So Ananse took the golden box of stories back to earth, to the people of his village. And when he opened the box all the stories scattered to the corners of the world, including this one.

This is my story which I have related. If it be sweet, or if it be not sweet, take some elsewhere, and let some come back to me.

The next day when Big Anthony went to the town square to fetch the water, he told everyone about the pasta pot. And naturally everyone laughed at him, because it sounded so silly—a pot that cooked all by itself. "You'd better go and confess to the priest, Big Anthony," they said. "Such a lie!"

And Big Anthony was angry and that wasn't a very good thing to be. "I'll show them!" he said to himself. "Someday I will get the pasta pot and make it cook! And then *they'll* be sorry."

That day came sooner than even Big Anthony would have thought, because two days later Strega Nona said to Big Anthony, "Anthony, I must go over the mountain to the next town to see my friend, Strega Amelia. Sweep the house and weed the garden. Feed the goat and milk her and for your lunch, there are some bread and cheese in the cupboard. And remember, don't touch the pasta pot."

"Oh, yes—yes—Strega Nona," said Big Anthony. But inside he was thinking, *My chance has come!* As soon as Strega Nona was out of sight, Big Anthony went inside, pulled the pasta pot off the shelf and put it on the floor.

"Now, let's see if I can remember the words," said Big Anthony. And Big Anthony sang,
> Bubble, bubble, pasta pot,
> Boil me some pasta, nice and hot.
> I'm hungry and it's time to sup.
> Boil enough pasta to fill me up.

And sure enough, the pot bubbled and boiled and began to fill up with pasta. "Aha!" said Big Anthony, and he ran to the town square, jumped on the fountain and shouted, "Everyone get forks and plates and platters and bowls. Pasta for all at Strega Nona's house. Big Anthony has made the magic pasta pot work."

Of course, everyone laughed, but ran home to get forks and plates and platters and bowls and sure enough, when they got to Strega Nona's the pasta pot was so full it was beginning to overflow. Big Anthony was a hero! He scooped out pasta and filled the plates and platters and bowls. There was more than enough for all the townspeople, including the priest and the sisters from the convent. And some people came back for two and three helpings, but the pot was never empty.

When all had had their fill, Big Anthony sang,
> Enough, enough, my pasta pot,
> I have my pasta nice and hot.
> So simmer down, my pot of clay
> Until I'm hungry another day.

But, alas, he did not blow the three kisses!

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He went outside and to the applause of the crowd, Big Anthony took a bow. He was so busy listening to compliments from everyone that he didn't notice the pasta pot was still bubbling and boiling, until a sister from the convent said, "Oh, Big Anthony, look!"

And pasta was pouring out of the pot all over the floor of Strega Nona's house and was coming out the door! Big Anthony rushed in and shouted the magic words again, but he pot kept bubbling. He took the pot off the floor, but pasta kept on pouring from it. Big Anthony grabbed a cover and put it on the pot and sat on it. But the pasta raised the cover, and Big Anthony as well, and spilled on the floor of Strega Nona's house.

"Stop!" yelled Big Anthony. But the pasta did not stop and if someone hadn't grabbed poor Big Anthony, the pasta would have covered him up. The pasta had all but filled the little house. Out of the windows and through the doors came the pasta and the pot kept right on bubbling.

The townspeople began to worry. "Do something, Big Anthony," they shouted. Big Anthony sang the magic song again but without the three kisses it did no good! By this time the pasta was on its way down the road and all the people were running to keep ahead of it.

"We must protect our town from the pasta," shouted the mayor. "Get mattresses, tables, doors—anything to make a barricade." But even that didn't work. The pot kept bubbling and the pasta kept coming!

"We are lost," said the people, and the priest and the sisters of the convent began praying. "The pasta will cover our town," they cried.

And it certainly would have, had Strega Nona not come down the road, home from her visit. She didn't have to look twice to know what had happened.

She sang the magic song and blew the three kisses, and with a sputter the pot stopped boiling and the pasta came to a halt.

"Oh, *grazia*—thank you, thank you, Strega Nona," the people cried. But then they turned on poor Anthony. "String him up," the men of the town shouted.

"Now, wait," said Strega Nona. "The punishment must fit the crime." And she took a fork from a lady standing nearby and held it out to Big Anthony. "All right, Anthony, you wanted pasta from my magic pasta pot," Strega Nona said, "and *I* want to sleep in my little bed tonight. So start eating."

And he did—poor Big Anthony.

Survey of Reading, Listening, Viewing, and Speaking Habits

Student:

1. On a typical school day, about how much time do you spend reading to yourself or to someone else? (Please, do NOT include the time you spend reading while you are at school).
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than 1 hour

2. When it is NOT a school day (e.g. weekends, holidays, summer), about how much time do you spend reading to yourself or to someone else?
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than 1 hour

3. On a typical school day, about how much time do you spend listening to someone read to you or listening to books on tape? (Again, please do NOT include time you spend listening to someone read or listening to books on tape while you are at school).
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than 1 hour

4. When it is NOT a school day, about how much time do you spend listening to someone read to you or listening to books on tape?
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than 1 hour

5. On a typical school day, about how much time do you spend watching television?
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than 1 hour

6. When it is not a school day, about how much time do you spend watching television?
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than 1 hour

7. **On a scale from 1 to 5, with 1 being low and 5 being high, how would you rate yourself on the following:**

   Participation in whole class discussions or conversations:
   CIRCLE ONE:

1	2	3	4	5
(I never participate)				(I participate a lot)

   Participation in small group discussions or conversations in class
   CIRCLE ONE:

1	2	3	4	5
(I never participate)				(I participate a lot)

Participation in discussions or conversations with a group of friends or relatives
CIRCLE ONE:

1	2	3	4	5
(I never participate)				(I participate a lot)

Participation in discussions or conversations with a friend or relative
CIRCLE ONE:

1	2	3	4	5
(I never participate)				(I participate a lot)

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Parent:

1. On a typical school day, about how much time does your child spend reading to him/herself or to someone else? (Please, do NOT include the time s/he spends reading while s/he is at school).
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than1 hour

2. When it is NOT a school day, about how much time does your child spend reading to him/herself or to someone else?
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than1 hour

3. On a typical school day, about how much time does your child spend listening to someone read or listening to books on tape? (Again, please do NOT include time s/he spends listening to someone read or listening to books on tape while s/he is at school).
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than1 hour

4. When it is NOT a school day, about how much time does your child spend listening to someone read or listening to books on tape?
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than1 hour

5. On a typical school day, about how much time does your child spend watching television?
CIRCLE ONE:

   0 min.   15 min.   30 min.   45 min.   1 hour   More than1 hour

6. When it is not a school day, about how much time does your child spend watching television?
CIRCLE ONE:

| 0 min. | 15 min. | 30 min. | 45 min. | 1 hour | More than 1 hour |

7. **On a scale from 1 to 5, with 1 being low, how would you rate your child on the following:**

Participation in discussions or conversations with a group of friends or relatives
CIRCLE ONE:

| 1 | 2 | 3 | 4 | 5 |
(My child never participates)   (My child participates a lot)

Participation in discussions or conversations with a friend or relative
CIRCLE ONE:

| 1 | 2 | 3 | 4 | 5 |
(My child never participates)   (My child participates a lot)

APPENDIX F

Story-Format-Order Selection Matrices

LEVEL 3	Audio Print Video	Audio Video Print	Print Audio Video	Print Video Audio	Video Audio Print	Video Print Audio
Amazing Bone Dr. De Soto Madeline	***	Student 10	Student 2	***	Student 4	Student 13
Amazing Bone Madeline Dr. De Soto	Student 14	Student 24	***	Student 22	Student 20	Student 12
Dr. De Soto Amazing Bone Madeline	Student 9	***	Student 16	***	Student 17	Student 6
Dr. De Soto Madeline Amazing Bone	***	Student 21	Student 19	Student 26	Student 8	***
Madeline Amazing Bone Dr. De Soto	Student 15	***	Student 27	Student 11	Student 25	Student 1
Madeline Dr. De Soto Amazing Bone	Student 5	Student 7	Student 18	Student 3	***	Student 23

LEVEL 5	Audio Print Video	Audio Video Print	Print Audio Video	Print Video Audio	Video Audio Print	Video Print Audio
A Story Mosquitoes Strega Nona	***	***	Student 10	Student 15	Student 23	Student 25
A Story Strega Nona Mosquitoes	Student 11	Student 19	Student 6	Student 8	***	Student 27
Mosquitoes A Story Strega Nona	Student 16	Student 20	Student 9	***	Student 13	Student 17
Mosquitoes Strega Nona A Story	Student 2	Student 4	***	Student 14	Student 5	Student 7
Strega Nona A Story Mosquitoes	***	Student 1	Student 26	Student 18	Student 22	***
Strega Nona Moquitoes A Story	Student 24	Student 3	Student 12	***	***	Student 21