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Using Scaffolded Interaction to Improve LLD Readers' Inferencing and Narrative Abilities.

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USING SCAFFOLDED INTERACTION TO IMPROVE LLD READERS' INFERENCING AND NARRATIVE ABILITIES

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ABSTRACT

A time series control group study was completed to investigate the efficacy of Communicative Reading Strategies (CRS) as an instructional approach for improving the oral reading, question answering, and narrative retelling abilities of LLD students. The participants were 10 LLD students who ranged in age from 9 to 12 years and 5 reading-age matched (RAM) peers who ranged in age from 7 to 9 years. Five of the LLD subjects were randomly assigned to a treatment group (TLD), while the remaining 5 LLD subjects were assigned to a no-treatment group (NLD). All three groups participated in a series of probes (one pre-test, one post-test, and two intermittent probes) which involved (a) reading a fictional story aloud; (b) answering a series of factual, interpretation and inference questions about the story; and (c) retelling the story in their own words. The TLD group received treatment prior to participating in Probes 2 and 3 (a treatment period lasting approximately 4 weeks), while the NLD and RAM groups received no treatment and participated only in the series of probes.

Measurements of oral reading speed and accuracy, accuracy of responses to questions, and quality of oral narrative retellings were taken during the probes. Findings were mixed. Miscue analysis revealed positive effects for treatment. Question and narrative probes did not. Findings are discussed in terms of how they contribute to

our understanding of treatment efficacy research and our understanding of reading and processing strategies of LLD and normal reading students.

INTRODUCTION

For the last three decades, researchers have attempted to develop an adequate psychological theory of text comprehension which can account for the reader/listener's ability to make inferences. It is generally accepted that proficient readers and listeners make inferences (Brown & Yule, 1983; Graesser & Clark, 1985; Wallach & Miller, 1988), and that the ability to draw appropriate inferences significantly affects how well readers/listeners comprehend text (Anderson, Spiro, & Anderson, 1978; McCormick, 1992; Rumelhart, 1980; Winne, Graham, & Prock, 1993). Studies suggest, however, that children and adults sometimes have difficulty separating inferred information from literal or explicit information during memory tasks (Ackerman, 1986; Klein-Konigsberg, 1984; Paris & Lindauer, 1976), and that poor readers and language-learning disabled (LLD) children, in particular, have greater difficulty with inferential processing in comparison to their nondisabled peers (Bransford, Stein, Nye, & Perfetto, 1982; Davey & Macready, 1985; McCormick, 1992). Recently, researchers have begun to focus on documenting the causes and overall nature of inferential processing deficits in the LLD population, and to explore how LLD children might best be taught to improve their inferencing abilities during the comprehension of narrative texts. Accordingly, the proposed research project was designed to measure the effects of a treatment known as Communicative Reading Strategies or CRS (Norris,

1991) on the inferential processing and narrative retelling abilities of a group of LLD students (ages 9 years through 11 years, 6 months), enrolled in the Jefferson Parish Public School System in Louisiana. Specifically, the study attempted to determine if CRS (a form of scaffolded interaction) could be used to: (a) improve children's overall ability to process implied as well as explicitly stated information from narrative texts, as evidenced by an increased percentage of correct responses to factual, interpretation, and inference questions; (b) improve the overall quality of children's narrative retellings subsequent to oral story reading; and (c) reduce the number of oral reading miscues and/or qualitatively change the type of miscues exhibited by children during oral story reading.

LITERATURE REVIEW

In an attempt to summarize the extensive literature base pertaining to inferencing as a construct (particularly as it relates to memory and the comprehension of narratives), information regarding previous research will be organized around the following theoretical questions:

1. What are inferences and narratives, and what role do they play in memory representation and discourse comprehension?
2. What are the cognitive and physiological processes which underlie inferencing and the comprehension/production of narratives?
3. When do children first begin to draw inferences and produce fully developed narratives, and how do these abilities change over time?
4. What is the relation between stored background/world knowledge, textually explicit information, and inferencing?
5. What previous theoretical models have been offered to explain the inferencing phenomena, and what are the strengths and weaknesses of these models?
6. Can a connectionist-constructionist model of cognition explain the inferencing phenomena better than previous schema-based and text-based processing models?
7. What evidence exists to support the premise that LLD children have greater difficulty with inferential processing than their normal peers, and what methods have

proven effective (or ineffective) in dealing with these deficits?

8. What are the implications for assessment/remediation of suspected inferential processing deficits in the LLD population, given a connectionist-constructionist model of cognition?

Memory, Inferences, and the Comprehension of Narrative Discourse

In recent years, researchers in a variety of fields including psychology, psycholinguistics, special education, and speech-language pathology have become interested in narratives (Schneider, 1996). Narratives (which may be communicated in either the oral or written modality) are essentially "stories" in which the speaker/writer attempts to communicate some experience not directly shared by the listener/reader. Examples of the narrative genre include the telling of self-generated stories, telling/retelling of familiar stories, folk tales, or fairy tales, recounting the plot of movies or television shows, and the recounting of personal experiences (Owens, 1991).

Narratives present an attractive medium of study for the following reasons: (a) they provide samples of language in use rather than in isolation, out of context; (b) they comprise a form of language commonly encountered in everyday life, both in social interaction and in recreational and educational media; and (c) they are produced and understood according to certain structural and

organizational principles (Schneider, 1996). For these reasons, speech-language pathologists (SLPs) and other language practitioners are increasingly using narratives not only as a tool for assessment, but as a medium and target for oral and written language intervention, particularly with students who exhibit language and learning disabilities (Hoggan & Strong, 1994; Liles, 1985, 1987, 1993; Merritt & Liles, 1987, 1989; Norris & Hoffman, 1993; Schneider, 1996).

Research documenting the link between memory, knowledge structures and narratives has been present for some time. In a review on child memory development published in 1975, Brown reported that children appear to remember best material that is meaningful to them. In particular, children retain information conveyed in narrative form better than information conveyed in the form of isolated lists. Brown speculated that narratives are more easily remembered because they are "made to fit the head of the child," i. e., they exist in a format that is already meaningful and familiar. This familiarity exists because narratives are a linguistic universal of sorts, as they play a major role in the interpersonal communication of nearly all societies, and they are produced in some form by people of all ages, with the exception of very young children under 2 years of age.

Narratives play a major role in our communicative interactions because they have such close correspondence to

our daily experiences in contextually specific situations (Bruner, 1986; Kintsch, 1980; Nelson, 1986). In other words, because we know a great deal about people's motives, actions, goals, and attempts to solve daily problems (since it is adaptive to know this information in our social and physical environment), we also come to know a great deal about narratives (Graesser, Singer, & Trabasso, 1994).

In addition to being universally present, narratives also share universality of structure. The consistent, structural components of narratives have been variously referred to as story grammars or story schemata (Mandler & Johnson, 1977; Rumelhart, 1975; Stein & Glen, 1979; Thorndyke, 1977). Story grammars typically include elements such as *characters, settings, problems, initiating events, internal responses, plans, attempts, consequences,* and *resolutions*. These elements are important because speakers and writers know (from their experience as communicators in the real world) that they are expected to adhere (more or less) to story grammar structure when communicating narrative information. Readers/listeners also know that they can expect to receive information containing these essential elements. It is the consistency of story grammars, therefore, which ensures that narrative content will be predictable to communicative participants to a large extent. This predictability is particularly helpful to the reader/listener, whose job in processing/retaining the information will be somewhat

simplified as a result. Since the reader/listener already has an existing "frame" or schemata for the narrative, the information conveyed will generally be much easier to process, store and retrieve, in comparison to information conveyed in other more isolated formats. (Note: Since most theoretical claims in this paper apply equally to speakers, listeners, readers and writers, the author will dispense with the awkward "listener/reader" and "speaker/writer" designations, with the understanding that claims refer to communicative participants in general, regardless of whether the communication takes place in the spoken or written modality).

An ability that is intrinsically linked with the comprehension of narratives is that of inferencing. Brown and Yule (1983) define inferencing as "that process which the hearer or reader must go through to get from the literal meaning of what is said/written to what the speaker/writer intended to convey." In other words, listeners and readers cannot rely exclusively on explicitly stated information in order to achieve comprehension. They must "go beyond" what is explicitly or literally stated in the text, in order to grasp subtleties and implied nuances of meaning. This is not to say, however, that text-based information in unimportant. Rather, in order to draw plausible, appropriate inferences, the reader or listener must combine prior knowledge with text-based information, in order to accurately reconstruct the writer/speaker's

intended meaning (Anderson, Reynolds, Shallert & Goetz, 1977; Anderson, Spiro, & Anderson, 1978; Bishop & Adams, 1992; McCormick, 1992).

Inferencing as "Constructive Comprehension"

Many theoretical frameworks have been used to define and explain inferencing behavior in relation to discourse processing. As previously stated, readers do not achieve comprehension simply by decoding the literal meaning of the text (Bishop & Adams, 1992). The reader must also utilize contextual information and stored background knowledge to "fill in the gaps" or infer what has not been explicitly stated. This process of "filling in the gaps" has been variously referred to as *constructive comprehension* (Westby, 1984), *goodness of fit analysis* (Wallach & Miller, 1988), *developing an inferential set* (Hansen & Pearson, 1983), and *search (or effort) after meaning* (Bartlett, 1932; Berlyne, 1949, 1960; Spiro, 1980; Stein & Trabasso, 1985; Graesser et al., 1994). The ability to engage in constructive comprehension is critical, for, as noted by Weaver & Kintsch (1991), "there can be as many as 12 to 15 implicit inferences for every expressly mentioned statement" in a passage of narrative or expository text. Samuels and Kamil (1984) also note that "even the simplest type of literal comprehension requires that we engage in inferencing." Taken together, these findings suggest that the reader must continuously make inferences in order to comprehend even the smallest pieces of text. Considering

the integral part inferencing plays in text comprehension, it is not surprising that researchers such as Winne et al. (1993) have referred to this ability as "a cornerstone of reading competence.

Development of Narratives and Inferencing in Children

Various authors (Applebee, 1978; Liles, 1993; Owens, 1991) have investigated narrative development in children, and discernible patterns of acquisition have emerged (see Table 2.1). Although it is generally agreed that most children are capable of producing an ideal, "adult-type" narrative by 6-7 years of age, narrative form and content continue to be refined throughout late childhood and adolescence (Liles, 1993). This later development is often characterized by an increased number of episodes in the narrative, as well as an increased ability to link multiple episodes together in complex ways (Purcell & Liles, 1992; Roth & Spekman, 1986).

Table 2.1

Developmental Sequence for Narratives (Adapted from Applebee, 1978; Owens, 1991)

Ages 2-3 years: pre-narratives; additive chains; heaps; descriptive/action sequences---children talk about whatever attracts their attention, but without specifying relationships among the elements; characters, objects and events are put together because they are perceptually associated with each other; no macrosructure; no real plot or storyline; no discernible beginning, middle or end, no specific order of events; no cause-effect relationships.

Ages 3-5 years: primitive narratives; temporal event sequences; causal chains---still no well-developed theme or plot, but characters, objects and events are put together because they complement each other in some logical way; events are linked sequentially or causally; may have beginning and middle, but no ending or resolution.

Ages 6-7 years: true narratives---fully developed plot; clear beginning, middle and ending; logical cause-effect relationships

(Table 2.1 continued)

specified and linked to macrostructure of story; increased character development; contain markers such as once upon a time, lived happily ever after, the end; contain dialogue; may contain evaluative statements such as that was a good one.

Ages 8 and above: complex narratives---continued plot development; stories increase in length and complexity with embedding of multiple episodes; increased use of syntactic devices such as conjunctions (and, then), locatives (in, on, under, next to); comparatives (almost, bigger than), and adjectives; fewer unresolved problems and resolutions; fewer extraneous details; better introduction including setting; more overt marking of changes in time and place; better description of character motives and internal responses; closer adherence to story grammar model.

As with narrative development, studies show that inferencing abilities in children also develop in predictable ways, and that by age 6-7 years, most children are fairly skilled at making "adult-type" inferences. However, as with narrative development, some aspects of inferential processing appear to continue to develop through the middle grades (Wallach & Miller, 1988). The apparent similarity in the ages at which children are simultaneously capable of producing fully developed narratives and making adult-type inferences may be related to their reaching certain cognitive developmental milestones. The time frame in question (ages 6-7 years) coincides with the child's transition from the Pre-Operational Stage to the Concrete Operations Stage (Piaget, 1952, 1954, 1960). During the Pre-Operational Stage (ages 2-7 years), children rely almost exclusively on the immediate perceptual characteristics of objects to construct a framework of reality, and they trust as valid only what they perceive. Therefore, although children at

this stage may be capable of describing a simple series of actions or events (based on perception), they are often incapable of describing logical cause-effect relationships between actions and events, or attributing complex motives to characters in a story (both of which are largely dependent on inferencing, as authors frequently do not specify these relationships explicitly in the story). Upon entering the Concrete Operations stage (ages 7 through 11-12 years), the child's thinking is no longer dominated by simple perception, and operations such as classification, seriation, coordination, reversibility, and conservation are acquired. These new operations allow the child to understand more advanced concepts of temporality and causality in narratives, as well as changes in state.

The continued development in narrative and inferencing abilities that occurs in late childhood/adolescence may be related to the child's transition from Concrete Operations to Formal Operations (ages 11-12 through 14-15 years). Upon reaching Formal Operations, the child is finally able to perform purely mental operations on nonconcrete objects, exhibit complete generality of thought, engage in propositional thinking, and deal with hypothetical situations and events. This move toward Formal Operations may be reflected in the child's increased ability to attribute complex motives to characters, understand abstract relationships between problems, plans, attempts, and solutions, and to predict possible

consequences/outcomes of events in a story. In other words, as children's cognitive abilities become increasingly more elaborated over time, their narratives become increasingly more elaborated as well, and they also becomes more adept at making inferences about the kind of information that is often not explicitly stated in the narrative text.

Theoretical Models of Inferencing

Given the interest in exploring the link between memory, inferences, and the comprehension of narratives, considerable debate has arisen about the extent to which inferencing and comprehension are text-based or schema-based phenomena (Carnine, Kameenui, & Woolfson, 1982). Proponents of text-based theory have traditionally analyzed textual characteristics such as thematic organization, sentence structure, propositional structure, and cohesion, whereas advocates of schema-based models have emphasized the role of the reader's prior knowledge structures (including story schema knowledge and general world knowledge) in comprehension (Carnine et al, 1982). Other theorists have proposed a balance between the two paradigms, by asserting that it is the reader's ability to "blend" knowledge of textual characteristics with prior knowledge that accounts for "correct" or plausible inferencing. Hansen (1981), for example, suggested that when information is not explicitly stated in the text, a reciprocal process takes place, whereby the reader uses

textual information to "instantiate" a probable schema, then makes a "guess" or inference according to what would best fit that schema. The reader then "checks" the inference against additional incoming textual information, activates a different or modified schema as needed, makes a new or adjusted inference, rechecks the text, and so on, until a "best-fit" between prior knowledge structures and textual information is achieved. Hansen described this process as making "default assignments," and indicated that a reader who relies too heavily on either text-based information or prior knowledge risks making incorrect or faulty inferences. According to Hansen's model, it is the reader's ability to balance and blend text-based information with prior knowledge to achieve "best-fit" solutions that results in the generation of plausible/correct inferences, and maximal reconstruction of intended meaning.

To illustrate how the "best fit" phenomena works, consider the following brief examples from Nicholas and Trabasso (1980):

1. Mary had a little lamb. It's fleece was white as snow.
2. Mary had a little lamb. She spilled gravy and mint jelly on her dress.
3. Mary had a little lamb. The delivery was difficult and afterwards the vet needed a drink.

In item (1), the reader will probably infer that "Mary" is the little girl from a well-known nursery rhyme

who is followed by her pet lamb. In item (2), the reader will likely infer that Mary is dining on lamb, either at home or perhaps at a restaurant. The reader may further infer that Mary is a little girl (since children often spill food on themselves), or conversely, that Mary is a very old woman (as the elderly may also have difficulty eating and swallowing, due to loss of muscle control, dentures, etc.), or that Mary (regardless of age) is simply a messy eater. Alternately, the reader may infer nothing at all about Mary's age, traits, or personality from these two statements, preferring to wait for additional text-based information before drawing any conclusions. In item (3), the reader will likely infer that Mary is not human at all, but rather a mature female sheep who has just given birth to a lamb, and that the vet who presided at the birth needed a drink to relax after the hard work involved in the delivery.

These examples illustrate that a considerable amount of world or background knowledge is needed in order to make inferences about information not explicitly stated in the text. For instance, the reader of the previous passages would need to possess and activate prior knowledge structures associated with a variety of topics, including familiar nursery rhymes, owning a pet, characteristics and traits of little girls and old women, dining at home or in a restaurant, caring for farm animals, veterinarians, animal births, alcoholic beverages, etc., in order to make

sense of the text (Trabasso & Nicholas, 1980). However, although activation of relevant background knowledge is clearly an important factor, it is also necessary to achieve a "best-fit" solution that preserves the cohesive relationship and propositional ties between the two sentences in each passage. Text-based, explicit information is clearly important as well, and plausible inferences cannot be generated unless the relationships specified in the literal text are preserved during the reconstruction of meaning by the reader.

Researchers have proposed several taxonomies to describe the different types of inferences that are generated during the comprehension of narrative text. Several of these taxonomies are based on the premise that comprehension consists of the construction of multi-level representations of texts, and that comprehension improves to the extent that the reader constructs more levels of representation and more inferences at each level (Graesser et al., 1994). For instance, under the overall category of "knowledge-based inferences," Graesser et al. differentiate between "shallow" low-level inferences that are instantiated to construct propositional code, syntactic code, and the explicit text base, and "deeper" high-level inferences, which involve the reader inferring the global message or "point" of the text (including causes and motives that explain why actions/events have occurred). According to their definition of comprehension, Graesser et

al. indicate that it is the reader's job to construct representations of meaning at both shallow and deep levels. To illustrate this phenomena, they propose the following example:

> The truck driver saw the policeman hold up his hand. The truck driver's vehicle stopped, but a car rear-ended the truck driver.

An analysis of the textbase or shallow level of representation in this passage (Kintsch, 1992; Kintsch & Van Dijk, 1978) reveals the following propositional content of the first sentence:

> PROPOSITION 1: saw (truck driver, PROPOSITION 2)
>
> PROPOSITION 2: hold-up (policeman, hand)

At the textbase level, each of the above propositions has a predicate (i.e., verb, connective or adjective) and one or more arguments (i.e., noun or embedded proposition), and the two sentences are connected by the overlapping argument "truck driver." But this shallow level of representation still fails to capture the deeper, more global meaning of the text. Deeper comprehension can only be achieved when the reader infers causes and motives to explain why the events occurred. For example, a reader would likely infer the following: (a) that the policeman held up his hand with the goal of having the truck driver stop his vehicle (perhaps for safety reasons or to control the flow of traffic); (b) that it was an abrupt stop on the part of the truck driver (in response to the policeman

holding up his hand to indicate "Stop!") which triggered the accident, when the car behind the truck could not stop in time to avoid a collision; and (c) that the car rear-ended the vehicle of the truck driver and not the truck driver himself, as the explicit text would seem to suggest. The reader would also infer that the truck driver performed some action to stop the truck (such as stepping on the brake), as did the driver of the car (although the action was unsuccessful in preventing the collision),and that the truck driver had the goal of stopping in order to avoid getting a ticket from the policeman (or because drivers are expected to respond to a policeman's directions in traffic for safety reasons). The driver of the car also had the goal of stopping, in an attempt to avoid hitting the truck. *Finally, the reader might make a more global inference* about the passage, such as "accidents occur even when people follow the rules," or "it is dangerous to follow too closely behind another vehicle in traffic." It is readily apparent that the inferences generated while attempting to construct meaning from this passage rely quite heavily on prior knowledge and experience, and that the number of inferences that may or must be drawn to construct the various levels of meaning are almost endless. Obviously, the more inferences the reader constructs (both shallow and deep); the more "rich" and multi-layered the comprehension of the text.

Graesser et al. advocate a constructionist theory of comprehension to explain the mechanism by which readers generate inferences during the actual reading of the text, as opposed to generating inferences during same later retrieval task. According to Graesser et al., all knowledge-based inferences generated while reading the text are constructed when background knowledge structures in long-term memory (LTM) are activated." Background knowledge consists of both generic knowledge structures (i.e., meaningful, contextually rich "packets" of knowledge such as scripts or schemata), as well as specific knowledge structures that are relevant to the text (including memory representations of other texts, and of prior excerpts within the same text). Graesser et al. propose that background knowledge structures are first activated through pattern recognition by explicit content words, combinations of content words, or interpreted text constituents. When knowledge structures from LTM are activated, a subset of this information is then encoded in the meaning representation of the text, which includes both the textbase, and a referential situation model,(i.e, a mental representation of the setting, characters, actions and events that are mentioned explicitly, or that are "filled-in" inferentially from world/background knowledge). Graesser et al. further suggest that when a background knowledge structure is very familiar or "overlearned," much of the content for that memory structure will be

automatically activated in working memory (WM), at a very small cost to the processing resources (Graesser & Clark, 1985; Kintsch, 1988). In other words, according to constructionist theory, when a knowledge-based inference is "directly inherited" or "copied" from a background knowledge structure (due to high familiarity or overlearning), the process of incorporating it into the meaning representation of the text places very little processing burden on the reader's WM. On the other hand, sometimes a novel knowledge-based inference must be constructed. Such a novel inference might involve several cycles of searching memory for the appropriate background knowledge structures to make the inference (Just & Carpenter, 1992; Graesser et al., 1994). Theoretically, generation of these novel inferences would place a much higher burden on WM, and a potential inference has less likelihood of being generated to the extent that it imposes higher demands on WM.

Connectionist Models and Solving the "Frame Problem"

Although constructionist theory is appealing in many ways (particularly as it specifies how inferences may actually be generated), it fails to solve what has been variously referred to as the "frame problem." The frame problem may be summarized as follows: when polymodal input is being received from the environment (for example, when humans are trying to read and process narrative text), theoretically, any part of the total knowledge base of the

individual may be relevant for making the necessary inferences at any given point in time. Garfield (1990) notes that the frame problem, or "the problem of how we organize knowledge and information about the world in such a way that the relevant bits are available when they are needed, without having to perform an exhaustive or horrendously inefficient search of the listener's knowledge base," has yet to be satisfactorily resolved in the field of cognitive science. Interestingly, the frame problem also continues to pose a major stumbling block in the field of artificial intelligence (AI). Put simply, solving the frame problem remains "staggeringly difficult" for current AI machines, but appears to pose little difficulty for normally intelligent humans (Garfield, 1990). In fact, inference generation (along with question asking and answering, summary generation and paraphrasing) has traditionally served as a sort of "litmus test" of whether AI computers are capable of understanding text (Graesser, et al., 1994; Kass, 1992; Lehnert, Dyer, Johnson, Young, & Harley, 1983; Schank & Abelson, 1977). Further exploration of how (and by what mechanism) relevant background information is stored and activated efficiently, easily, and at the right time by humans may shed light on how to facilitate this process in the next generation of AI computers.

In summary, we know that humans process narrative discourse quite rapidly, yet it would be almost impossible

to engage in the kind of rapid processing needed to make sense of the text if we had to "filter" through our entire store of background knowledge to determine which information is relevant every time we need to make an inference. We require the ability (and indeed appear to have the ability) to determine which previous background knowledge structures are relevant, and to activate the pattern associated with that knowledge almost instantaneously, in order to make inferences. In addition, we must also determine which information from the continuing stream of input data (i.e. the continuing text-base of the narrative) is relevant, so that we can confirm or deny the schemata initially activated, and/or modify the inference accordingly.

Although constructionist theory does specify that background information which is overlearned or highly familiar somehow places "less demand" on WM, the exact mechanism for how information might actually be stored or accessed in WM or LTM is unspecified. Perhaps it is necessary to reexamine the larger question of how humans acquire and store knowledge (particularly knowledge about routine events and story structure) and how they retrieve/activate this knowledge, before attempting to design a model for how the system solves the "frame problem. A connectionist or parallel distributed processing (PDP) model of cognition (grafted onto the existing framework of the constructionist model) may do a

better job of explaining how individuals store and access knowledge of routine events and story structure, as well as how they solve the frame problem in order to generate inferences quickly and accurately.

First, let us examine how children's knowledge of routine events is acquired. According to Nelson (1985; 1986; 1991), scripts or "generalized event representations" describe children's schematic knowledge of routine events. It is through the child's active participation in routine events (e.g., eating, bathing, napping, dressing, going to the store, reading a story book, etc.) that these event representations are created. Initially, the child perceives the event holistically, and does not separate the parts (i.e., people, actions, objects, outcomes) from the whole. But as the caregiver talks to the child and points out the salient aspects of these routine events, the child becomes aware of the elements involved, and gradually builds a network of associations representing the entire event. These representations include specification of the event's temporal and causal structure, its obligatory and optional components, and the props and roles commonly associated with the event. Young children's basic event knowledge is thought to be very similar to that of an adult's in terms of both its schematic structure and its consistency across time and individuals. Event representations constitute one of the child's earliest and most stable forms of knowledge about the world, and form

the basic "building blocks" for subsequent cognitive development.

PDP models of cognition attempt to show how such conceptual information may be represented in neural networks, where connections between bits of information (units) are activated as a pattern across the network, representing a concept or event. The connections between units or "connection weights" have variable strengths which undergo continuous adjustment based on experience. Events or routines that the child encounters frequently in life will result in stronger connection weights between the units representing the concept or event. Theoretically, stronger connection weights would result in easier access and retrieval of the concept as well. For instance, in the Nicholas and Trabasso (1980) "Mary had a little lamb" example previously cited, hearing and singing the familiar nursery rhyme over and over (as many children do) would result in strong connection weights for the pattern of activation representing that event or concept. Newer, or less frequently encountered events (e.g., eating lamb, or watching a sheep give birth) would have much weaker connection weights between units. PDP models stipulate that anything that has been previously "learned" or experienced may be reactivated within the network at any time (for example, when the reader encountered the first "Mary had a little lamb" sample sentence earlier in this paper). The pattern that is initially activated by this

incoming data will be the one with the strongest connection weights (for most of us, certainly the familiar nursery rhyme event representation). Therefore, this highly familiar pattern is activated immediately, before we even read/process the second sentence in the passage (similar to the phenomena Hansen referred to as making "default assignments"). We activate patterns with weaker connection weights only when subsequent stimuli (in this case the text-based data concerning gravy and mint jelly) force us to reject the first, more likely representation. In other words, rather than focusing on an artificial dichotomy between WM and LTM, and suggesting that there are less processing demands when information is "overlearned," the emphasis in PDP models is on concepts consisting of patterns of activation of units across a network, with stronger connection weights between units resulting from experience leading to easier access and retrieval of that concept.

Finding a "Best Fit" Solution: A Constructionist-Connectionist Model of Inferencing

Although PDP models go a long way toward solving the "frame" dilemma, one more component remains to be added. A constructionist-connectionist model that would allow the reader to make use of simultaneous bottom-up and top-down processing in order to construct a "best-fit" solution to the inference may solve the frame problem, since it would never be necessary to activate the entire store of prior

knowledge all at once. Such a model would work as follows. First, initial input to the system (primarily from the text-base) activates the most likely schemata or representation (i.e. bottom up processing) because the connection weights for this pattern of activation are stronger due to experience. Therefore, our "first guess" inference or "default" solution is generated quickly and easily, and has a high probability of being correct. However, the system also has a "safeguard" mechanism in the form of almost simultaneous "top down" processing, in order to handle contradictions that may arise from subsequent incoming data. While instantiating the first schema and inference, the system quickly scans the continuously incoming data stream in order to confirm or deny the plausibility of the inference. If a "match" or "best-fit" solution is achieved, the default inference is retained. However, if subsequent data from the input stream "denies" the plausibility of the first-guess inference, we must resort to activating the patterns for a series of "less-likely" schemata and formulating new or modified inferences, which will then be "tested" against incoming data, and so forth, until a best fit solution is achieved. In this manner, the system is designed for speed and maximum efficiency in activating appropriate background knowledge (without having to search the entire knowledge store), but is also equipped with safeguards which allow for flexibility in generating alternate solutions as

needed, through simultaneous top-down/bottom-up processing (see Appendix A for pictorial representation of this model).

There is some preliminary neurophysiological evidence which suggests that the brain is capable of and does engage in simultaneous top-down/bottom-up processing. Specifically, reciprocal interactions between the reticular formation (RF), cerebellum, hippocampus, and cortex (particularly the prefrontal cortex) may be involved in this process.

The RF has been described as a "universal connector" or "gating mechanism" for all the parts of the brain (Parkins, 1990). In addition to connecting the cerebellum and the cerebrum to the environment, the RF may also facilitate interaction between the cerebellum and cerebrum. It is now known that the cerebellum has fiber tracts which connect it directly with all major subdivisions of the cerebral cortex, and that it may influence electrical activity in all four lobes of the brain, including cerebral responses to external stimuli. Additionally, evidence suggests that the cerebellum may activate or influence neurons within the RF, possibly exerting some sort of discriminatory control. Through the ascending RF, the cortex appears to receive nonspecific, polymodal input, the content of which is thought to be experientially based and related to the contextual significance of the the stimuli. This may provide the equivalent of a "psychological set"

(similar to an "inferential set") that serves as background for subsequent cerebrocortical processing (Parkins, 1990). This process may be twofold. First, the data concerning the contextual significance of the stimuli may be forwarded to the cortex through the ascending RF. Then, on the basis of this information, the cortex may selectively attend to or filter subsequent ascending information, by means of its influence on the reticular system through cerebro-reticular projections (Parkins, 1990).

The hippocampus also appears to be significantly involved with attention, memory, and the activation of relevant background knowledge. Although it is not the site of actual memory storage, the hippocampus appears to act as a "key of access" to the "experiential record" or memory bank (Parkins, 1990). Specifically, the hippocampus seems to be involved in the mechanism which allows information to be consciously retrieved from the memory bank (where all our previous experiences are recorded), and it also influences input to the cerebrum, through its reticular connections. Clearly, the cerebellum, the hippocampus and the RF are involved in a complex reciprocal process whereby information is filtered and directed back and forth between the cerebrum and the environment, and the resulting comparison between incoming stimuli and relevant stored information is involved in memory storage, retrieval, and inferencing.

New findings garnered from neuroimaging studies are also providing support for top-down/bottom-up, connectionist-constructionist models of processing and memory. Positron emission tomography or PET is a brain scanning technique that provides a precise reading of blood flow in localized brain regions (Schacter, 1996). The underlying rationale for PET is that when a region of the brain is actively involved in a specific cognitive task, that area should become more active, thus requiring more blood uptake (Schacter, 1996). Another neuroimaging technique called functional magnetic resonance imaging (functional MRI or fMRI) also measures changes in regional blood flow during the performance of cognitive tasks. Researchers have been successful in using PET and fMRI to explore activation patterns and blood flow during a variety of memory storage, retrieval, and other cognitive tasks. For instance, Kapur, Jones, Brown, Houle and Tulving (1995) found evidence that there is strong activation (i.e., high blood flow) in the left inferior prefrontal cortex associated with *elaborative encoding* (i.e., the process by which subjects make a conscious effort to remember by associating new information with previous knowledge). These results have been confirmed using fMRI (Schacter, 1996). Likewise, the hippocampus, which has been previously implicated as a structure important for memory access and retrieval, also appears to be involved during elaborative encoding (Schacter, 1996). Neuroimaging results suggest

that part of the encoding process (i.e., the process of transforming something a human thinks, feels, hears, sees, etc. into a memory) involves a hippocampal response to novelty. When the hippocampus becomes active during exposure to a novel event, the individual's attention is drawn to the event. Furthermore, there appears to be a reciprocal relationship between activation of the hippocampus in response to novelty and activation of other areas of the brain presumed to store relevant memories and prior knowledge. Schacter (1996) reported PET results which suggest that once the hippocampus is activated by a novel stimulus, another "network" presumed to store a wealth of semantic associations and prior knowledge (specifically a region of the left inferior frontal lobe) is then activated as well. According to Schacter, it is this interaction between the hippocampus and the left inferior frontal lobe that allows us to engage in elaborative encoding (i.e., the process of integrating new information with existing knowledge), and elaborative encoding in turn yields a higher probability that the new information will be readily recalled/retrieved at a later time.

Along similar lines, Moscovitch (1994) has suggested that the frontal and hippocampal systems may actually be involved in two different types of memory retrieval. Moscovitch uses the term *associative retrieval* to refer to the process whereby a retrieval cue automatically triggers

an experience of remembering (for example, when hearing an old song inadvertently triggers a memory of where you were, who you were with, and what you were doing when you used to hear that song played). Moscovitch suggests that associative retrieval probably depends on the hippocampus and other related medial temporal lobe structures. On the other hand, Moscovitch proposes that *effortful* or *strategic retrieval* (i.e., the process whereby we explicitly and effortfully try to retrieve prior knowledge or memories) most likely involves activation of regions of the prefrontal cortex (as indicated in PET studies).

Although still preliminary in nature, results from these neuroimaging studies lend credence to the notion that there is no single location or area in the brain that contains the memory of a particular experience or event, and that different brain regions work reciprocally and collaboratively during the processes of encoding, filtering and retrieving of stored information. This notion is hardly new; memory researchers as far back as Semon (1904/1921, 1909/1923) have been interested in what constitutes the *engram*, or actual neural representation of a memory in the brain. Semon argued that memory consists of *engraphy* (his term for the process of encoding information into memory); the *engram* itself (the enduring change in the nervous system or "memory trace"); and *ecphory* (the process of activating and retrieving a memory). What made Semon's work so different from that of his contemporaries was that

he focused not only on the process of memory storage (a popular subject for exploration and discussion at the time), but also on memory retrieval. Many neuroscientists believed then (as many continue to believe now) that the likelihood of remembering an experience or event is determined by the strength of connections or associations formed when that event was initially encoded into memory. Semon further argued, however, that memory does not solely depend on the strength of the associations or connections made at the time of encoding. Rather, he suggested that the probability of remembering also depends strongly on the hints or cues that trigger recall (he called these hints/cues the *ecphoric stimulus*), and how the cues are related to the original engram or memory trace.

Although his work was largely ignored at the time, some of Semon's ideas did become an enduring part of the neuroscience literature (particularly his notion of the engram), and other neuroscientists have continued to suggest that the brain stores an engram by strengthening connections between groups of neurons that participated in the encoding experience. This theory closely parallels modern connectionist/neural network theories of brain organization. As Schacter (1996) notes, any typical experience from our lives generally consists of multimodal input (i.e., sights, sounds, smells, tactile sensations, feelings, etc.). Different areas of the brain (e.g., regions of the parietal, occipital, and temporal lobes)

appear to be responsible for analyzing various aspects of this input in order to make sense of the whole event. As a result, neurons in different regions of the brain eventually become more strongly connected to one another as a result of experience. The particular "pattern" of these connections constitutes the brain's "record" of the event or the engram (Hebb, 1949, Schacter, 1996). Engrams are thus important contributors to the subjective experience of remembering and using stored information for performing various cognitive tasks (such as inferencing). Presumably, at any given moment, there may be literally millions of engrams existing in the brain in the form of patterns of neural connections. These patterns have the potential to enter our awareness and contribute to implicit, associative, unintentional recall, or to explicit, effortful, intentional recall at any given time. An external retrieval cue from the environment, or an internal retrieval cue (both of which may well exist as a unit or piece of the original engram), may activate the entire engram or pattern of connections at a particular time. But most patterns simply lie dormant or inactivated until they are needed. The strength of this theory (and a strength of connectionist theories in general) is that only a fraction of the original event or a "tiny piece" of the engram in the form of an internal or external cue needs to be present in order to trigger activation and recall of the entire episode or event. Once again, this helps to solve the

"frame problem" by explaining how we are able to activate relevant prior knowledge (i.e., a particular engram) when needed, without having to engage in an exhaustive search of our entire memory bank. More importantly, connectionist theory helps us to view both memory storage and retrieval as dynamic, fluid, reciprocal processes, with memory in general existing as a constructed, transitional entity or "work in progress," consistenting of a constantly changing network of associations strengthened through experience and repeated activation. Connectionism can also help us explain the phenomenon of "forgetting" or failing to retrieve relevant stored information at the appropriate time. Engrams whose connections are not strengthened through experience and repeated activation are more likely to "fade" gradually over time and thus may be more difficult to activate when needed. Most importantly, connectionist models encourage us not to ignore the importance of retrieval cues on the memory process. Some proponents such as Schacter (1996) go even further by suggesting that a memory is not merely an activated engram, but a uniquely new activation pattern that emerges from the "pooled contributions" of the retrieval cue and the stored engram. In this light, there is no need for false dichotomies to exist between phenomena such as memory storage, retrieval, and the coalescing of new information with prior knowledge. Instead, all of these processes operate in parallel as part of a flexible, emergent,

collaborative neural network that is capable of handling a variety of complex cognitive tasks (including inferencing) effectively and efficiently.

Inferential Processing In Normal and LLD Populations

Although it is accepted that proficient readers and listeners make inferences regularly and with relative ease, studies suggest that even normal children and adults sometimes have difficulty making inferences (Bransford et al., 1982; Davey & Macready, 1985; Holmes, 1985; Paris & Lindauer, 1976; Wilson, 1979; Winne et al., 1993). The literature on inferential processing indicates that both children and adults typically have more difficulty answering inferential questions than factual/literal questions about stories (Holmes, 1984; Pearson et al., 1979). In recent years, researchers have focused on exploring the narrative and inferential processing abilities of LLD children, who appear to have greater problems in these areas in comparison to their normal peers.

Various studies have investigated LLD children's ability to process implied information, using a variety of formats. Ellis-Weismer (1985) for instance, examined inferential skills in 12 children (ages 7-8 years) with specific language impairment (SLI), by comparing them with children of similar age (matched on nonverbal ability), and slightly younger children (matched on language comprehension level). The subjects were presented with

short story sequences, either orally or as a series of pictures. Each story sequence was followed by a series of yes/no questions, half of which could be answered by recalling explicitly stated or shown premises, and half of which required making some sort of inference. Results revealed that the SLI children performed more poorly than their age-matched peers on both types of questions, however, they performed similarly to the younger, language comprehension-matched controls.

In a similar study, Crais and Chapman (1987) examined children's ability to recall information and draw inferences from orally presented narratives. Sixteen 9-10 year old LLD children participated in the study, along with two groups of nondisabled controls (sixteen 9-10 year olds and and sixteen 6-7 year olds). Short fable-like stories were presented to the children, followed by a series of true/false premise questions (i.e., factual/literal questions) and inference-type questions. Subjects were asked to retell the narrative in their own words either before or after the questions. Results indicated that across all three groups, inference questions were more difficult than premise questions. Overall, the LLD children performed significantly lower than their age-matched, normal peers, and, as in the Ellis-Weismer (1985) study, their performance closely resembled that of their younger, language-matched peers. The opportunity to retell the story prior to answering the questions (which could

conceivably have improved performance by prompting recall) did not improve performance on either question type. In analyzing their findings, Crais & Chapman speculated that question-answering itself may prompt on-the-spot recall, an idea previously explored by Wong (1980). Wong presented a group of LLD and nondisabled second graders and sixth grade graders with a list of sentences containing explicitly stated consequences, and another set containing implicitly stated consequences. He then used a question-prompt procedure to provide students with cues to recall the sentences. The normal readers recalled significantly more implicit sentences than the learning disabled readers. Additionally, the question-prompt procedure significantly improved comprehension and retention of implied information in the LLD students, leading Wong to speculate that LLD children have the ability to infer, but may need specific help in learning how to apply inferential processing strategies.

Based on data from the previous three studies, Bishop and Adams (1992) designed a study to further determine if inferential comprehension is more impaired than literal understanding in LLD children and if inferential problems in this population are present only when information is presented verbally. Sixty-one 8-12 year-old children with SLI were compared on a story comprehension/question-answering task with a control group consisting of ten children at each of the following ages, 5, 6, 8, 10, and 12

years. Four series of pictures were selected to correspond to four stories and a verbal version was prepared for each story as well. The stories were presented either orally (without accompanying pictures) or pictorially (without the accompanying verbal account); each story was followed by 14 questions (7 literal, 7 inferential). Results revealed that the SLI children performed significantly below their age-matched peers on both question types, however, they did perform at a level similar to that of the control subjects 2 to 3 years younger. There was no effect for mode of presentation of the story (pictorial or verbal). In summarizing their findings, Bishop and Adams hypothesized that SLI children may exhibit a more global story comprehension problem that limits their ability to answer both factual and inference questions stories (with inference questions posing more of a problem simply because they are more difficult for everyone, not just SLI children). Bishop and Adams further speculated that because SLI children do not appear to impose structure on the story and do not engage in constructive comprehension, they are poor at understanding and remembering all aspects of the story, including both implied and explicitly stated information. This hypothesis is consistent with other research findings (Norris & Hoffman, 1993; Liles, 1993) which suggest that SLI/LLD children exhibit difficulty with various structural and global aspects of narrative comprehension and production.

Researchers have documented a variety of weaknesses in the narratives of LLD children. In general, their narratives are shorter and less complex than those produced by their age-matched, normal peers, with deficits apparent in overall length and complexity, story grammar constituents, sentence grammar, content, and cohesion (Gillam, 1989; Gillam & Johnston, 1992; Graybeal, 1981; Liles, 1985; 1987; 1993; Merritt & Liles, 1987). Their inferencing problems, in conjunction with their more global narrative deficits, have the potential to negatively impact LLD students' performance in a variety of academic areas. It is not surprising that these children find themselves unable to adequately comprehend and explain story actions, events and character motives, answer factual, evaluative, or interpretative questions, explain cause-effect relationships, and otherwise summarize/retell narrative information in correct sequence and detail.

Potential Causes of Inferential Processing Deficits in LLD/Poor Readers

There have been a number of other theories offered to explain why students in general (and in particular, those with reading and language-learning disabilities) sometimes have difficulty answering inference-type questions. One possible reason is lack of practice. Hansen and Pearson (1983) note that although children infer naturally and regularly during their non-school lives (by attempting to infer similarities and differences between new situations

and those they have already encountered), they are seldom required to infer during their school lives. Evidence suggests that teachers generally ask more literal than inferential-type questions in the classroom (Guszak, 1967), and that lower achieving students in particular are asked fewer inferential questions than better readers (Chou-Hare & Pulliam, 1980; Palmer, 1982; Sadker & Sadker, 1982). In fact, poor readers are more likely to be involved in lessons which emphasize word identification and decoding skills as opposed to comprehension (Winne et al., 1993). Kos (1991) notes that in general, there is little instructional time devoted to comprehension in most classrooms, and even less to inferential comprehension (Kos, 1991). Hansen and Pearson (1983) also point out that rather than being taught to learn textual information by relating it to something familiar (thus leading to activation of appropriate schemata), children are often encouraged to learn new information simply by memorizing it. Given the lack of emphasis on comprehension, and the resulting lack of inferencing practice, it is not surprising that many school-age readers exhibit inferential processing abilities that are less well developed than those needed for literal comprehension.

Still other theories have focused on the reader's ability (or lack thereof) to activate relevant background knowledge as a potential source of inferencing difficulties. First, readers may simply lack the

appropriate background knowledge needed to make the necessary inference (Pearson, Hansen, & Gordon, 1979). Second, they may possess the appropriate prior knowledge, but underutilize it for a variety of reasons. Spiro and Myers (1984) suggest that readers may underutilize prior knowledge because: (a) they are unable to determine which schemata to draw upon; (b) they lack appropriate strategies for activating and retrieving relevant schemata; (c) they do not maintain activation of the schemata for a sufficient period of time; (d) they have a confused representation of knowledge; or (e) they pay undue attention to word decoding/identification, thus exceeding processing capacity limitations. Third, readers may exhibit an overreliance on prior knowledge when making inferences. Anderson (1978) proposed that readers may be unable to differentiate between what has actually been stated in the text, and what they perceive to be logical based on prior information, resulting in the generation of inferences "too heavily shaded" by previous perceptions. Spiro and Meyers (1984) also suggest that excessive word identification problems in some readers may limit their access to text-based information, thus inducing them to rely too heavily on background knowledge to make sense of the text. Finally, Tierney and Pearson (1981) note that some readers may simply be unaware of strategies for drawing inferences (specifically, that inferencing requires a "coalescence" of text information and prior knowledge), and may exhibit a

lack of flexibility in using either background information or written, text-based clues for making various inferences. Any of the above circumstances may cause the reader to make inferences which Tierney and Pearson describe as being "too text-based" (i.e., based too heavily on literal information from the text) or "too reader-based" (i.e., based too much on the reader's prior knowledge).

Given the many potential causes of failure to make inferences, it is imperative that teachers and clinicians identify the particular set of contributors for a given disabled reader, and design instructional and remedial methods accordingly. The goal of any instructional or remedial method used with this population should be to teach "strategic reading" (Trabasso, 1981). Strategic reading enables the reader to employ a wide variety of resources, strategies, and techniques to decode words and make sense of text, and to generate inferences while reading. Discovering the source of inferential processing difficulties as well as the various strategies (or lack thereof) employed by a given reader is a complex task, however. While we know that good readers employ a wide variety of strategies while engaged in constructive comprehension (Paris, Wasik, & Turner, 1991; Kletzien, 1991), poor readers may lack some or all of these strategies. Fortunately, a process known as *error analysis* (Kamil, 1984) or *miscue analysis* (Goodman, 1965; 1969, 1984; Goodman & Gollasch, 1980; Goodman & Goodman, 1977),

can provide a "window" into the reading comprehension processes of good and poor readers, and is now frequently used for diagnosis and intervention planning by those who have a more "interactionist" perspective on reading disabilities (Lipson & Wixson, 1986). Specifically, teachers and researchers can hear the reader's departures from the written text (i. e., "miscues"), while the student is reading aloud, as the student repeats, corrects, reprocesses, predicts, and monitors his/her own struggle to make meaning of the text. In general, proficient readers are fairly successful at decoding and constructing meaning, and the miscues they produce are fewer in number, and do not grossly violate meaning. Less proficient readers, however, are often less successful at decoding and reconstructing the author's intended meaning. Subsequently, they produce more miscues overall, and the miscues they produce often grossly violate the meaning of the text (Goodman & Goodman, 1977). In other words, miscues are far from random, and much insight into the reader's process of meaning-making may be gained when we attempt to determine why the miscue occurred. Therefore, miscue analysis generally involves careful consideration of the type and general pattern of miscues exhibited by a reader. For instance, miscues may be broken down into two broad categories; *accuracy-related miscues* (ARMs) and *fluency-related miscues* (FRMs). ARMs include substitutions, additions, or omissions of word(s), phrases,

or sentences, and reversal of word order. An ARM may preserve meaning (for example, when the reader substitutes a synonym or semantically-related term that still makes sense in the sentence) or ARMs may violate meaning (for example, when the substituted word is not a synonym or semantically- related concept, and does not make sense in the sentence). Although ARMs are often a signal that a reader is failing to decode and/or process the meaning of the text, FRMs may also reflect increased difficulty with decoding and processing. FRMs include too long or inappropriate pauses, repetitions of words, phrases or sentences, failure to pause appropriately for punctuation marks such as commas and periods, and inappropriate prosodic or intonational contours including failure to elevate pitch and/or loudness for question marks and exclamation points, monotone or "word-by-word" reading, and excessively fast or slow rate. FRMs may increase when the reader encounters a "difficult patch" of text and although he/she may be successfully decoding the text and technically "getting the words right," constructive comprehension (including drawing inferences and grasping subtleties of meaning) may not be taking place. For these reasons, detailed miscue analysis (augmented by question-answering and other reporting techniques to assess comprehension) is an important first step when planning remediation.

Now that we have explored some of the theories regarding LLD/poor readers' narrative and inferencing deficits, let us examine some of the studies which have previously attempted to improve their abilities in these areas.

Use of Explanatory Feedback and "Think Aloud" Techniques to Improve LLD/Poor Readers' Inferencing Abilities

In order to test specific techniques for improving students' ability to make inferences, researchers have used a variety of methods such as verbal protocols, time-based measurements, think-aloud techniques, and question-answer tasks to "trace" as well as improve the inference-making process during the reading of narrative texts. Most prior studies of this nature have focused on the following: (a) making students aware of the importance of drawing inferences while reading narrative texts; and (b) use of facilitative questions and active feedback, provided before, during, and after reading, to help subjects identify explicit or implicit clues in the text for activating the appropriate background knowledge (Carnine, Kameenui, & Woolfson, 1982; Carnine, Stevens, Clements, & Kameenui, 1982; Dixon & Rossi, 1995; Hansen, 1981; Hansen & Pearson, 1983; Holmes, 1983, 1985; Pearson, Hansen, & Gordon, 1979; Winne et al., 1993). In most of these studies, facilitative questions were designed to help the learner process material in new, constructive ways, and to

emphasize the importance of using text-based information and prior knowledge to make inferences. Active feedback in these studies usually involved giving the reader explicit verbal feedback regarding the accuracy/completeness of a response to an inference question, modeling what would have been a better answer, and/or giving clues to help the reader devise a better answer if the answer was incorrect or partially correct.

Overall, results from these studies have been positive, as students were generally able to significantly improve their inferencing ability as a result of the treatment. These studies, however, have not been without limitations. First, in an effort to maximize internal validity (by controlling specific textual dimensions and manipulating precise interventions on certain types of inferencing behaviors), only highly contrived passages (i.e., structurally similar, single page passages) were used. This has made it difficult to predict whether the strategies used would also be effective in contexts where students are required to read authentic literature (i.e., fictional stories and texts containing academic or expository content), as opposed to contrived texts generated strictly for research purposes. Second, in an attempt to eliminate decoding problems as a possible factor in the students' inability to correctly answer inference questions, the questions were often read aloud to the subjects, and whole word corrections were provided when the

subjects miscued or could not read a word aloud. As a result, the reading events in these studies have borne little resemblance to normal classroom practice, where students are often expected to read a story and answer subsequent questions themselves, silently or aloud. In addition, by removing the decoding "burden" for the students, whatever part decoding may actually play in their overall reading comprehension and inferencing deficit has yet to be fully explored. Based on these factors, it would appear that further research is needed to explore the effects of specific teaching strategies on inferencing behaviors by using authentic literature as the medium of presentation and intervention, while maintaining the reading process as an intact, whole event, with students reading the passages or stories themselves. In addition, although preliminary studies have attempted to explore ways to improve LLD children's narratives and inferencing abilities separately, few have attempted to address these problems simultaneously, using procedures that can be feasibly implemented in a classroom situation. Devising a set of procedures consistent with *whole language* philosophy may offer a viable means for simultaneously addressing these areas, by guiding children through the process of constructive comprehension in small group and classroom settings.

Whole Language Philosophy and Use of Communicative Reading Strategies

Whole language is a philosophy or set of beliefs about how people learn (Norris, 1992). Principle to the whole language philosophy is the fact that in literate societies, there are four language processes which must be mastered; listening, speaking, reading and writing (Goodman & Goodman, 1977; Harste, Woodward & Burke, 1984). Research indicates that these four processes emerge and develop in an interrelated fashion, through complex, meaningful interactions during childhood (Westby, 1990). Intervention, therefore, must also take place in the context of purposeful, meaningful interactions. One program which uses written language as the medium of intervention and is consistent with whole language philosophy is known as Communicative Reading Strategies or CRS (Norris, 1988, 1989, 1991). CRS is a communication-based approach to reading, designed to facilitate the reader's ability to construct multiple levels of meaning representation from the text. Intervention with CRS involves conducting the reading event as a meaning-making process, and all cueing systems (e.g., visual, auditory, graphophonemic, pictures, context, prior knowledge, previously read information, etc.) are utilized to help the reader process the meaning of the text and the underlying language (Norris & Hoffman, 1993). CRS pairs the use of oral and written language, such that there is a dialogue

about the text, with the adult facilitator providing more or less assistance (scaffolding) as needed to help the reader reconstruct the intended meaning of the text. When using CRS, particular attention is paid to the reader's fluency and word recognition, as reading miscues frequently provide clues to the reader's decoding and comprehension difficulties, and scaffolding strategies are adjusted accordingly. When the text is difficult for the child (as evidenced by multiple miscues), the adult may provide more scaffolding (particularly in the form of parsing a sentence, phrase or word into constituent parts) in order to help the child make sense of structure, form, and surface features. When the text is less difficult, the adult may assist the child in making more abstract interpretations, inferences, and evaluations about the text (Norris & Hoffman, 1993). Over time, children generally require less and less scaffolding, as they become more independent, strategic readers, capable of constructing meaning at multiple levels of representation.

Although practitioners using CRS employ a variety of scaffolding techniques (see Appendix B for detailed description and examples of CRS methodology), perhaps one of the most important features involves an adaptation of what has often been referred to in the reading literature as "The Method of Repeated Readings" (Dowhower, 1997; LaBerge & Samuels, 1974; Samuels, 1976). Dowhower (1997) notes that the Method of Repeated Readings usually involves

having the student "reread a short, meaningful passage several times until a satisfactory level of fluency is reached." This method was originally based on the "Automaticity Theory" (LaBerge & Samuels, 1974; Samuels, 1976), which suggests that fluent readers are those who decode text automatically, thus leaving their attention free for comprehension. Dowhower (1997) notes that the Method of Repeated Readings has had a significant impact on educational practice for the last two decades, and has been adapted and used successfully by a variety of reading practitioners, including those who subscribe to holistic, interactive, as well as skills-based reading methodology. Studies have shown the Method of Repeated Readings to be particularly beneficial to poor readers, resulting not only in increased reading fluency, but in improved motivation and greater self-confidence as well (Chomsky, 1978; Dowhower, 1997). The Method of Repeated Readings has been adapted for use in CRS in the following manner. First, rather than reading an entire story in one sitting, the child reads only a few pages of a story at a time. As the child prepares to read the first few pages of text, scaffolding is used to facilitate the student's activation of relevant background knowledge, ability to utilize picture and contextual cues (e.g., by looking at the title, cover page and pictures), and to make predictions about story content. As the child reads, miscues are addressed as they occur, and scaffolding strategies to assist

comprehension are employed accordingly. On subsequent occasions, the student may be asked to verbally summarize what has already happened in the story (sometimes with the help of a graphic organizer such as a "story map" or flow chart), and to reread previously read pages of the story before proceeding on to new pages. Careful attention is again paid to any remaining miscues when the student rereads a portion of the text, and additional scaffolding is provided accordingly. Students may exhibit poor fluency and multiple miscues during their first reading of a piece of text, but with each successive reading, they generally produce fewer miscues, and rate, phrasing and fluency often improve as well. These improvements may be attributed to a combination of scaffolding and repeated exposure to the same piece of text, such that decoding and processing difficulties are gradually overcome. In other words, the focus when using CRS is not on reading the story as quickly as possible, but rather on building comprehension and fluency as the child reads and rereads meaningful and interesting material in context. In addition, by breaking down a longer story into manageable parts, the child has the opportunity to master one part of the story before going on to the next, resulting in a type of cumulative constructive comprehension. Mastering each part of the story successively also allows the child to experience frequent successes while reading. This may be particularly helpful with LLD/poor readers for whom the reading event

has seldom been a successful or enjoyable experience. Students may gain much needed confidence and motivation as a result.

Other advantages to using CRS include: (a) the techniques may be utilized with individuals or small groups of children, and may even be modified for use in classroom settings when implemented as part of a collaborative language lesson on the part of the SLP and classroom teacher; (b) the adult facilitator is provided with a flexible set of strategies for addressing the reader's decoding and comprehension difficulties while the child is actually reading the text; (c) unlike many phonics-based reading remediation programs, CRS focuses on helping the child become a balanced reader, capable of using multiple strategies for decoding and comprehending text; and (d) it provides a way to help the reader work on constructing progressively more abstract interpretations and inferences about the text, as opposed to focusing solely on extraction of literal, explicit information. Most importantly, with its focus on simultaneous bottom-up/top-down processing, CRS is consistent with the constructionist-connectionist model of cognition previously discussed. For these reasons, CRS appears to have potential as a remediation technique for LLD children who exhibit a variety of problems with decoding, comprehension, and inferential processing during the reading of narrative texts.

Preliminary Studies

Several recent studies have evaluated the efficacy of CRS intervention with school-age children, in comparison to more traditional reading approaches. The author of this proposal has had preliminary success in implementing CRS with a group of LLD children at Miller Wall Elementary School, in an informal pilot study conducted during the 1995-96 academic year. A group of 18 LLD children in two self-contained special education classrooms at the school were targeted for remediation. The subjects ranged in age from 6 years, 0 months to 11 years, 10 months of age. Students were seen in small groups of 2-4 children, for 30 minute sessions, two times per week over the course of the school year. Narrative-centered thematic units were used to target various language abilities, including inferencing and narrative retelling abilities. Daily tallies were made to record percentage of correct responses to factual, interpretation, and inference questions about stories read. Students also were asked to retell/summarize parts of the story previously read at the beginning of each session, and were asked to provide a complete narrative retelling at the end of the story. Narratives were scored for overall quantity and quality of information, using the following numerical rating system: 4= good, complete, elaborated narrative; 3= adequate, fair, unelaborated narrative; 2= incomplete, below average narrative; and 1= poor narrative. Although this study was not conducted in a controlled

manner, results of daily tallies and anecdotal records indicated that percentage of correct responses to factual, interpretation and inference questions increased steadily over time for nearly all subjects, as did the overall length and complexity of their narratives (as characterized by presence of more story grammar constituents including characters and setting, better explanation of cause-effect relationships, improved cohesion, and occasionally providing a moral or "lesson" from the story). Perhaps the most encouraging finding was that students appeared to quickly transfer and generalize strategies from one story and thematic unit to the next, and less scaffolding was needed over time to produce the desired results. Teachers also indicated informally through progress notes and IEP documentation that many of the students exhibited accompanying gains in the classroom as evidenced by improved ability to answer comprehension questions about stories, and improved expressive language skills. Based on these findings, it would appear that this informal study using CRS intervention with LLD children should be replicated in a controlled manner.

Other studies have also demonstrated the utility of CRS as an intervention strategy with various language disordered populations. Hernandez (1989) compared the effects of CRS versus a basal reading program in a study involving third grade children who exhibited poor reading and language abilities. Changes in reading fluency,

comprehension, language, and writing were evaluated after 10 hours of small group instruction (30 minutes per day over a four week period). Results indicated that the group who received CRS intervention demonstrated a statistically significantly improvement in reading comprehension when compared to the basal reading group. The CRS group also demonstrated greater, albeit statistically insignificant gains in all other measures including word recognition, instructional reading level, story retelling ability, and thematic maturity in writing. The fact that gains in these areas were not statistically significant may be attributed to the extremely short period of intervention. Results suggest that a longer intervention cycle could produce significant gains in these measures as well.

Of the measures that did not reach significance, the result on the word recognition measure was of particular interest. Although the CRS group received no direct instruction in word recognition skills (whereas 20% of the basal group's time was dedicated to word recognition tasks such as phonics, vocabulary practice, etc.), equivalent gains were demonstrated by both groups. This finding suggests that reading intervention may not need to address word identification separately from comprehension in order to produce improvement in both.

Badon (1993) conducted a single-subject, alternating treatment study with four first-grade poor readers to compare the effects of CRS to a directed reading approach.

Subjects received two, thirty-minute instructional sessions each day for five days. Treatment effects were measured for reading accuracy, rate, fluency, and complexity and completeness of story retelling. Although findings were not significant for all subjects, the significant differences and trends in the data favored CRS intervention. Results indicated that rereading under the CRS treatment condition produced fewer reading miscues and an increased reading rate. Story retellings under the CRS condition resulted in the inclusion of more story grammar components and episodes, more interepisodic relations, longer retellings, and fewer maze behaviors than the directed reading approach. None of the subjects performed significantly better under the directed reading condition.

Ezell (1995) investigated the efficacy of CRS with high-risk first graders as compared to a no-treatment group. The nine experimental subjects were divided into three small groups. Each group received 45 minutes of intervention, four days a week, over a period of eight weeks. Standardized reading and language tests, and informal reading measures administered pre-intervention and post-intervention were employed to measure and compare changes. Long-term effects were evaluated through additional testing at four months and nine months post-intervention.

The results indicated that CRS is an effective treatment for young poor readers. Comparisons of pre-test

and post-test gain scores immediately following intervention revealed significant results for measures of word recognition, reading rate, and comprehension on both standardized and informal reading measures. Children with the poorest profiles prior to treatment made the greatest gains. The treatment group also evidenced significantly better performance on a wide range of word analysis skills (e.g., decoding, word attack, word identification, morphemic analysis, and word ordering) compared to the control group. Results of comparisons made at four and nine months post-intervention reflected greater increases for the treatment group over the control group but gains were not significant. As with the Hernandez study (1989), the gains in word analysis and word recognition skills, in the absence of direct intervention, provide support for the effectiveness of an integrated approach to reading instruction (as opposed to targeting decoding and comprehension separately).

An on-going, clinical program at Louisiana State University which utilizes CRS with language delayed children (kindergarten through eighth grade) has, for the past seven years, resulted in consistent, quantifiable increases in language and reading performance on standardized tests administered at pre-treatment and post-treatment. For instance, following seven weeks (20 hours) of intervention, a group of 19 subjects demonstrated an average percentile gain of 12% in reading comprehension and

6% in word recognition on the *Gray Oral Reading Test - Revised* (Bryant & Wiederholt, 1986), and an average percentile gain of 11% on the *Test of Language Development-2* (Newcomer & Hammill, 1988). Although not investigated in a controlled study, these clinical results suggest that CRS intervention, in a relatively short period of time, can affect measurable changes in reading and language performance with young beginning readers and middle school students.

METHODS AND MATERIALS

A time series control group study was designed to determine if CRS would improve the oral reading accuracy, question comprehension, and narrative retelling abilities of a group of LLD students. Authentic story books from The Wright Group *Sunshine Series* were used during treatment sessions and during probes to measure the dependent variables which included (a) number and type of oral reading miscues evidenced while reading fictional stories; (b) qualitative measures of responses to a series of factual, interpretation and inference questions about stories; and (c) qualitative measures of narrative retellings of stories.

Subjects

Subjects consisted of 15 students total (10 LLD students and 5 nondisabled, reading age-matched peers) enrolled in the Jefferson Parish Public School system in Louisiana. Half (five) of the LLD students were randomly assigned to a treatment group (designated as the TLD group), while the remaining half (five) were assigned to the no-treatment group (designated as the NLD group). The 5 nondisabled, reading age-matched (RAM) subjects, along with the 5 NLD subjects participated only in a series of pre-test, intermittent, and post-test probes designed to collect baseline data on their oral reading, narrative retelling and question-answering abilities; these RAM and

NLD subjects did not receive any instruction or treatment as part of the study.

Permission to screen the Special Education and Regular Education rosters of two schools in Jefferson Parish for prospective TLD, NLD and RAM subjects was obtained from the Coordinator of Speech and Language Services for the entire parish and the principals of the respective elementary schools. Ella Pittman Elementary, located in Harvey, LA, and Miller Wall Elementary, located in Marerro, LA were the schools targeted for subject selection, since both schools housed self-contained special education and/or generic classrooms for LD students on campus (see Table 3.1 for enrollment, demographic, and socioeconomic information on the respective schools).

Table 3.1

Enrollment, Demographic, and Socioeconomic Information on Schools

	Wall Elementary	Pittman Elementary
Total Enrollment	682	722
Race/Ethnicity		
White	202 (30%)	431 (60%)
Black	434 (64%)	246 (34%)
Asian	29 (4%)	18 (2%)
Hispanic	0	22 (3%)
Other	0	5
Number Receiving Free Lunch	511 (75%)	455 (63%)

Selection of LLD Subjects

Prospective LLD subjects were selected from the existing pool of Special Education students currently enrolled at the respective elementary schools. Eighteen subjects were originally targeted for inclusion in the study. Of the eighteen subjects initially identified and targeted, fifteen subsequently met all of the inclusion criteria. In order to be included in the study, subjects were required to:

1. Meet criteria for the classification Learning Disabled/Speech Impaired (LD/SI) or Speech-Impaired (SI) due to significant academic deficits and/or language delay/disorder, as specified in the *Louisiana Department of Education Pupil Appraisal Handbook- Bulletin 1508* (see Appendix C for pertinent excerpts and details from this document);
2. Exhibit intelligence within the normal range, as measured by a nonverbal intelligence test.
3. Exhibit normal vision and hearing, as measured during screenings conducted by the school nurse. (Note: School health records indicated that two subjects had previously failed the distance portion of the vision screening, and one student had passed the acuity portion of the screening, but displayed mild strabismus in the right eye. These students were referred for further vision testing; these examinations were still pending at the time the study commenced. However, the school nurse confirmed that all

three of these students exhibited near (i.e., close range) vision within the normal range, therefore, these subjects were not excluded from the study, as their near visual acuity was judged to be adequate for reading texts in close proximity.)

4. Be between 9 years and 11 years, 11 months of age (i. e., students who would be enrolled in fourth or fifth grade if they were enrolled in Regular Education).

5. Read at least 1.5 grade levels or more below chronological age expectancies.

6. Exhibit no significant accompanying communication deficits in the areas of fluency, voice, or articulation/phonology (Note: One subject exhibited occasional linguistic nonfluencies during spontaneous conversation. These nonfluencies were not judged to significantly interfere with the subject's ability to communicate for the purposes of this study, therefore, this subject was not excluded from the study).

Statement Concerning Possible Cross-over Effects

All LLD subjects who participated in the study were already receiving speech-language therapy services from their school-based SLPs (as specified on their Individualized Education Plan or IEP) at the time the study commenced. For those students assigned to the TLD group, parents and school personnel were informed that the PI would be providing speech-language therapy services to the children for the duration of the study; i.e., these

children would not be seen by their school-based SLP while the study was in progress, but would be seen by the PI instead. For the NLD subjects, parents and school personnel were assured that enrollment in the study would in no way interfere with those students receiving their designated speech-language therapy services at the regularly scheduled times, as the students could not legally or ethically be denied services they were entitled to as a result of participation in the study. Accordingly, there were some initial concerns about cross-over effects, as the NLD subjects would continue to receive therapy from another service provider during the study (and thus might not truly constitute a "no treatment" group). These concerns were somewhat allayed, however, when review of the NLD students' IEPs revealed that they were being seen by their school-based SLPs in small groups (3-4 children) no more than once per week for 20 minutes, or in some cases, once per month for 15-30 minutes (i.e., consultative services) at the time the study began. Considering that students placed in the TLD group would be seen individually by the PI approximately 3 times per week for approximately 30 minutes each session throughout the treatment phase of the study (representing a substantial increase in the number of sessions they would receive in comparison to the students in the NLD group, who would continue to be seen as scheduled by their school-based SLP), the possibility of cross-over effects appeared to be minimal. Additionally,

informal interviews with the students' school-based SLPs and review of the NLD students' IEPs revealed that current goals/objectives and treatment practices were characteristic of a more traditional "skills- based" therapy approach, quite different in scope and practice from the whole language reading-based approach being utilized in this study. Given this cluster of factors (i.e., the relative shortness/infrequency of the group treatment sessions administered to the NLDs by their school-based SLPs, the difference in methodology and treatment approaches, and the high frequency of the individualized treatment sessions administered to the TLDs during the treatment phase of the study), it was not anticipated that significant cross-over effects would occur.

Selection of Nondisabled, Reading Age-Matched (RAM) Controls

The group of nondisabled RAM peers (who only participated in the intermittent test probes) were selected based on the following criteria:

1. They exhibited an instructional reading grade level comparable to that of a member of the LLD group (as measured by the *Basic Reading Inventory* (BRI), along with teacher estimates of their current reading level).
2. They were functioning academically within the average to slightly above average range compared to their same-age

grade level peers, according to teacher estimates, i.e., they were receiving grades in the "B-C" to "A-B" range; students receiving "straight A's" or who were estimated to be functioning in the significantly above average range as compared to their classmates were not considered eligible for the study (Note: Attempts were made to obtain standardized achievement test scores for the NLD subjects from the previous academic year, however, this information was not available in the cumulative school records for some of the RAM subjects).

3. They exhibited normal language functioning as measured by the *Clinical Evaluation of Language Fundamentals-3* (CELF-3).

4. They exhibited normal intelligence as measured by the same nonverbal intelligence test utilized with the LLD subjects.

5. They exhibited no significant communication deficits in the areas of fluency, articulation or phonology.

The RAM subjects were selected from the pool of nondisabled Regular Education students at the respective schools in the following manner. Since diagnostic testing revealed that the LLD subjects as a group were exhibiting instructional reading grade levels ranging from mid-first grade through early third grade (with an approximate mean of 2nd grade), a group of Regular Education second graders appeared to offer the best potential match overall for the LLD subjects in the area of reading. Chronological ages

and language ages were not used in the matching equation for students in the RAM group, (i.e., RAM subjects were matched to TLD and NLD subjects on the basis of reading grade level only).

In order to solicit RAM subjects for the study, the PI placed a letter in the school mailboxes of the second grade Regular Education teachers at the respective schools, explaining the proposed research project and the need to collect data from nondisabled RAM peers for comparison purposes. The letter requested that teachers indicate if they were interested in participating, and if so, to submit the names of 3-5 potential subjects from their classroom who might be eligible and willing to participate in the study. Only one second grade teacher at Pittman Elementary indicated an interest in helping to locate potential RAM subjects and a willingness to allow her students to leave the classroom periodically to participate in the probes, therefore, all RAM subjects were solicited through this teacher's classroom.

After obtaining a list of potential RAM subjects from the second grade teacher, permission for those students to be screened and tested for eligibility and to participate in the study was requested from the parent/guardians and the students themselves via consent letter. If permission was granted, screening and diagnostic testing to determine eligibility was completed. Names of RAMs who were deemed eligible for the study were then placed on a master list,

and 5 names (plus several alternates) were selected at random and confirmed for participation in the study.

Informed Consent/Privacy/Confidentiality of Subjects

Permission for all subjects to participate in the study was obtained from parent/guardians and the students themselves via consent letter (see Appendixes D.1, D.2 and D.3 for Sample Consent Letters). Parent/guardians were given an opportunity to ask questions prior to, during, and upon completion of the study. Participation in the study was strictly voluntary, and parent/guardians were informed that they could withdraw their child from the study at any time. Subjects were also advised that they could withdraw from the study, with the approval of their parent/guardian. Parent/guardians were informed that sessions with their child would be videotaped/audiotaped, to allow for later in-depth analysis and inter-examiner reliability checks. Privacy and confidentiality of all subjects who participated in the study was strictly maintained. All student data collected for the study (e.g., copies of report card grades, health records, case history forms, diagnostic test forms, and baseline probe/treatment response forms) was maintained in a locked filing cabinet throughout the duration of the study; this filing cabinet could be accessed only by the PI and qualified school personnel, in accordance with established Louisiana state confidentiality guidelines for public school students. Parent/guardians were assured that no names would be used

should the data eventually be published, and that their child's confidentiality and privacy would be strictly protected. University protocols and procedures (IRB forms, etc.) for research involving human subjects were also followed.

Race/Ethnicity and Gender Profile of Subjects

During initial screening, every effort was made to obtain a representative sample of the population of the respective schools, including both males and females, as well as members from diverse racial/ethnic backgrounds as potential subjects. Race/ethnicity and gender profiles for the subjects included in the study are as follows (see Table 3.2).

Table 3.2

Race/Gender Profiles for Subjects

	GROUP					
	TLD	n	NLD	n	RAM	n	Total
Race/Gender							
Black Females		3		1		1	5
Black Males		1		1		0	2
White Females		0		2		3	5
White Males		1		1		1	3

Case History Information

Relevant medical and social history was obtained from school records for each child participating in the study, and academic history (including a record of pass/fails,

academic strengths/weaknesses, review of previous evaluations and documentation of any prior interventions) was obtained from school records, the child's classroom teacher and other related school personnel.

Examiners

The principal investigator (PI) was a doctoral student in Communication Disorders at Louisiana State University, and a licensed, ASHA certified SLP employed by Jefferson Parish Public Schools at the time the data collection portion of the study took place. The PI was subsequently employed by University of North Texas Department of Speech and Hearing Sciences during the data analysis portion of the study. Other examiners who evaluated data (for inter-examiner reliability checks) included two graduate students enrolled in the Department of Speech & Hearing Sciences at the University of North Texas.

Procedures

Prior to beginning the instructional/treatment phase of the study, a period of approximately 4-6 weeks was originally allocated for subject selection, administering the diagnostic test battery, obtaining baseline data via probes, and recording background/case history information on the subjects. A post-test/data analysis period lasting approximately 4 weeks was scheduled to follow a 9 week treatment phase (this 9 week period would coincide with one regular "grading period" at the school). However, once the initial subject selection and pre-test phase of the study

commenced, it became apparent that the original time frame would be insufficient for completing the necessary screening and diagnostic procedures to determine subject eligibility and measure baseline performance. Due to a variety of factors, (e.g., lengthy administration time for tests such as the CELF-3, scheduling constraints and restrictions as to when subjects could be removed from their classrooms for diagnostic testing, loss of approximately 14 days during the spring semester due to holidays, standardized achievement test week, field trips, student absences, etc.), the pre-test/diagnostic phase of the study actually took nine weeks to complete. Therefore, it was necessary to shorten the duration of the treatment phase to 4 weeks, followed by a one week post-test/probe period, in order to complete all phases of the study prior to the end of the school year.

Diagnostics

All subjects were administered the following diagnostic test battery at the beginning of the study, in order to assess overall language, reading, and cognitive abilities:

(a) *Clinical Evaluation of Language Fundamentals-3* (CELF-3) for ages 6 through 21 years. Comprehensive test of receptive and expressive language; this instrument yields composite scores, standard scores, percentile ranks, and age equivalents.

(b) *Basic Reading Inventory* (BRI) for grades Pre-Primer(i.e., Pre-Kindergarten) through grade 8. An informal oral reading inventory consisting of isolated word lists and a series of contextualized passages; yields estimates of subject's independent, instructional and frustrational reading grade levels, as well as measures of comprehension, reading speed and accuracy via miscue analysis.

(c) *Test of Nonverbal Intelligence-Second Edition* (TONI-2) for ages 5-0 through 85-11. A language free measure of intelligence, aptitude, and reasoning (requires no reading, writing, speaking or listening on the part of the subject); this instrument yields standard scores, percentile ranks, and chronological age equivalents.

(d) Informal Language Sampling

(Note: Subjects' diagnostic test scores are summarized in Appendix E.1)

Materials

Throughout the study, measurements of oral reading speed and accuracy, accuracy of responses to factual, interpretation and inference questions, and quality of oral narrative retellings were taken via a series of probes. Each probe involved having the subjects (a) read a story book aloud; (b) verbally answer questions about the story; and (c) retell the story in their own words. In selecting story books for the study, care was taken to avoid selecting books that would be too easy for the subjects (i.e., books they could already read easily and

independently), or too difficult (i. e., books they could not read without experiencing undue struggle or frustration, even with adult assistance). Books selected for pre/post-test probes and the treatment phase of the study were chosen to coincide with a level of difficulty commensurate with the subjects' current instructional reading grade level, as opposed to their independent or frustrational reading level. In other words, books selected were judged to be sufficiently challenging to the students, but at a level where they could still be read successfully by the child with adult assistance (scaffolding).

To simplify the book selection process, the Wright Group's *Sunshine Series* was used. The Wright Group is a well known publisher of books and materials for an integrated language arts curriculum consistent with whole language philosophy. The *Sunshine Series* Levels 1-11 includes books (fiction and nonfiction) at various levels for emergent readers (Level 1: Grades K-1; ages 5-6), early fluent readers (Levels 2-5: Grades 1-2; ages 6-7) and fluent readers (Levels 6-11: Grades 2-5; ages 7-10) as well as read-together big books and teacher guides. The PI determined the appropriate level(s) of books for the subjects based on results of the reading inventory (BRI) and teacher estimates of subjects' current reading levels.

There are approximately eight books at each level in the *Sunshine Series*. Each subject read five books from the

series during the study. Since the books in this series become progressively more difficult from one level to the next, (and books within the same level become slightly more difficulty when read in sequential order as well), books from the same level were presented in sequential order as listed in the Wright Group's catalog during the treatment phase of the study. For the pre-test probe, any book other than the first book at that particular level was used, and the treatment phase then started with Book 1 of that level and worked forward. In this manner, the book used during the pre-test probe was slightly more difficult than the one used in the first treatment probe, and books used during successive treatment probes and in the post-test probe were progressively more difficult as well.

Since diagnostic testing indicated that subjects exhibited instructional reading grade levels ranging from approximately first grade through early third grade, with a mean of approximately second grade, it was necessary to use two sets of books for the study; one set for the slightly "higher" level readers (i.e., those with instructional reading levels in the mid second through early third grade grade range), and one set for the slightly "lower" level readers (i.e., those with instructional levels in the Pre-Primer/Primer/first through second grade range). Subjects functioning in the "lower" range were assigned books from the Sunshine Level 1 Fiction, Set I, Group 1 books (for grades K-1, Ages 5-6, Emergent Readers). Subjects whose

instructional reading levels were in the slightly "higher" range were assigned books from Sunshine Series Level 4 Fiction, Group 1, Grades 1-2, Ages 6-7, Early Fluency. It was the PI's clinical impression that there was a slight "mismatch" between the instructional reading levels students evidenced on the BRI and the reading levels listed on the Sunshine books, and that it would be better to select books slightly lower than the instructional levels indicated by the BRI, to ensure that the books would not be at the students' frustrational level. Subsequent use of the books during the probes confirmed that these books were appropriate for the subjects, i.e., they met the previously stated criteria of being sufficiently challenging to the students, but at a level where they could be read successfully with adult assistance/scaffolding. Whether the slight "mismatch" occurred because the BRI slightly over-estimated the students' instructional reading levels or because the Wright Group's books are slightly more difficult than the grade level assigned to them remains unknown at this time. Determining instructional reading levels and assigning grade levels to books is by no means an exact science. However, it is interesting to note that with one exception (i.e., a TLD student operating in the Pre-Primer to Primer range according to the BRI, whose teacher estimated he was reading at the 1.5-2nd grade level), BRI results were consistent with teacher estimates of the subjects' instructional reading grade levels for all

14 of the remaining subjects (see Appendix E.2 for BRI estimates of subjects' independent, instructional and frustrational reading grade levels as compared to teacher estimates of instructional reading levels; see Table 3.3 for schedule and titles of *Sunshine* books used during probes and instructional phase of the study).

Table 3.3

***Sunshine* Books**

Books Used With "Lower" Level Readers

Level 1 Fiction, Set I, Group 1,

Grades K-1, Ages 5-6, Emergent Reader

Treatment/Probe	Title of Book
Probe 1 (no treatment)	Just This Once
Treatment Book 1	Boogywooga
Treatment Book 2/Probe 2	Letters for Mr. James
Treatment Book 3/Probe 3	Mishi-na
Probe 4 (no treatment)	Mom's Birthday

Books used with "Higher" Level Readers

Level 4 Fiction, Group 1, Grades 1-2,

Ages 6-7, Early Fluency

Treatment/Probe	Title of Book
Probe 1 (no treatment)	The Royal Baby-sitters
Treatment Book 1	Dragon With a Cold
Treatment Book 2/Probe 2	The Fantastic Washing Machine
Treatment Book 3/Probe 3	In the Middle of the Night
Probe 4 (no treatment)	Jim's Trumpet

Description of Probes

All three groups (TLD, NLD and RAM) participated in a pre-test probe (Probe 1) and a post-test probe (Probe 4) to obtain baseline data on their oral reading, narrative retelling, and question-answering abilities. No scaffolding or assistance was provided for any of the subjects during the pre and post-test probes. All three groups also participated in two intermittent probes administered after reading Books 2 and 3 during the treatment phase of the study. During these two intermittent probes, the NLD and RAM subjects (who received no treatment) were simply asked to read each story aloud, answer questions about the story and retell the story without assistance or scaffolding while measurements were taken, just as in the pre and post-test probes. The TLD subjects received CRS intervention while reading Treatment Books 2 and 3 over the course of several sessions (as they did with the other treatment books), however, they did not receive scaffolding or assistance during the actual administration of the probe, i.e., as they read the entire story one final time without assistance, answered questions about the story, and retold the narrative. Measurements taken during all of these probes were used to compare the performance of the three groups across the dependent variables. By having the NLD and RAM subjects participate in all of the probes, any gains noted in the performance of these subjects across time could be attributed solely to

their having had more practice with the story reading, question answering and story retelling format (since the control groups received this practice as part of the probes as well). All probes were videotaped (and audiotaped as backup) to check accuracy and establish reliability. All treatment sessions were videotaped/audiotaped as well for further analysis.

During the pre and post-test probes, each subject was asked to (a) read a book from the Wright Group's *Sunshine* Series aloud, without CRS or other scaffolding; (b) answer a series of factual, interpretation, and inference questions about the story; and (c) retell the story.

There were nine questions for each probe; three in each of the following categories: Factual (F); Interpretation (IP); and Inference (IF). Factual questions required the subject to recall literal, specific information stated explicitly or clearly depicted in the text. Factual questions included information about specific actions, characters, qualities, or events in the story. Interpretation questions were those for which the cues for interpretation were implied or suggested within the context of the story, but were not explicitly stated or observable. Correctly answering interpretation questions required some use of background knowledge. Inference questions also required the reader to "go beyond" what was stated explicitly in the text, however, the cues for making the inference were not necessarily present or implied in

the text. Inference questions required the highest level of constructive comprehension on the part of the reader, who had to carefully blend textual information with prior knowledge in order to make a plausible inference.

The examiner read the questions aloud to the subject. The order of the questions was randomized across subjects, and the sequence of steps (b) and (c) above was counterbalanced across subjects and probes to control for order effects (i. e., half of the time the subjects answered the questions before retelling the story, while the other half of the time they retold the story before answering the questions). Directions to the subjects during the probes were as follows:

"Here is a story that I would like you to read aloud. Take your time while reading. If you get stuck on a word, try your best to figure it out and then go on. After you read the story, I will ask you some questions, to see how well you understood the story. I will also ask you to tell the story back to me, to see how much of it you remember."

In the event that the subject miscued on a word and could not go on (characterized by a lapse of five seconds or more accompanied by obvious frustration or struggle behavior), the subject was advised to "Skip the word and go on." The examiner had a typed transcript of the story available for marking miscues during real-time (i. e., while the child was reading the story) which was later rechecked via videotape/audiotape analysis. Total time

needed to read the passage and number/type of miscues were recorded, using the Miscue Analysis System described in Appendix F.

The examiner also had a list of factual, interpretation, and inference questions available during administration of the probes with space for recording the child's response and accuracy of response to the questions. The questions for each story were generated by the PI, and a list of "potentially correct/most plausible responses" to the questions was generated for scoring purposes. The list of potentially correct/most plausible responses was created by the PI and the UNT graduate students who served as additional scorers; the PI and graduate students read each story and then generated a list of most plausible responses based on their understanding of the story. If it became apparent during subsequent scoring/analysis that a subject had generated another potentially correct/most plausible response not previously thought of by the PI or other two examiners, that response was accepted as correct and added to the overall list of correct/plausible responses for future scoring purposes.

Each question response received a score of 0 (inaccurate/incomplete/implausible response), 1 (partially correct/incomplete/plausible but not probable response) or 2 (accurate, complete, most plausible response). This scoring system was designed to be sensitive to the fact that questions often had more than one plausible answer,

however, some answers were more plausible (given contextual variables in the story) than others. Originally, the PI had planned to use the ordinal (0,1,2) rating scale for the Interpretation and Inference questions only, while using a nominal scale of (0,1) for the factual questions (since it was assumed that responses to Factual questions would either be correct or incorrect). Subsequent analysis of subjects' responses however, revealed that even the Factual questions had "gradations" of responses that could be considered accurate, incomplete, partially complete, plausible but not probable, etc., therefore, the ordinal scale was used with the Factual questions as well (see Appendix G for more details on Question Response Scoring System).

Each of the subjects' narrative retellings was transcribed and scored later, using the audiotaped and videotaped recordings. Originally, the PI had planned to use an ordinal scale of (1-5) to rate the narrative retellings, with 1 representing a Heap structure retelling (labeling and description of events with no central theme), and a 5 representing a True Narrative (a complete narrative containing at least five story grammar elements). During the course of the study, it became apparent that the original narrative scoring system might not be sensitive enough to reflect subtle differences in narrative macrostructure, presence of markers for temporality and causality, cohesion, as well as presence of more

sophisticated stylistic devices sometimes present in more complex narratives. The original scoring system also failed to penalize the subject for stating incorrect/erroneous information in the narrative or for adding episodes not present in the original story. Therefore, the PI replaced the original scoring system with a more descriptive narrative scoring instrument (adapted from Koskinen, Gambrell, & Kapinus, 1993; Fox & Wright, 1997). All narratives were assigned a quantitative score based on the presence or absence of certain qualitative, obligatory features of the narrative such as (a) adherence to story grammar constituents (i.e., description of setting, characters, clear beginning and ending); (b) presence of major plot episodes (i.e., statement of problem, plans/attempts to solve problem and consequences/resolution), and c) coherence (i.e., evidence of temporality and causality, correct use of relational and transitional terms, etc.). Each obligatory feature received a score of 0 (no evidence of that feature present in the narrative), 1 (meager to fair evidence of that feature in the narrative) or 2 (strong evidence of that feature in the narrative). Narratives received additional points for presence of certain optional features known to occur in more complex narratives such as use of stylistic devices (i.e., "Once upon a time..." or "The end.") as well as metalinguistic statements concerning personal, world or social significance of the story (i.e., statement of a

"moral" or "lesson learned"). One point was subtracted from the Total Narrative Score for presence of incorrect/erroneous information in the narrative, and/or addition of episodes or information not present in the original story. Each narrative could receive a maximum of 20 points if all obligatory features were present, with a grand total of 22 points possible if optional features were also present (see Appendix H for Narrative Scoring Criteria).

Instructional/Treatment Phase

This project was designed to measure the effects of an independent variable (treatment with CRS versus no treatment) on several dependent variables. Dependent variables which were measured before, during, and after treatment included (a) the number and type of reading miscues exhibited during story reading; (b) the ratio of correct to incorrect responses and overall quality of responses to factual, interpretation, and inference questions about the stories; and (c) the quality of the narratives produced by the subjects subsequent to oral story reading.

Subjects in the TLD group were seen for treatment sessions individually in a quiet room three times per week for sessions lasting approximately 30 minutes for a period of approximately 4 weeks, with probes/measurements taken following completion of the stories as previously

described. Directions to the TLD subjects at the beginning of the treatment phase of the study were as follows:

"During the next few weeks, we will be working together to improve your reading skills, your ability to answer questions about stories, and your ability to retell stories after you have read them. We will be using different methods to help you work on these areas. I will be videotaping our sessions together, so that I can go back and watch the tapes later, in order to make careful notes about what we did. I know that you will work hard and always do your best."

The TLD subjects read approximately one story book per week (several pages per session) throughout the treatment phase of the study. At the beginning of each new story, the TLD subjects were given the following directions:

"We are going to start a new story today. I would like you to read the story aloud, but while you are reading, we are also going to talk about the story. Our conversation about the story will help you understand more about what you are reading. We will only read a few pages each day. At the end of some sessions, I will ask you a series of questions to see how well you understood what you read. I will also ask you to retell the story to me, to see how much you remember."

During treatment sessions, the PI provided scaffolding through use of CRS as needed for each individual TLD subject. An important scaffolding technique utilized with

all of the TLD subjects included the use of a graphic organizer or story map (See Appendix I) during the treatment sessions. Subjects completed a story map for each book read during the treatment phase of the study. Subjects added to the story map at the end of each treatment session by summarizing and writing information covered in the pages read that day under the appropriate category (e.g., title, characters, initiating event, problem, attempt, etc.). Subjects then orally reviewed what had happened previously in the story by referring to the story map at the beginning of the next treatment session, read several new pages of the book with scaffolding, added to the story map, and so on until the book was completed. The PI informally recorded subjects' miscues and items that required scaffolding on a separate sheet of paper during treatment sessions, so that those concepts could be reviewed and re-scaffolded as needed during subsequent sessions. After the subjects finished reading the story with scaffolding, they were asked to review their completed story maps before reading the story once more without scaffolding to obtain data for the probes. Subjects were then asked to provide a narrative retelling in response to the query:

"Can you retell the whole story for me, in your own words?"

To elicit responses to the series of factual, interpretation, and inference questions about the story subsequent to the readings, subjects were instructed:

"Now I am going to ask you some questions about the story, to see what you remember. Answer each question as completely and as accurately as you can."

Reliability

Two graduate students from the University of North Texas Department of Speech and Hearing Sciences independently rescored 10% of the data (i.e., six of the oral reading transcripts, six sets of responses to questions, and six narrative retellings), in order to determine reliability of the scores assigned by the PI. Examiners were trained on a set of question responses, narratives, and oral reading transcripts from one of the probes until 90-100% agreement was reached, prior to being allowed to score additional samples of the data independently. This initial training period lasted approximately 2 1/2 hours.

Point-to-point percentage of agreement was calculated for the number of oral reading miscues agreed upon, the number of question response scores agreed upon, and the number of obligatory and optional narrative feature scores agreed upon. Analysis revealed the following average inter-examiner percentages of agreement: oral reading miscues 88.9%; question responses 88%; and narratives 85.7%. It is interesting to note that when disagreements

did occur on the oral reading miscue analyses, they generally occurred on Fluency Related Miscues rather than Accuracy Related Miscues. Given the more objective nature of Accuracy Related Miscues (e.g., words omitted, added, substituted, etc.) compared to the rather subjective nature of Fluency Related Miscues (e.g., the listener's perception of length of time which constitutes a pause, the prosodic features of pitch and rate which contribute to a listener's perception of word-by-word reading, etc.), this finding was not unexpected.

RESULTS

There were some discrepancies in the data that were due to the different reading grade levels of the subjects, which necessitated the use of two different levels of books. As previously noted, LLD subjects were randomly assigned to the TLD and NLD groups. As a result of the random selection, there was not an exact match between these two groups in terms of level of reading ability. Although all of the subjects in these two groups were reading below grade level expectancies, the TLD group consisted of two "higher" level readers (i.e. those with instructional reading grade levels between mid second through early third grade) and three "lower" level readers (i.e. those with instructional reading grade levels between first and mid-second grade), while the NLD group consisted of four "higher" level readers and two "lower" level readers. Therefore, NLD group members as a whole were overall better readers than the TLD group from the start, and they read higher level books throughout the study accordingly. The RAM controls consisted of two "higher" level readers and three "lower" level readers; technically a closer match to the TLDs but still not an exact match for the NLD group in terms of reading ability. In retrospect, it might have been better to dispense with random selection in order to match the groups more exactly in terms of reading ability, perhaps in a manner as follows, thus making it easier to compare performance across groups:

TLDs 3 Higher readers; 2 Lower readers (or vice versa)

NLDs 3 Higher readers; 2 Lower readers (or vice versa)

RAMs 3 Higher readers; 2 Lower readers (or vice versa)

It is also likely that sampling from a larger number of schools would make it easier to find sufficient numbers of LLD subjects to allow for more exact matching in terms of reading ability; the heterogeneity in ability of students within any one or two Special Education classrooms makes finding such exact matches more problematic (as was the case in this study).

In addition to the problem of exact matching, there was also a discrepancy in the data related to the book used for Probe 3 for the lower level reading subjects across all three groups. This story (entitled *Mishi-na*) proved to be unusually difficult for the lower reading subjects, in comparison to the other books from the same level that were used during the study. This discrepancy resulted in a noticeable drop in scores for the lower level TLDs on Probe 3, rather than an increase in scores as would be expected. Likewise, the lower level subjects in the NLD and RAM groups also exhibited a drop in scores on Probe 3, rather than performing about the same as on the other probes as would be expected. That this discrepancy was due to problems with the complexity and/or content of the story

itself and not some other variable(s) was substantiated by the fact that the higher level subjects in all three groups did not show this pattern, presumably because they were reading a different book. Rather than exhibiting a drop in scores, the higher level TLD subjects showed gains on Probe 3 as expected, whereas the higher level NLDs and RAMs stayed about the same or only improved slightly, as expected. Furthermore, the scores for the lower level subjects rebounded to some extent on Probe 4, again providing support for the claim that it was the difficulty of the book *Mishi-na* that resulted in the lowered scores for the lower level subjects on Probe 3. Detailed semantic and syntactic analysis of the text of *Mishi-na*, as well as careful examination of the story's content and concepts revealed a variety of reasons why this book was so difficult for the lower level readers. First, the story contains a cultural component that appeared to be unfamiliar and confusing to the subjects (i.e., the story setting is presumably an Asian country, although this is never explicitly stated in the book). The story also contains culturally unfamiliar character names (e.g., the chicken in the story is named "Mishi-na"), and the story macrostructure is heavily dependent on the reader's presumed background knowledge about seasons of the year (knowledge that the lower level subjects did not appear to have or were unable to activate successfully). As a result of the discrepancies in scores related this story, data

from Probe 3 were not subjected to further statistical analysis. Instead, analyses were performed on Probes 1, 2 and 4, with Probes 1 and 4 serving as the pre and post-treatment measures, and Probe 2 serving as the treatment measure. In future studies of a similar nature, it is recommended that extra consideration be given to subjects' probable familiarity with cultural concepts depicted in each story, as well as familiarity with other background concepts critical to understanding the story's macrostructure. A book that contains culturally unfamiliar concepts or one that differs markedly from the other stories in the series in terms of content/complexity should be discarded, even if that book is the "next one" in the sequential order of the particular series or otherwise meets readability criteria.

Despite the problems concerning exact matching and the discrepancies encountered in Probe 3, comparison of performance across the three groups for Probes 1, 2 and 4 did reveal findings which were both clinically and statistically significant, across all three dependent variables.

Oral Reading Miscues

Since group averaging can sometimes obscure important findings, subjects were compared both individually and across groups, in order to search for patterns or trends in the data. The first analysis involved calculating the

total number of miscues exhibited by the subjects for each story and comparing performance across the probes.

TLD Group

All 5 TLD subjects demonstrated a marked reduction in the number of miscues (depicted as a ratio of number of miscues to number of syllables in the text) on the first treatment probe (Probe 2). Four out of the five TLDs exhibited a subsequent "rebound" in number of miscues when treatment was withdrawn on Probe 4 (see Figure 4.1),i.e., a typical ABA-type profile. Only one subject (TLD5) showed a very slight decrease in number of miscues when treatment was withdrawn. This slight decrease may have marked the beginning of carryover of skills acquired during treatment for that subject. Interestingly, TLD5 was one of the higher level readers in the TLD group. Perhaps being a better reader to begin with was related to this subject's seemingly quicker carryover of skills when treatment was withdrawn.

In order to provide additional evidence that treatment resulted in a noticeable reduction in number of miscues, data from one of the treatment sessions occurring between Probes 1 and 2 were analyzed as well. The ratio of miscues (i.e., number of miscues divided by number of syllables in the text) was calculated for the last treatment session for Treatment Book 2, prior to Probe 2 (see Figure 4.2) for each TLD subject. This last treatment session occurred after each TLD subject had read all but the last few pages

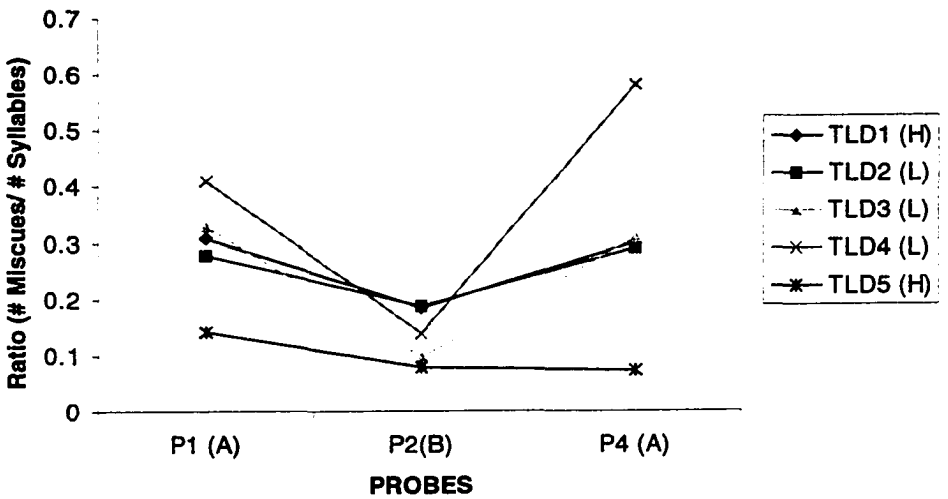


Figure 4.1 TLD Total Miscues Across Probes 1,2 4

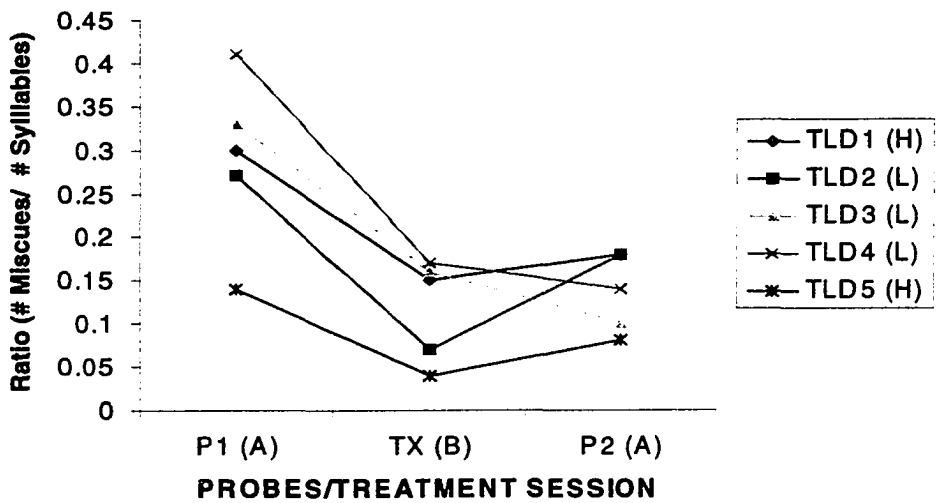


Figure 4.2 TLDs Miscues, P1, TX, P2

of the story with scaffolding during previous sessions. During this last treatment session before Probe 2, subjects reviewed their story maps orally with scaffolding, and then read the entire story (including previously read pages plus the remaining new pages) with scaffolding. Number and type of miscues were recorded in the same manner as during probes. Results again revealed a marked reduction in number of miscues during the treatment session in comparison to Probe 1 for all five TLD subjects. Three out of the five TLD subjects exhibited an ABA-type profile (i.e., a subsequent rebound or increase in number of miscues when treatment was removed for Probe 2). Two of the subjects (TLD3 and TLD4) continued to show a slight decrease in number of miscues even when treatment was removed for Probe 2. Again, this pattern may have reflected the beginning of carryover of skills and strategies from one session to the next for those two subjects. Interestingly, these two subjects were the two lowest level readers in terms of grade level equivalency in the TLD group at the beginning of the study. This finding suggests that lower level readers may be particularly responsive to scaffolded interaction as a means of increasing their oral reading accuracy, especially during the early stages of treatment.

NLD Group

Four out of the five NLD subjects exhibited relatively flat profiles across Probes 1,2, and 4 as expected, i.e.,

relatively little variation in number of miscues across time (see Figure 4.3). Only one subject (NLD2) exhibited a different profile; this subject exhibited a marked increase in number of miscues for Probe 2, with a marked decrease in number of miscues for Probe 4. This profile may reflect individual subject variation or changes in day-to-day performance (perhaps related to motivational and/or attentional factors as well).

RAM Group

Interestingly, the RAMs displayed considerable variation in profiles across Probes 1, 2 and 4, despite the fact that they were not involved in treatment (see Figure 4.4). RAM1 displayed a flat profile between Probes 1 and 2 (i.e., little variation in number of miscues), with an increase in number of miscues on Probe 4. RAM2 exhibited a decrease in number of miscues from Probe 1 to Probe 2 with a flat profile between Probes 2 and 4. RAM3 exhibited a slight increase in number of miscues from Probe 1 to Probe 2, with a noticeable decrease in number of miscues on Probe 4. RAM4 exhibited a decrease in number of miscues from Probe 1 to Probe 2, with an increase in number of miscues for Probe 4. RAM5 exhibited a steady increase in number of miscues across Probes 2 and 4. The variability in these patterns across subjects in the RAM group may be attributed to multiple factors including individual variation in subjects' reading level and abilities, differences in use of decoding and processing strategies, variations in

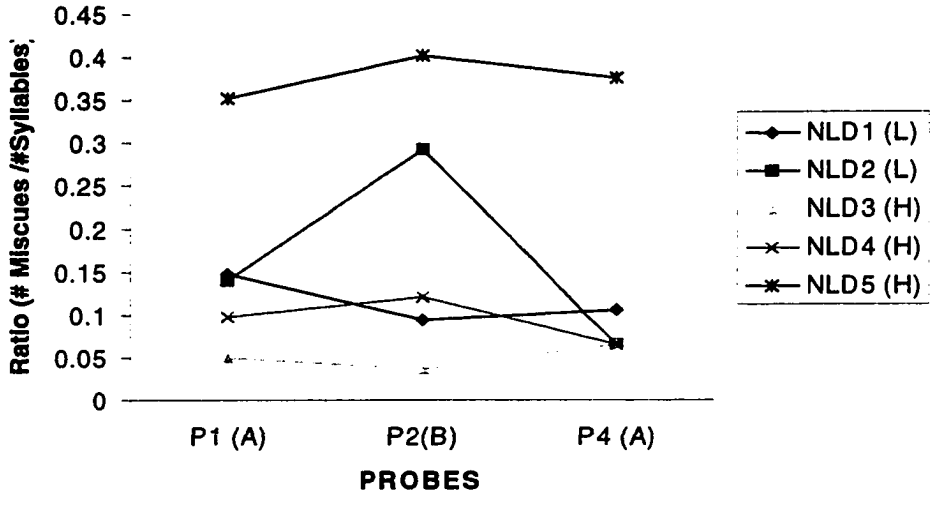


Figure 4.3 NLDs Total Miscues Across Probes 1,2,4

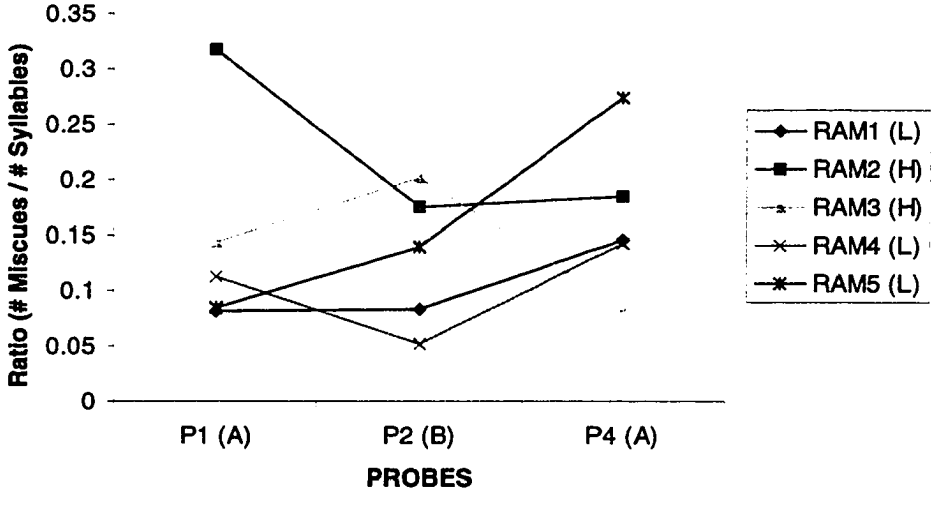


Figure 4.4 RAMs Total Miscues Across Probes 1,2,4

content and complexity of the texts, varying amounts of background knowledge available on concepts encountered in the stories, etc. What is interesting is that the RAMs as a group did not exhibit the relatively consistent profiles displayed by the majority of members in the TLD and NLD groups. This suggests that normal readers may be more heterogeneous than poor readers across multiple variables. This is not an altogether unexpected finding, given previously stated evidence which suggests that normal readers are more flexible, strategic readers, capable of employing multiple decoding and processing strategies when encountering texts. Additionally, normal readers may also have larger available stores of background knowledge to draw upon than their reading-disabled peers. Perhaps the differing profiles exhibited by the RAM subjects are evidence of the greater heterogeneity and flexibility in this population, both in terms of the strategies they are able to employ when encountering texts and the amount of background knowledge they bring to the task. Although caution must be used in interpreting the data in this manner based on such a small sample of subjects, these interpretations are consistent with hypotheses previously posed in the literature, and are deserving of further exploration in future studies.

Analysis of Miscues by Type

In addition to calculating total number of miscues, an analysis was made of the types of miscues made by subjects

across probes (specifically, the ratio of accuracy related miscues or ARMs to frequency related miscues or FRMs).

TLD Group

First of all, there were were some notable consistencies across members of the TLD group in terms of type and number of miscues. Three out of the five TLDs (TLD2, TLD3, and TLD4) displayed a significantly higher proportion of ARMs at the time the study commenced (see Appendixes J.1 through J.5 for individual TLD subject profiles of ratio of ARMs to FRMs). These three TLD subjects were also the three lowest level readers in the TLD group. The remaining two TLDs (TLD1 and TLD5) displayed more FRMs than ARMs at the time the study commenced, although the ratio between the two types was nearly balanced (e. g., TLD 1 displayed 44.6% ARMS and 55.4% FRMS on Probe 1, while TLD5 exhibited 42.9% ARMs and 57.1% FRMs on Probe 1. Interestingly, TLD1 and TLD5 were the two highest level readers in the TLD group, suggesting that this pattern of more FRMS than ARMs, with the two types of miscues being almost in balance may be correlated with higher level reading abilities (this will be discussed in more detail when examining the RAM groups' findings). Another striking feature of the profiles was that four out of the five TLD subjects exhibited an interesting "trade-off" in the type of miscues exhibited with treatment. Three of these four subjects (again, the lower level readers; TLD2, TLD3, and TLD4) showed a marked decrease in

the number of ARMS (i.e., miscues that compromise meaning) with a simultaneous increase in the number of FRMs (i.e., miscues that preserve meaning) from Probe 1 to Probe 2. In other words, these three TLD subjects changed in the direction of producing more meaning-preserving miscues as opposed to meaning-altering miscues with treatment. For two of these subjects (TLD2 and TLD3), there was an almost complete reversal in ratio of ARMs to FRMs from Probe 1 to Probe 2. TLD2 and TLD3 initially had between 60-70% ARMs and 30-40% FRMs on Probe 1; this ratio was completely reversed on Probe 2, with the subjects exhibiting approximately 60-70% FRMs and 30-40% ARMs. Subject TLD4 (like TLD2 and TLD3) also exhibited between 60-70% ARMS and 30%-40% FRMS on Probe 1, but the percentages did not completely reverse on Probe 2. Rather, TLD4 demonstrated a balancing of the two types of miscues on Probe 2, with both ARMs and FRMs approaching 50%. Like TLD2, TLD3, and TLD4, TLD5 also showed a "trade-off" in types of miscues with treatment, but in the opposite direction of the other three subjects. This subject (who initially exhibited more FRMs than ARMs on Probe 1) showed a decrease in FRMs with a subsequent rise in ARMs on Probe 2. Similar to the balancing pattern exhibited by TLD4, TLD5 also demonstrated a balancing of miscue types on Probe 2, with both ARMs and FRMs approaching 50%. Overall, these tradeoffs in miscue types with treatment, along with the trend towards balancing of miscue types for some of the subjects suggests

changes in processing and decoding strategies as a result of treatment. Perhaps, the tradeoffs and trend toward balancing of miscue types is an indicator of balancing of strategies in the reader (i.e., evidence that the subject is becoming a more balanced, strategic reader).

It is also interesting to examine what happened to the ratio of ARMs to FRMs when treatment was withdrawn for the four TLDs who exhibited trade-offs in miscue type with treatment. TLD2 and TLD4 (i.e., the subjects who exhibited an almost complete reversal in ratio of ARMs to FRMs on Probe 2) also seemed to show a trend towards a balancing of miscue types on Probe 4, even though treatment had been withdrawn. This pattern of balancing was similar to that exhibited by TLD4 on Probe 2. Indeed, the proportion of ARMS and FRMs for TLD3 did reach approximately 50% on Probe 4, while TLD2 merely showed a shift towards 50% ARMs and FRMs on Probe 4. Perhaps this pattern reflected the beginnings of carryover of skills acquired during treatment for those two subjects. In contrast, TLD4 and TLD5 showed more of an ABA-type pattern across probes, i.e., although their miscue types approached balance on Probe 2, the ratios returned to previous levels on Probe 4 when treatment was withdrawn (in fact, TLD5 exhibited more ARMs and fewer FRMs on Probe 4 than on Probe 1, possibly due to the increased difficulty of the Probe 4 book for that particular subject). Finally, in contrast to the other four TLDs, TLD1 exhibited a completely different profile

altogether. This subject (who initially exhibited more FRMs than ARMs) displayed a relatively flat profile across probes, with only a very small increase in ARMS and a slight decrease in FRMs across time. It is important to note that TLD1 did display a reduction in number of total miscues (regardless of type) with treatment and a rebound in total number of miscues when treatment was withdrawn (i.e., an ABA-type profile); the subject simply did not show a variation in proportion of miscue types over time. It is interesting to note again that TLD1 was initially one of the highest level readers in the TLD group; this factor will become relevant in the subsequent discussion of the analysis of miscues by type for the RAM subjects, whose profile TLD1's very much resembled.

NLD Group

In comparison to the TLD group (three of whom exhibited more ARMs than FRMS prior to treatment), four out of the five NLD subjects initially exhibited more FRMs than ARMs (see Appendixes K.1 through K.5 for individual NLD subject profiles for proportion of ARMs to FRMS). Since four out of the five NLDs were also higher level readers (compared to the TLD group which had only two higher level readers), this finding may be significant. It would appear that a higher ratio of FRMs to ARMs may be a characteristic of higher level readers. This interpretation of the data will be further substantiated when discussing results from the RAM group.

Although four of the NLDs displayed relatively stable patterns in ratio of ARMs to FRMs over time in comparison to the TLD group, there were some slight variations in performance. Despite not being involved in treatment, NLD2 showed a balancing trend over time, (i.e., percentage of FRMs steadily decreased while percentange of ARMs steadily increased, such that both approached approximately 50% on Probe 4). This trend may have reflected the subject's increased familiarity with the task over time, resulting in improved performance in the form of balancing of miscue types. NLD4 also exhibited a balancing trend between Probes 1 and 2, with little variation in performance across Probes 2 and 4. NLD5 exhibited relatively stable performance across probes, with only a slight decrease in percentage of ARMs accompanied by slight increases in percentage of FRMs over time. NLD3 displayed stable performance from Probe 1 to Probe 2, with only a slight increase in the number of FRMs and a decrease in the number of ARMs exhibited on Probe 4. Only NLD1 displayed what may be described as an atypical pattern for this group. This subject displayed the kind of trade-off between ARMs and FRMs on Probe 2 similar to that exhibited by some of the TLD subjects; this trend was completely reversed again on Probe 4. Individual subject variation, day-to-day differences in attention, motivation, and performance, difficulty level of the books, differences in amount of background knowledge about concepts in the stories, or any

number of other variables may account for some of these differences across NLD group members.

RAM Group

Perhaps the most significant (although again, not unexpected) finding in the RAM group's performance was that with the exception of RAM4, all four remaining RAM subjects exhibited significantly more FRMs than ARMs at the time the study commenced, and this pattern remained relatively stable over time (see Appendixes L.1 through L.5 for individual RAM subject profiles). RAM2 and RAM5 did show a slight trend in the direction of balancing of miscue types on Probe 4; perhaps increasing familiarity with the task had something to do with this trend in these two subjects (i.e., as they became more familiar with the task, the task became easier, with resulting slight decreases in ARMs and slight increases in FRMs for those two subjects).

These overall findings with respect to proportion of ARMs to FRMS across groups would seem to support previous data in the literature stating that LLD/poor readers generally produce more meaning-altering miscues, whereas normal or higher level readers produce fewer meaning-altering miscues. It was previously mentioned that TLD1 exhibited a profile in some ways similar to that of the majority of RAM and NLD subjects (i.e., more FRMs than ARMS, at the time the study commenced, with relatively little change in proportion of miscue types over time). Given that TLD1 was one of the highest level readers in the

TLD group to begin with, it is possible that this pattern is characteristic of normal or near-normal readers in general, and by exhibiting this profile, TLD1 was showing evidence of being less impaired and more like a normal reader than the other subjects in the TLD group.

Response to Questions and Narrative Retellings

Subjects' comprehension of stories was measured by analyzying their responses to a series of questions and narrative retellings. Since both of these dependent measures were used to assess comprehension, the findings will be discussed concurrently.

TLD Group

All five TLD subjects showed a noticeable increase in accuracy of response to questions with treatment (see Figure 4.5). Four out of the five TLDs showed an ABA-type pattern (i. e., accuracy of response to questions decreased when treatment was removed on Probe 4). TLD5 (one of the higher level readers in the group) maintained gains on Probe 4 for questions even when treatment was removed, again suggesting possible carryover of skills acquired during treatment for that subject.

Four out of the five TLDs also exhibited improvement on the narrative retelling score with treatment (see Figure 4.6). TLD2 maintained the same narrative score on Probe 2 as on Probe 1. Only two of the TLDs (again, the two lowest readers, TLD3 and TLD4) exhibited an ABA-type pattern on the narratives as well as on the questions (i.e., a

reduction in question and narrative scores when treatment was removed). This finding is in contrast with the results of the miscue analysis for TLD3 and TLD4; as previously noted, they were the only two subjects in the TLD group to show continuing gains in oral reading accuracy even when treatment was removed. Perhaps these findings suggest that the lowest level readers respond more dramatically and more quickly to scaffolding in terms of improving their oral reading accuracy, however, they may need a longer treatment interval before mastery and generalization of newly acquired question answering and narrative retelling abilities can be expected. Put another way, it would appear that despite their improving oral reading accuracy (as indicated by declining number or miscues), these lower level readers were still having difficulty processing and understanding some of what they read. Perhaps future studies employing a longer treatment cycle would confirm these speculations.

Of the remaining three TLD subjects, TLD1 (a higher level reader to begin with) maintained the same narrative score across Probes 2 and 4. TLD5 (the other higher level reader in the group) showed a very slight increase in narrative score on Probe 4, again suggesting the beginnings of possible maintenance and carryover of skills acquired during treatment. Finally, TLD2 (a lower level reader) showed a marked reduction in narrative score on Probe 4,

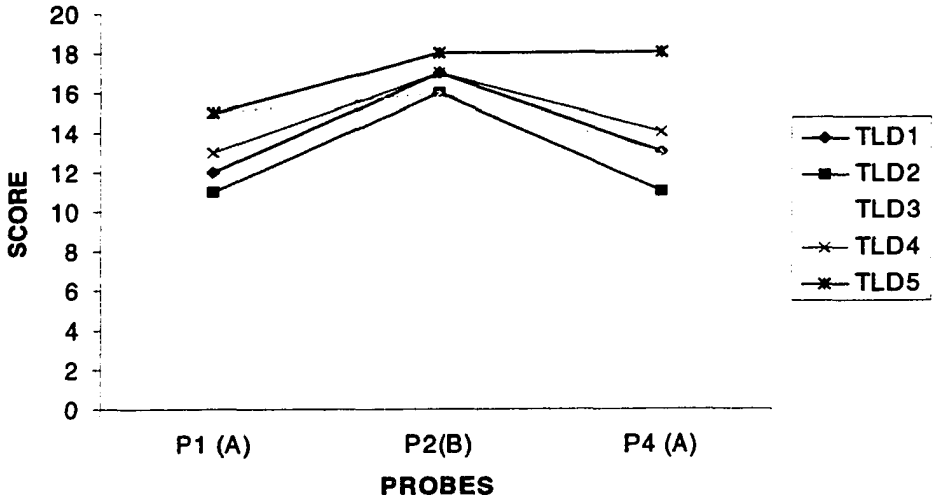


Figure 4.5 TLD Questions

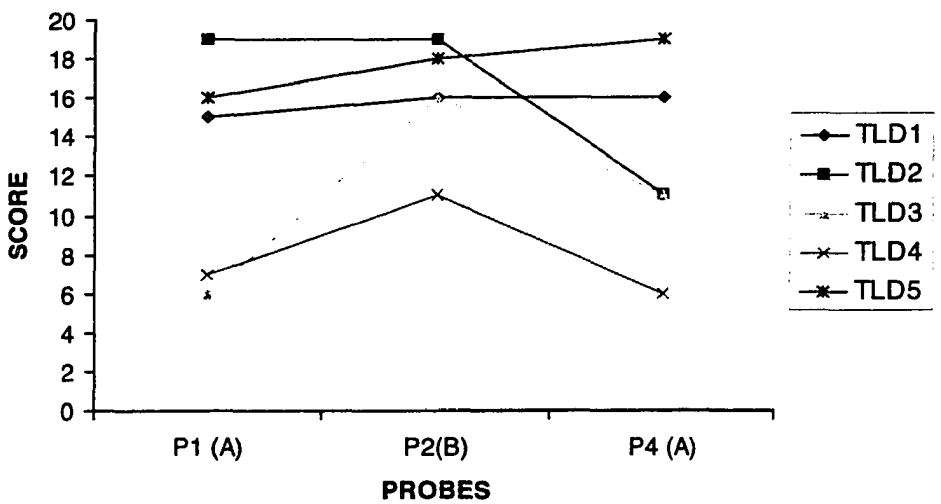


Figure 4.6 TLD Narratives

despite having maintained the same score on Probes 1 and 2 (perhaps this was related to the increasing difficulty level of the Probe 4 book for that subject).

NLD Group

Another interesting finding was that despite not having been involved in treatment, all five members of the NLD group performed slightly higher on the questions for Probe 2 than on Probe 1, and three of the five (NLD1, NLD2 and NLD3) scored higher on the narratives for Probe 2 as well (see Figures 4.7 and 4.8). The remaining two (NLD4 and NLD5) maintained essentially the same score on the narratives from Probe 1 to Probe 2 as expected. These findings may be interpreted in one of two ways; either increased familiarity with the task resulted in higher scores on Probe 2 for all five subjects on the questions and three out of five subjects for the narratives, or the tasks of answering questions and retelling stories in and of themselves constitute a form of treatment (an idea previously suggested and supported in the literature).

Finally, in comparing the performance of the NLD subjects from Probe 2 to Probe 4, three out of the five (NLD1, NLD2 and NLD5) exhibited a reduction in accuracy of response to questions on Probe 4. Perhaps the increasing level of difficulty of the Probe 4 book and/or differences in the difficulty level of the questions asked for Probe 4 in comparison to previous probes may account for these findings. The remaining two NLD subjects (NLD3 and NLD4)

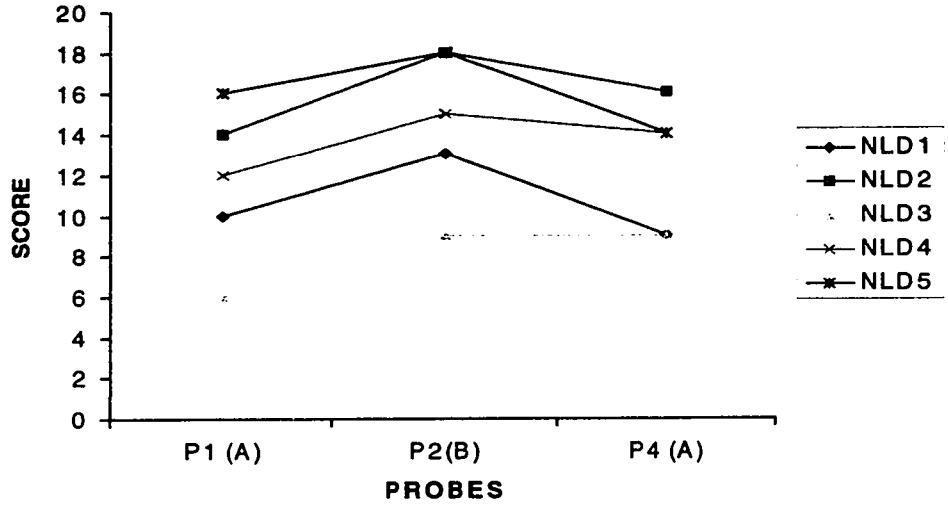


Figure 4.7 NLD Questions

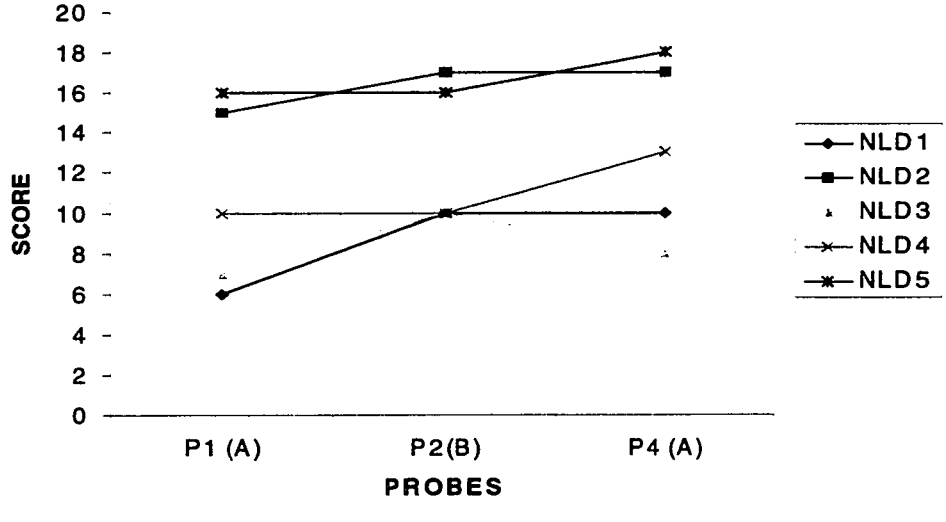


Figure 4.8 NLD Narratives

exhibited essentially the same degree of accuracy of response to questions on Probe 4 as on Probe 2. The patterns of performance were slightly different for the narratives. Two of the subjects (NLD1 and NLD2) maintained the same level of performance on the narratives from Probe 2 to Probe 4; one subject (NLD3) showed a slight reduction in performance on the Probe 4 narrative, and two subjects (NLD4 and NLD5 showed slightly improved performance on the Probe 4 narrative. Again, these variations may be attributed to a combination of factors including differing reading levels of the subjects and amount of relevant background knowledge available to them for making sense of each story, individual subject variation and changes in day-to-day performance (perhaps related to motivational and attentional factors), and changing difficulty level of the books used in the probes, etc.

RAM Group

In terms of performance on questions across probes, the RAM subjects exhibited a variety of profiles (see Figure 4.9). Two of the RAMS subjects (RAM4 and RAM5) showed little variation in performance on the questions across probes. RAM3 showed improvement on Probe 2, which was maintained on Probe 4. RAM2 showed a slight decrease in performance on Probe 2, with rebound in performance on Probe 4, while RAM1 displayed steadily decreasing performance on questions across probes.

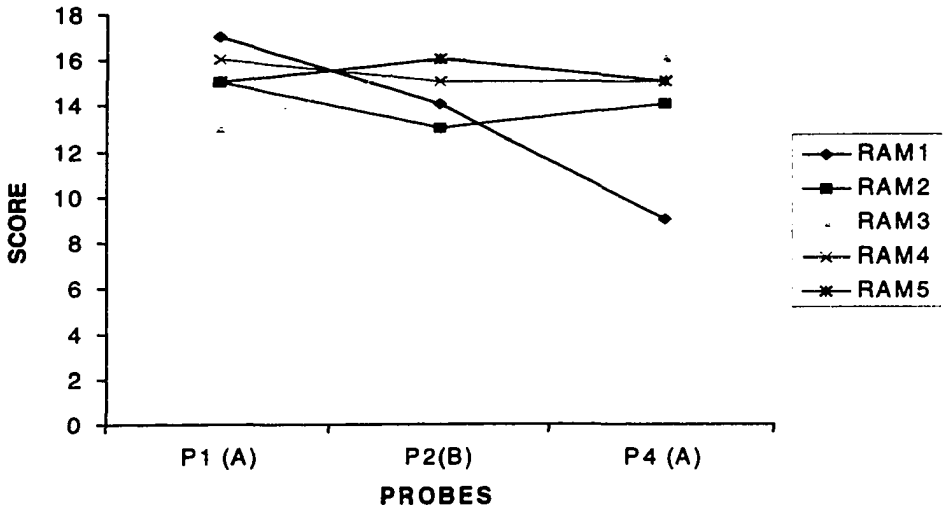


Figure 4.9 RAM Questions

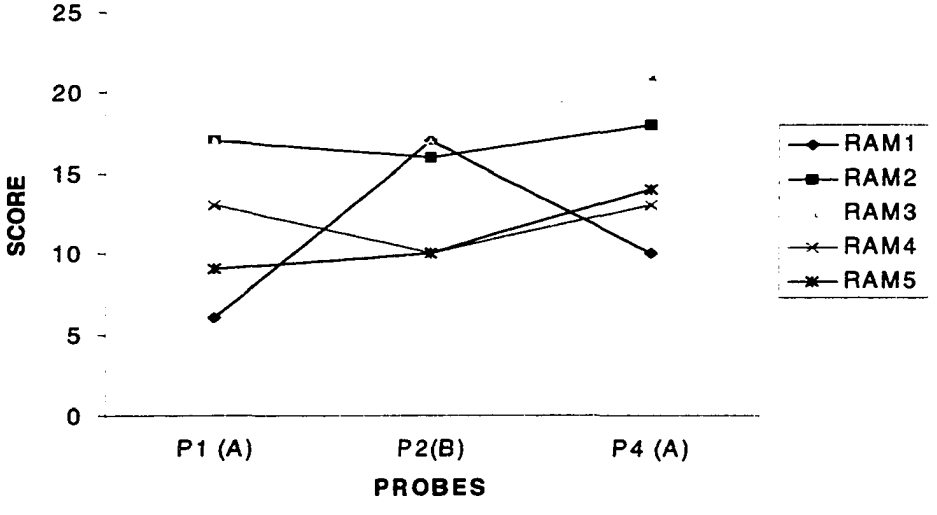


Figure 4.10 RAM Narratives

On the narratives, RAM1 exhibited a marked improvement on Probe 2, with a noticeable decrease in performance on Probe 4 (see Figure 4.10). RAM2 and RAM4 both exhibited slight decreases in performance on Probe 2, with a rebound in performance on Probe 4. RAM3 exhibited stable performance on narratives across Probes 1 and 2, with improved performance on Probe 4. RAM5 exhibited steadily improving performance on narratives across all three probes. Once again, these differences in performance were likely the result of individual subject variation across multiple variables. It does seem significant that the RAM subjects as a group again displayed more individual variation in performance on questions and narratives than the TLD and NLD groups (just as they did on oral reading miscues).

This trend would seem to support the premise that normal readers are more flexible and have a variety of strategies at their disposal for decoding and processing texts, and that the strategies they employ may vary according to several factors, including perhaps, difficulty level of the book and amount of background knowledge the reader has available relevant to the content of the book.

Comparison of Subjects' Performance Across Dependent Variables

The remaining analysis involved the comparison of each subject's individual performance across all three dependent

variables. Specifically, attempts were made to determine the relationship (if any) between oral reading accuracy (i.e., percentage of miscues) and comprehension (i.e., performance on the questions and narratives) for each subject.

Based on perusal of the data and the PI and independent raters' subjective impressions of what scores constituted fluent reading and adequate comprehension, certain categorizing and scoring criteria were established for comparing subjects' performance across the dependent variables. Subjects who displayed fewer than 20 percent total miscues (percentage based on the ratio of number of miscues to number of syllables) on the pre-treatment Probe 1 book were classified as fluent readers, while those who exhibited more than 20 percent total miscues were classified as nonfluent readers. As previously noted, the maximum score obtainable on the set of comprehension questions was 18, and the maximum score obtainable on the narratives for obligatory features was 20. Subjects who achieved a score of 15 or higher on either the questions, the narratives, or both on the pre-treatment Probe 1 book were considered to have fair-to-good comprehension, while those who scored below 15 on the questions, the narrative, or both were considered to have poor comprehension. Subjects' miscue percentages and scores on the questions and narratives for Probe 1 were then used to complete a

profile comparing fluency (i.e. oral reading accuracy) with comprehension for each subject (see Table 4.1).

The disabled readers (TLD and NLD subjects) were analyzed as a group and compared with the normal readers (RAM subjects). The following profiles emerged. Three of the disabled readers were classified as fluent readers with fair to good comprehension; three were classified as fluent readers with poor comprehension; and three were classified as nonfluent readers with fair to good comprehension. Only one subject (TLD5, who was the lowest level reader in the entire sample) was classified as a nonfluent reader with poor comprehension.

The same categorizing criteria were used to prepare a profile of the RAM subjects (see Table 4.1). Four out of the five RAM subjects were fluent readers with fair to good comprehension; the remaining RAM subject (RAM2) was a nonfluent reader with fair to good comprehension.

The implications from these profiles are as follows. First, based on the presumed relationship between the ability to decode text and the ability to process meaning, it would be easy to assume that fluency and comprehension go "hand-in hand" to some extent (i.e., that a reader who is fluent is likely to be successful at comprehending, and a reader who exhibits good comprehension is likely to be a fluent reader as well). This assumption appears to have some validity for normal readers, as supported by the results for the majority of the RAM subjects.

Table 4.1 Comparison of Fluency and Comprehension

		Fluency		Comprehension	
		Fluent	Nonfluent	Fair to Good	Poor
Subjects					
TLD	1		X	X	
	2		X	X	
	3	X		X	
	4		X		X
	5	X		X	
NLD	1	X			X
	2	X		X	
	3	X			X
	4	X			X
	5		X	X	

Totals

Fluent/Fair to Good Comprehension	n=3
Fluent/Poor Comprehension	n=3
Nonfluent/Fair to Good Comprehension	n=3
Nonfluent/Poor Comprehension	n=1
	N=10

		Fluency		Comprehension	
		Fluent	Nonfluent	Fair to Good	Poor
Subjects					
RAM	1	X		X	
	2		X	X	
	3	X		X	
	4	X		X	
	5	X		X	

Totals

Fluent/Fair to Good Comprehension	n=4
Nonfluent/Fair to Good Comprehension	n=1
	N=5

However, with disabled readers, the relationship between fluency and comprehension is more complex. Although approximately one third of the disabled readers did show a positive correlation between fluency and comprehension, the remaining two thirds showed reverse relationships, i.e., poor comprehension despite being able to read fluently, or fair to good comprehension despite being a nonfluent reader. These findings are pertinent in light of other results from this study, particularly the trend concerning the changing relationship between ARMs and FRMs within subjects who received treatment. As previously noted, four out of the five TLDs showed a trend toward reversing the types of miscues they had originally exhibited with treatment (i.e., a simultaneous increase in FRMs with a decline in ARMs, or vice versa). Interestingly, four out of the five TLD subjects also demonstrated a noticeable increase in reading rate (number of words per minute) with treatment (Probe 2). As readers often slow down when struggling to decode or comprehend text, this increase in rate, especially when viewed along with the previously described "trade-off" in miscue types, again suggests a balancing of strategies with treatment. Further substantiating this claim is the fact that the NLD and RAMs did not tend to show an increase in reading rate; their rates either tended to fluctuate somewhat randomly from one probe to the next, or remained relatively constant over time.

It would appear from these findings that the TLD readers were indeed becoming more balanced, "strategic" readers with treatment, capable of using multiple strategies to decode and construct meaning from the text. It would appear that disabled readers are often in a state of "imbalance" with regard to fluency and comprehension prior to treatment, seemingly because their strategies for decoding and processing meaning are in a state of imbalance as well. Some disabled readers are apparently devoting most of their energies to decoding and are utilizing a restricted set of strategies to 'get the words right," at the expense of deriving meaning from the text (an idea previously posed by Spiro and Myers, 1984, who speculated that poor readers' undue attention to word decoding/indentification may cause them to exceed their processing capacity). Other disabled readers appear to be more focused on deriving the underlying meaning of the passage, using a restricted set of strategies that do not preserve accuracy and fluency. This too can lead to problems, as reduced fluency/accuracy may inhibit the reader from fully accessing text-based information. Preliminary findings from this study suggest that the use of scaffolded interaction as a form of treatment assists disabled readers in becoming more balanced, strategic readers, who have the flexibility needed to simultaneously attend to word-identification/decoding and meaning-making processes. These changes resulting from scaffolding

eventually allow them to achieve higher degrees of fluency and comprehension. The relevance of these findings in relation to connectionist, top-down/bottom-up processing models will be explored in the Discussion section of this paper.

Statistical Analyses

Group means and standard deviations for the three dependent variables were calculated (see Table 4.2). A *one-way analysis of variance (ANOVA) using groups as the* independent variable was calculated with posthoc comparisons using the gain scores from Probe 1 to Probe 2, then from Probe 2 to Probe 4 as the dependent variables. The Levine test (a test of homogeneity of variance) was then calculated (see Table 4.3). From Probe 1 to Probe 2, there were significant differences in the changes made by the groups for the number of oral reading miscues, with groups TLD and NLD differing. There were also significant differences on the questions with groups TLD and NLD being greater than the RAMs. None of the differences from Probe 2 to Probe 4 were significant. The Levine test also showed that the subject groups' variabilities were homogeneous for all comparisons.

Table 4.2 Means and Standard Deviations

Subjects	Miscue Totals			Question Totals			Narrative Totals		
Group TLD	P1	P2	P4	P1	P2	P4	P1	P2	P4
TLD1	0.308	0.184	0.299	12	17	13	15	16	16
TLD2	0.279	0.188	0.290	11	16	11	19	19	11
TLD3	0.133	0.097	0.307	15	16	13	6	16	11
TLD4	0.411	0.149	0.584	13	17	14	7	11	6
TLD5	0.141	0.079	0.073	15	18	18	16	18	19
Total	1.272	0.697	1.553	66	84	69	63	80	63
Mean	0.254	0.139	0.311	13.2	16.8	13.8	12.6	16.0	12.6
Std. Dev.	0.118	0.050	0.182	1.789	0.837	2.588	5.771	3.082	5.030
Group NLD									
NLD1	0.146	0.094	0.106	10	13	9	6	10	10
NLD2	0.141	0.293	0.065	14	18	16	15	17	17
NLD3	0.050	0.037	0.065	6	9	9	7	10	8
NLD4	0.099	0.121	0.065	12	15	14	10	10	13
NLD5	0.352	0.402	0.375	16	18	14	16	16	18
Total	0.788	0.947	0.676	58	73	62	54	63	66
Mean	0.158	0.189	0.135	11.6	14.6	12.4	10.8	12.6	13.2
Std. Dev.	0.115	0.152	0.135	3.847	3.782	3.209	4.550	3.578	4.324
Group RAM									
RAM1	0.082	0.083	0.145	17	14	9	6	17	10
RAM2	0.317	0.175	0.184	15	13	14	17	16	18
RAM3	0.143	0.202	0.084	13	16	16	17	17	21
RAM4	0.113	0.052	0.142	16	15	15	13	10	13
RAM5	0.085	0.139	0.274	15	16	15	9	10	14
Total	0.740	0.651	0.829	76	74	69	62	70	76
Mean	0.148	0.130	0.166	15.2	14.8	13.8	12.4	14.0	15.2
Std. Dev.	0.098	0.062	0.070	1.483	1.304	2.775	4.879	3.674	4.324

Table 4.3 Levine Test

Gain Scores from P1 to P2

	F	df	prob	Levine	prob	Tukey differences
Miscues	4.5585	2,12	.0337	.2059	.817	TLD v NLD
Questions	7.6703		.0071	3.8930	.050	TLD & NLD v RAM
Narrative	.2992		.7469	1.1325	.354	

Gain Scores from P2 to P4

	F	df	prob	Levine	prob	Tukey differences
Miscues	1.6021	2,12	.2417	1.17175	.221	
Questions	1.2459		.3224	.1319	.878	
Narratives	2.3568		.1370	1.2578	.319	

DISCUSSION

It was predicted that at the end of the treatment phase, the TLD subjects would demonstrate statistically significant improvements in (a) reading accuracy (as demonstrated by fewer oral reading miscues and/or qualitative improvements in the type of miscues produced); (b) improved accuracy of response to factual, interpretation, and inference questions about stories; and (c) qualitatively improved narrative retellings (as measured by a holistic narrative score), in comparison to their own pre-test performance, as well as the performance of the NLD and RAM groups on intermittent and post-test probes. It was also predicted that the TLDs would evidence steadily improving performance across the dependent variables throughout the duration of the treatment phase, and that some stability of treatment effects might be demonstrated during the post-treatment probe. Finally, it was predicted that the RAM and NLD control groups would generally show little to no improvement across probes, however, any slight improvements would most likely be due to variables such as increasing familiarity with the task resulting from practice (i.e., participation in the probes), and/or exposure to regular instructional methods in the school setting.

Analysis of the data indicated that miscue analysis was the most useful dependent variable for documenting treatment effects. At the individual level, all five of

the TLD children demonstrated a decrease in the number of miscues during treatment Probe 2 as compared to baseline whereas only one of the five NLD subjects demonstrated a decrease. Also, at the group level, a statistically significant difference was observed between the TLD and NLD children's use of miscues when treatment Probe 2 scores were subtracted from baseline scores. Qualitative analysis of the type of miscues the children produced also indicated positive effects of treatment. Three of the five TLD children demonstrated shifts in the type of miscues they produced when reading, and the shifts involved the predicted pattern of a decrease in meaning related miscues and an increase in fluency related miscues. In contrast, only one of the five NLD children demonstrated a shift in miscue types that led to a reduction in accuracy related miscues.

In contrast to the miscue analysis, data collected from the question probes and narrative probes were not sensitive to treatment effects. However, at the individual level, all of the TLD and NLD children demonstrated gains on the question probe when treatment probe 2 was compared to baseline. A similar finding was observed for the narrative probe; five out of the five TLD and four out of the five NLD children demonstrated gains on the narrative probe when treatment Probe 2 was compared to baseline. Moreover, on both of these probes, gains made by the TLD group were not significantly different from the NLD group.

Liles (1993) noted the need to establish a reliable index of narrative ability to be used for assessment purposes, and suggested that some type of "weighted composite score" might serve as the best indicator of a student's narrative ability across parameters such as content, form, cohesion, presence of evaluative comments, etc. Liles further stated that narrative macro-organization or macrostructure might serve as the best organizational "base" for such a composite scoring system. The holistic narrative scoring instrument adapted for this study was comprised of a weighted, composite scoring system organized according to obligatory macrostructure features as suggested by Liles. Although this instrument was not sensitive to any differences resulting from treatment across groups, it proved to be sensitive to differences in narrative macrostructure within individual subjects, and produced fairly reliable results across different examiners.

Liles also suggested that the use of narrative rating systems might reveal particular processing patterns and/or patterns of performance across LLD subjects, which in turn might help in identifying "subgroups" of language-learning disability and/or a severity continuum for the disorder. Interesting processing patterns and performance trends for the LLD subjects did emerge in this study, providing further support for Liles' theory. As previously mentioned, some of the LLD subjects who were fairly fluent

readers nonetheless produced poor quality narratives and/or had marked difficulty answering comprehension questions about stories (Note: Informal analysis revealed that these subjects tended to have more difficulty answering interpretation and inference questions, although their ability to answer factual questions was adversely affected as well). Interestingly, these fluent reading LLD subjects with poor comprehension also tended to be more spontaneously verbal during conversations, with fewer errors in language form/structure (i.e., morphosyntax). However, some of these subjects did display what could be characterized as anomia or word-finding deficits, difficulty planning and structuring discourse, difficulty engaging in message repair, as well as difficulty with vocabulary and memory (as observed by the PI while engaging in conversation with the subjects and as reported by their teachers and school-based SLPs). Other LLD subjects who were nonfluent readers with relatively intact comprehension (i.e., better performance on questions and/or narratives), tended to be less spontaneously verbal during conversations, and what language they did produce consisted of shorter, less syntactically complex utterances, which contained more frequent errors in morphosyntax. The greatest pragmatic problems noted in these subjects were related to failure to provide sufficient information to the listener during conversation, and failure to take a turn in the conversation. Based on these trends, it is possible to

hypothesize two different "subgroups" of language-learning disability. One consists of children who, despite their seeming mastery of phonological principles and surface aspects of grammar, are more semantically and conceptually impaired, with poorer comprehension and possible memory deficits as well. These memory deficits may be related to failure to elaboratively encode information at the time of input, resulting in weak connection weights between neurons in a particular pattern representing that information. This failure to elaboratively encode (i.e.,failure to coalesce new input with previous knowledge structures) may then lead to retrieval problems when attempts are made to reactivate that weak neuronal pattern at a later time. In other words, problems of this nature could make it difficult for these subjects to engage in the simultaneous bottom-up/top-down processing needed for a variety of cognitive tasks including inferencing. Difficulty with elaborative encoding and/or memory retrieval may also explain the presence of anomia and the difficulty with planning and structuring discourse noted in these subjects, due to their struggle to activate weak patterns representing word knowledge and other types of conceptual information.

The other LLD subgroup appears to be more impaired in "surface" aspects of language structure/form, yet still capable of accessing "deep" structure or underlying meaning/content. These children may have better

capabilities in the area of elaborative encoding and/or memory retrieval for relevant background knowledge, as evidenced by their ability to comprehend subtleties of meaning and to make sense of texts despite grappling with phonologically-related processes such as decoding and surface aspects of morphosyntax. From a connectionist point of view, these subjects have stronger connection weights for patterns representing content/meaning aspects of language, with weaker connection weights for patterns representing structure and form.

Given the possible presence of different "subgroups" within the LLD population, how might a connectionist, top-down/bottom-up processing model contribute to a more fully developed explanation of these phenomena? First, despite the fact that the brain operates as a whole, there can be no question that different parts or regions within the whole perform perform specific functions, and more importantly, that several specific regions (e.g., reticular formation, cerebellum, hippocampus, prefrontal lobe, etc.) work collaboratively to perform higher level cognitive functions. Connections between neurons in different brain regions are thought to constitute stored memories in the form of engrams. Connection weights between neurons are strengthened differentially through input, experience and pattern reactivation, and thus weights across the vast network of neurons are not always equal (specifically, elaborative encoding or purposefully trying to relate new

information to existing stored knowledge seems to be particularly involved in the process of increasing the strength of these connections). Conceivably, an individual may have very strong connection weights between neurons or brain regions responsible for handling certain aspects of language such as form (e.g., phonology, morphosyntax) yet have weaker connection weights between neurons or regions involved with content, meaning-related aspects of language including concept formation, vocabulary, and word associations. These weaker connection weights may be the product of neuroanatomical, neurophysiological and/or genetic weaknesses coupled with failure to make and strengthen connections due to lack of experience and exposure in the environment. Weak connections between neurons involved with content aspects of language may make elaborative encoding more problematic (i.e., it would be more difficult to relate new information to prior content knowledge that is loosely assembled/poorly represented due to weak connection weights) and this in turn could lead to difficulty retrieving relevant background knowledge when needed to perform higher level language functions such as word retrieval, discourse planning, understanding abstractions, inferencing, etc. Conversely, if there are stronger connection weights for content-related aspects of language but weaker connection weights for surface, form-related aspects of language, individuals may be able to store, retrieve and comprehend information more readily,

but may still struggle with structural parameters including phonologically-related processes like word decoding as well as have difficulty producing longer more grammatically complex utterances.

Regardless of whether the LLD subject's deficits are due to weaker connections in form-related or content-related language parameters, the goal of intervention should be to strengthen connection weights and integrate the entire system such that the subject can successfully perform higher level functions that require use of multiple linguistic parameters. Nearly all higher level language functions require use of multiple brain regions and integrated systems. Success at reading for example, requires the ability to simultaneously decode words and derive meaning from extended pieces of text. It is not enough to simply use morphologically and phonologically based information to "get the words right" (although this is certainly an important part of the process). Nor is it enough to focus solely on meaning-making (i.e., determining how the words, phrases, sentences and paragraphs work together to form a whole meaning that is greater than the sum of the parts). Put another way, fluent reading without comprehension is not very useful; neither is comprehension that ignores parameters such as accuracy and fluency. Good readers are able to achieve a balance between these processes and parameters; this ability appears to require flexibility and use of multiple cues from the text and

activation of relevant prior knowledge (i.e., simultaneous bottom-up/top-down processing). The goal of intervention with LLD readers should therefore be to determine the nature of the weakness in their system and then to strengthen weak connections while integrating the system as a whole. Results from this study seem to indicate that scaffolded interaction as a form of treatment is successful in doing just that, as evidenced by some subjects' shift towards meaning-maintaining miscues and others' shift towards improved fluency. Scaffolding appears to be successful in helping disabled readers achieve a more integrated, flexible system by allowing the adult facilitator to point out salient text-based cues while simultaneously using a variety of techniques such as preparatory sets and constituent questions to activate relevant background knowledge. Over time, connection weights between form and content-related parameters of language are strengthened. The result is a more balanced, strategic type of reading that allows the reader to take advantage of a variety of external (i.e., text-based) and internal (i.e., stored engrams) cues to simultaneously decode and make sense of text. Just as new evidence is emerging which suggests that processes such as memory storage and retrieval are not really separate entities, but rather part of a dynamic, fluid, collaborative system, so it appears to be with the processes we typically think of as decoding and meaning-making as well. In a normal or

remediated system, there is no false dichotomy or imbalance between these processes; rather, they take place simultaneously and with ease, as the whole system is both unitary and flexible due to strong connection weights between neurons responsible for content and form-related linguistic parameters.

Limitations of the Study

As previously stated, there were limitations in the design of the study due to lack of exact matching across subjects. Lack of exact matching for reading grade level/ability made it difficult to compare performance across groups and subjects. This problem may be addressed in future studies by screening a larger population of subjects in order to increase the probability of finding more exact matches and/or selecting and assigning subjects to groups based on reading level/ability to preserve exact matching ratios, rather than randomly assigning subjects to groups as was done in this study. Another limitation was that the difficulty of the probes changed across time, due to the increasing level of difficulty of stories used for the probes. Originally, it was felt that since successive books in the Wright Group series gradually increase in difficulty, so should the difficulty level of books used for treatment and probes. If only the easier books from the beginning of a level/series were used for probes while treatment books continued to increase in difficulty, then books used for probes would eventually be easier than those

used during treatment. Therefore, any improvements seen on the later probes might be attributed to the ease of the book(s) rather than progress due to treatment. There could be problems with choosing books from the middle or end of a level/ series to serve as probe books as well. Although choosing several books near the end of a level/series for probes would eliminate the problem of probe books eventually becoming easier than treatment books, there would then be a much larger discrepancy between the harder book used for the pre-treatment/baseline probe and the easier book used for the first treatment probe. Therefore, any dramatic gains attributed to treatment could merely be the result of using a much easier book for the first treatment probe. Likewise, if several books from the middle of a level/series were used for probes, then only easier books from the beginning and harder books from the end would remain available to serve as treatment books. Therefore, after completing the first few easier treatment books, the subject would be faced with a sudden increase in difficulty when presented with the remaining difficult books from the end of the series. This sudden increase in difficulty could make it look as if treatment had suddenly stopped working (i.e., if there was a sudden drop in reading accuracy and/or comprehension) when in reality, the difficulty of the probe book(s) was to blame for the sudden drop in performance.

In addition to the problems involving book selection and sequencing, there was also the matter of some books being too difficult for subjects for reasons concerning culture and content (as was the case with the book used in Probe 3 of this study). Certain books may not be suitable for use in such a study, even though they technically meet readability requirements in terms of overall length, number of words, sentences, grammatical complexity, etc. Clearly, selection and sequencing of books remains an important yet problematic issue, which is why researchers often choose to dispense with the use of authentic story books and texts in favor of formulated, contrived passages which can be carefully controlled across multiple variables. Fortunately, there may be another option. Since the Wright Group has several series of books at the same level(s) of difficulty (e.g., *Sunshine Books* and *The Story Box* series), it might be possible to select books from one series for the probes while using similar books at the same level of difficulty from the other series for treatment. Other publishing companies that produce materials based on a whole language philosophy (e.g., Scholastic) might also have books at the same level of difficulty which could be used, although books would have to be carefully screened to determine if they met readability and content criteria. Despite these difficulties inherent in book selection and sequencing, it is important to remember that although there may be some

loss in internal validity and reliability when contrived texts are abandoned, there is a gain in ecological validity when authentic texts are used. Researchers must continue to strive to solve problems involving book selection and sequencing rather than return to use of contrived passages and texts if we are to discover what really goes on "in the head" of LLD readers when they are engaged in the struggle to make sense of texts in authentic classroom and learning situations.

Another inherent weakness of this study concerns the limited pre-treatment baseline period. The purpose of a baseline is to obtain a standard by which the efficacy of experimental interventions can be evaluated. When choosing a baseline, both its stability and variability must be carefully examined (Barlow & Hersen, 1984). The difficulty lies in determining how long the baseline should last. Most researchers have suggested that the baseline measurement should continue until a stable pattern emerges, and that a minimum of three separate observation points during the baseline are generally sufficient to establish either an upward or downward trend in the data, making it possible to analyze the efficacy of a subsequent treatment as a departure from this trend. Due to logistical and time constraints, pre-treatment data were collected at only one observation point during this study (i.e., during the pre-treatment probe, which was completed during one session). In future studies, it might be beneficial to take baseline

measurements on two to three books read over a period of two to three weeks, allowing for data collection at several additional observation points.

The length of the treatment phase (approximately four weeks) was also a limitation in this study. It is possible that a longer treatment cycle would have resulted in even larger gains on the dependent variables over time, and might also have contributed to stronger carryover and stability of effects when treatment was removed.

The length of the post-treatment phase was somewhat of a limitation as well. Just as a longer pre-treatment phase might have allowed for a stable pattern of behavior to emerge (thus making it easier to document the effects of treatment as a departure from that stable pattern), a longer post-treatment phase might have made it easier to establish patterns which would have indicated greater stability of effects, or indicated if gains diminished over time once treatment was removed.

Finally, there were limitations in this study with respect to external validity. It is unknown whether these findings will generalize to other subjects in other settings, as well as to other clinicians who may be interested in using the treatment. Subjects in this study were seen individually rather than in groups (which is the more common service delivery model for children receiving speech-language therapy services in public schools), and they were seen by a clinician trained in use of CRS

techniques. CRS is a complex treatment approach that requires a thorough understanding of the link between oral and written language, as well as how meaning is expressed at multiple levels through various language forms in the text. Unlike the step-by-step procedures that are utilized in traditional skills-based treatment approaches, CRS requires that the language facilitator be able to predict where and when a reader will most likely experience difficulty with the language of the text, and respond appropriately. In addition, subtle variations in scaffolding "style" and content from one clinician to the next might make it difficult to replicate these findings, even with maximal training.

Despite these limitations, this study does have some notable strengths in terms of ecological validity. Significant treatment effects were obtained by a school-based SLP (albeit one enrolled in a doctoral program) conducting treatment in a public school setting. This suggests that other school-based SLPs should be able to use the treatment successfully with students of their own, assuming they receive proper training in underlying theory and CRS techniques, as well as direction on how to manage logistical constraints, how to modify techniques to allow for group therapy sessions, etc.

Suggestions for Future Research

Future research should focus on replicating the findings from this study with larger samples of LLD children of various ages, as well as with other clinicians. A longer treatment cycle (with accompanying longer pre- and post-treatment baselines) is also suggested to allow stable patterns of behavior to emerge, which would make it easier to assess the effects of treatment as a departure from those trends. A longer treatment cycle would also allow for the introduction of a broader based thematic unit that might include multiple fiction and expository texts centered around a particular topic or theme, with related writing, art, drama, and play activities added as treatment variables. For instance, one of the scaffolding techniques that was used consistently in this study which appeared to be quite beneficial in helping the TLD students understand story macrostructure was the story map (see Appendix I). The experimental effects of other types of graphic organizers (e.g., flow charts, outlines, time lines, character maps, fact maps, etc.) could also be explored, compared, and contrasted as part of a larger thematic treatment unit.

Another anecdotal finding of this study which deserves additional exploration was the apparent benefit of CRS as a tool for enhancing lexical acquisition in LLD children. Informal documentation was kept throughout the treatment phase of the study, in the form of writing down on the back

of each TLD subject's story map the various vocabulary items, instances of figurative/abstract language, and other concepts from the story that were problematic for the subject which required scaffolding. Daily notes were kept on whether the subject appeared to be grasping the meaning of these new lexical items and concepts with scaffolding and successive readings of previously read pages. It became apparent that subjects were able to demonstrate increased knowledge of word meanings and concepts with scaffolding and successive readings, as indicated by their ability to explain the meaning of these lexical items/concepts while engaged in discussions about stories during treatment, as well as their ability to use the new lexical items appropriately in context when answering questions about the stories and retelling the narratives during probes. This anecdotal finding should be investigated further under controlled conditions. For example, in future studies, specific semantic concepts and vocabulary items from the story that are judged to be unfamiliar to the subject and/or potentially problematic could be targeted in advance for scaffolding, and various techniques could be used to measure the effects of treatment on the subject's acquisition of those lexical items and concepts. A rating system could be devised to measure each subject's increased level of "knowing" the meaning of that word or concept over time during treatment and probes (e.g., 0 = subject has no receptive or

expressive knowledge of meaning of word/concept; 1 = subject is able to receptively identify the word/concept on a multiple choice or pointing task; 2 = subject is able to provide definition or description of word/concept on demand during discussions about story; 3 = subject is able to use word/concept expressively and spontaneously while answering questions about story and/or during narrative retelling tasks).

Finally, future research should attempt to further document and describe patterns or trends consistent with "subgroups" of language-learning disability as well as the probable underlying etiology of these disorders. Particular attention should be paid to how certain deficit patterns in the areas of oral reading, question comprehension and narration may or may not be correlated with patterns of semantic, morphosyntactic, and pragmatic deficits evident in the conversational and expository discourse of these children. Only by achieving a more global and integrated understanding of the nature of language-learning disabilities can we continue to devise and revise appropriate treatment strategies for these children.

REFERENCES

Ackerman, B. P. (1986). Referential and causal coherence in the story comprehension of children and adults. Journal of Experimental Child Psychology, 41, 336-366.

Anderson, R. C. (1978). Schema directed processes in language comprehension. In A. Lesgold, J. Pelligreno, S. Fokkema, & R. Glaser (Eds.), Cognitive psychology and instruction (pp. 67-82). NY: Plenum.

Anderson, R. C., Reynolds, R. E., Schallert, D. I., & Goetz, E. T. (1977). Frameworks for comprehending discourse. American Educational Research Journal, 14, 367-382.

Anderson, R. C., Spiro, R. J., & Anderson, M. C. (1978). Schemata as scaffolding for the representation of information in connected discourse. American Educational Research Journal, 15, 433-440.

Applebee, A. (1978). The child's concept of story. IL: University of Chicago Press.

Badon, L. C. (1993). Comparison of word recognition and story retelling under the conditions of contextualized versus decontextualized reading events in at-risk poor readers. Unpublished doctoral dissertation, Louisiana State University, Baton Rouge.

Bandura, A. (1969). Principles of behavior modification. NY: Holt, Rinehart & Winston.

Barlow, D. H., & Hersen, M. (1984). Single subject experimental designs: Strategies for studying behavior change (2nd ed.). Elmsford, NY: Pergamon Press.

Bartlett, F. C. (1932). Remembering: A study in experimental and social psychology. Cambridge, England: Cambridge University Press.

Berlyne, D. E. (1949). 'Interest' as a psychological concept. British Journal of Psychology, 39, 184-195.

Berlyne, D. E. (1960). Conflict, arousal, and curiosity. NY: McGraw-Hill.

Bishop, D. V. M., & Adams, C. (1992). Comprehension problems in children with specific language impairment: Literal & inferential meaning. Journal of Speech & Hearing Research, 35, 119-129.

Bransford, J. D., Stein, B. S., Nye, N. J., & Perfetto, G. A. (1982). Differences in approaches to learning: An overview. Journal of Experimental Psychology: General, 3, 390-398.

Brown, A. (1975). The development of memory: Knowing, knowing about knowing, and knowing how to know. In H. W. Reese (Ed.), Advances in child development and behavior. NY: Academic Press.

Brown, G., & Yule, G. (1983). Discourse analysis. NY: Cambridge University Press.

Brown, L., Sherbenou, R. J., & Johnson, S. K. (1990). Test of Nonverbal Intelligence. Austin, TX: Pro-Ed.

Bruner, J. (1986). Actual minds, possible worlds. Cambridge, MA: Harvard University Press.

Carnine, D. W., Kameenui, E. J., & Woolfson, N. (1982). Training of textual dimensions related to text-based inferences. Journal of Reading Behavior, 14, (3), 335-340.

Carnine, D. W., Stevens, C., Clements, J., & Kameenui, E. J. (1982). Effects of facilitative questions and practice on intermediate students' understanding of character motives. Journal of Reading Behavior, 14, 179-190.

Chou-Hare, V., & Pulliam, C. A. (1980). Teacher questioning: A verification and an extension. Journal of Reading Behavior, 12, 69-72.

Crais, E., & Chapman, R. (1987). Story recall and inferencing skills in language-learning disabled and nondisabled children. Journal of Speech & Hearing Disorders, 52, 50-55.

Davey, B., & Macready, G. B. (1985). Prerequisite relations among inference tasks for good and poor readers. Journal of Educational Psychology, 77, 539-552.

Dixon, M. E., & Rossi, J. (1995). Directors of their own learning: A reading strategy for students with learning disabilities. Teaching Exceptional Children, 27, (2), 10-14.

Dowhower, S. (1997). The method of repeated readings. The Reading Teacher, 50, (5), 376-381.

Ellis-Weismer, S. (1985). Constructive comprehension abilities exhibited by language-disabled children. Journal of Speech & Hearing Research, 28, 175-184.

Ezell, M. C. (1995). Evaluating the efficacy of communicative reading strategies with high risk first grade students. Unpublished doctoral dissertation, Louisiana State University.

Fox, B. J., & Wright, M. (1997). Connecting school and home literacy experiences through cross-age reading. The Reading Teacher, 50, (5), 396-403.

Garfield, J. L. (1990). Convention, context, and meaning: conditions on natural language understanding. In J. L. Garfield (Ed.), Foundations of cognitive science: The essential readings. NY: Paragon House.

Gillam, R. B. (1989). An investigation of the oral language, reading, and written language competencies of language impaired and normally achieving school-age children (Doctoral dissertation, Indiana University). University Microfilms, No. 9012207.

Gillam, R. B., & Johnston, J. R. (1992). Spoken and written language relationships in language/learning impaired and normally achieving school-age children. Journal of Speech and Hearing Research, 35, 1301-1315.

Goodman, K. S. (1965). A linguistic study of cues and miscues in reading. Elementary English, 42, 639-643.

Goodman, K. S. (1969). Analysis of oral reading miscues: Applied Psycholinguistics. Reading Research Quarterly, 1, 9-30.

Goodman, K. S. (1984). Unity in reading. In A. C. Purves & O. Niles (Eds.), Becoming readers in a complex society (Part 1, pp. 79-114). Chicago, IL: University of Chicago Press.

Goodman, K. S. & Gollasch, F. V. (1980). Word omissions: Deliberate and non-deliberate. Reading Research Quarterly, 16, 6-31.

Goodman, K. S., & Goodman, Y. M. (1977). Learning about psycholinguistic processes by analyzing oral reading. Harvard Educational Review, 47, 317-333.

Graesser, A. C., & Clark, L. F. (1985). Structures and procedures of implicit knowledge. Norwood, NJ: Ablex.

Graesser, A. C., Singer, M., & Trabasso, T. (1994). Constructing inferences during narrative text comprehension. Psychological Review, 101(3), 371-395.

Graybeal, C. M. (1981). Memory for stories in language-impaired children. Applied Psycholinguistics, 2, 269-283.

Guszak, F. J. (1967). Teacher questioning and reading. Reading Teacher, 21, 227-234.

Hansen, J. (1981). The effects of inference training and practice on young children's comprehension. Reading Research Quarterly, 16, 391-417.

Hansen, J., & Pearson, P. D. (1983). An instructional study: Improving the inferential comprehension of good and poor fourth grade readers. Journal of Educational Psychology, 75, 821-829.

Harste, J. C., Woodward, V. A., & Burke, C. L. (1984). Language stories and literacy lessons. Portsmouth, NH: Heinemann.

Hebb, D. O. (1949). The organization of behavior. NY: Wiley.

Hegde, M. N. (1994). Clinical research in communicative disorders: principles and strategies (2nd ed.). Austin, TX: Pro-Ed.

Hernandez, S. N. (1989) Effects of communicative reading strategies on the literacy behaviors of third grade poor readers. Unpublished doctoral dissertation, Louisiana State University, Baton Rouge.

Hoggan, K. C., & Strong, C. J. (1994). The magic of "once upon a time": Narrative teaching strategies. Language, Speech & Hearing Services in Schools, 25, 76-89.

Holmes, B. C. (1984). The effect of prior knowledge on the question answering of good and poor readers. The Journal of Reading Behavior, 15, 1-18.

Holmes, B. C. (1985). The effects of a strategy and sequenced materials on the inferential comprehension of disabled readers. Journal of Learning Disabilities, 18, 542-546.

Just, M. A., & Carpenter, P. A. (1992). A capacity theory of comprehension: Individual differences in working memory. Psychological Review, 99, 122-149.

Kamil, M. I. (1984). Current traditions in reading research. In P. D. Pearson (Ed)., Handbook of reading research (pp. 39-62). NY: Longman.

Kapur, S., Craik, F. I. M., Tulving, E., Wilson, A. A., Houle, S., & Brown, G. E. (1995). Functional role of prefrontal cortex in retrieval of memories: A PET study. Neuroreport, 6, 1880-1884.

Kass, A. (1992). Question asking, artificial intelligence, and human creativity. In T. W. Lauer, E. Peacock, & A. C. Graesser (Eds.), Questions and information systems (pp. 303-360). Hillsdale, NJ: Erlbaum.

Kintsch, W. (1980). Learning from text, levels of comprehension: A constructive integration model. Psychological Review, 95, 163-182.

Kintsch, W. (1988). The role of knowledge in discourse comprehension: A constructive-integration model. Psychological Review, 95, 163-182.

Kintsch, W. (1992). How readers construct situation models for stories: The role of syntactic cues and causal inferences. In A. F. Healy, S. M. Kosslyn, & R. M. Shiffrin (Eds.), From learning processes to cognitive processes: Essays in honor of William K. Estes (Vol. 2, pp. 261-278). Hillsdale, NJ: Erlbaum.

Kintsch, W., & van Dijk, T. A. (1978). Toward a model of text comprehension and production. Psychological Review, 85, 363-394.

Klecan-Aker, J., & Kelty, K. (1990). An investigation of the oral narratives of normal and language-learning disabled children. Journal of Childhood Communication Disorders, 13, 207-216.

Klein-Konigsberg, E. (1984). Semantic integration and language learning disabilities: From research to assessment and intervention. In G. P. Wallach & K. G. Butler (Eds.), Language learning disabilities in school-age children. Baltimore, MD: Williams & Wilkins.

Kletzien, S. B. (1991). Strategy use by good and poor comprehenders reading expository text of differing levels. Reading Research Quarterly, 26, 67-86.

Kos, R. (1991). Persistence of reading disabilities: The voices of four middle school students. American Educational Research Journal, 28, 875-895.

Koskinen, P. S., Gambrell, L. B., & Kapinus, B. A. (1993). The use of retellings for portfolio assessment of reading comprehension. In J. F. Almasi (Ed.), Literacy: Issues and practices (Vol. 10, pp. 41-77). Silver Spring, MD: State of Maryland International Reading Association Yearbook.

LaBerge, D., & Samuels, S. J. (1974). Toward a theory of automatic information processing in reading. Cognitive Psychology, 6, 293-323.

Lehnert, W. G., Dyer, M. G., Johnson, P. N., Young, C. J., & Harley, S. (1983). BORIS: An experiment in in-depth understanding of narratives. Artificial Intelligence, 20, 15-62.

Liles, B. Z. (1985). Cohesion in the narratives of normal and language-disordered children. Journal of Speech & Hearing Research, 28, 123-133.

Liles, B. Z. (1987). Episode organization and cohesive conjunctives in narratives of children with and without language disorder. Journal of Speech & Hearing Research, 30, 185-196.

Liles, B. Z. (1993). Narrative discourse in children with language disorders and children with normal language: A critical review of the literature. Journal of Speech & Hearing Research, 36, 868-882.

Lipson, M. Y. & Wixson, K. K. (1986). Reading disability research: An interactionist perspective. Review of Educational Research, 56, 111-136.

Mandler, J. M., & Johnson, N. S. (1977). Remembrance of things past: Story structure and recall. Cognitive Psychology, 9, 111-151.

Magliano, J. P., & Graesser, A. C. (1991). A three-pronged method for studying inference generation in literary text. Poetics, 20, 193-232.

Markwardt, F. C., Jr., (1989). Peabody Individual Achievement Test-Revised (PIAT-R). Circle Pines, MN: American Guidance Service (AGS).

McCabe, A., & Peterson, C. (1991). Linking children's connective use & narrative macrostructure. In A. McCabe & C. Peterson (Eds.), Developing narrative structure. NJ: Lawrence Erlbaum Assoc., Inc.

McCormick, S. (1992). Disabled readers' erroneous responses to inferential comprehension questions:

Description and analysis. Reading Research Quarterly, 27, 55-77.

McFadden, T. U., & Gillam, R. B. (1996). An examination of the quality of narratives produced by children with language disorders. Language, Speech and Hearing Services in Schools, 27, (1), 48-56.

McNamee, G. D. (1979). The social interaction origins of narrative skills. Quarterly Newsletter of the Laboratory for Comparative Human Cognition, 1 (4).

Merritt, D. D., & Liles, B. Z. (1987). Story grammar ability in children with and without language disorder: Story generation, story retelling, and story comprehension. Journal of Speech and Hearing Research, 30, 539-552.

Merritt, D. D., & Liles, B. Z. (1989). Narrative analysis: Clinical applications of story generation and story retelling. Journal of Speech & Hearing Disorders, 54, 438-447.

Miller, J., & Chapman, R. (1988). SALT: Systematic Analysis of Language Transcripts (Computer programs to analyze language samples.) Madison, WI: Language Analysis Laboratory, Waisman Center, University of Wisconsin-Madison.

Moscovitch, M. (1994). Memory and working-with-memory: Evaluation of a component process model and comparison with other models. In D. L. Schacter & E. Tulving (Eds.), Memory systems, 1994 (pp. 269-310). Cambridge: MIT Press.

Nelson, K. (1985). Making sense: The acquisition of shared meaning. NY: Academic Press.

Nelson, K. (1986). Event Knowledge: Structure & function in development. Hillsdale, NJ: Erlbaum.

Nelson, K. (1991). Event knowledge and the development of language functions. In J. Miller (Ed.), Research on child language disorders: A decade of progress (pp. 125-142). Austin, TX: Pro-Ed.

Nicholas, D. W., & Trabasso, T. (1980). Toward a taxonomy of inferences for story comprehension. In F. Wilkening, J. Becker, & T. Trabasso (Eds.), Information integration in children. Hillsdale, NJ: Erlbaum.

Norris, J. (1988). Using communication strategies to enhance reading acquisition. The Reading Teacher, 41, 368-373.

Norris, J. (1989). Providing language remediation in the classroom: An integrated language-to-reading intervention method. Language, Speech, & Hearing Services in Schools, 20, 205-219.

Norris, J. (1991). From frog to prince: Using written language as a context for language learning. Topics in Language Disorders, 12 (1), 1-6.

Norris, J. (1992). Some questions and answers about whole language. American Journal of Speech-Language Pathology, 1 (4), 11-14.

Norris, J., & Hoffman, P. (1993). Whole language intervention for school-age children. San Diego: Singular Publishing Group, Inc.

North, C. (1982). Jack and the beanstalk. NY: Merrigold Press

Owens, R. (1991). Narrative analysis. In Language disorders: A functional approach to assessment and intervention. New York: Merrill.

Palmer, W. S. (1982). An observational study in secondary English classrooms. Paper presented at the National Reading Conference, Clearwater, FL.

Parkins, E. J. (1990). Psychological development: An integrated description. In E. J. Parkins (Ed.), Equilibration, mind, and brain: Toward an integrated psychology. NY: Praeger.

Paris, S. G., & Lindauer, B. K. (1976). The role of inference in children's comprehension and memory for sentences. Cognitive Psychology, 8, 217-227.

Paris, S. G., Wasik, B. A., & Turner, J. C. (1991). The development of strategic readers. In R. Barr, M. L. Kamil, P. Mosenthal, & P. D. Pearson (Eds.), Handbook of reading research, Vol. II (pp. 609-640). NY: Longman.

Paul, R., Hernandez, R., Taylor, L., & Johnson, K. (1996). Narrative development in late talkers: Early school age. Journal of Speech and Hearing Research, 39, 1295-1303.

Pearson, P. D., Hanson, J., & Gordon, C. (1979). The effect of background knowledge on young children's comprehension of explicit and implicit information. Journal of Reading Behavior, 11, 201-209.

Piaget, J. (1952). The origins of intelligence. NY: International Universities Press.

Piaget, J. (1954). The construction of reality in the child. NY: Basic Books.

Piaget, J. (1960). The child's conception of physical causality. NJ: Littlefield, Adams.

Purcell, S., & Liles, B. Z. (1992). Cohesion repairs in the narratives of normal-language and language-disordered school-age children. Journal of Speech & Hearing Research, 35, 354-362.

Roth, F. P., & Spekman, N. J. (1986). Narrative discourse: Spontaneously generated stories of learning-disabled and normally achieving students. Journal of Speech & Hearing Disorders, 51, 8-23.

Rumelhart, D. E. (1975). Notes on a schema for stories. In D. G. Bobrow & A. Collins (Eds.), Representation and understanding: Studies in cognitive science. NY: Academic Press.

Rumelhart, D. E. (1980). Schemata: The building blocks of cognition. In R. J. Spiro, B. C. Bruce, & W. F. Brewer (Eds.), Theoretical issues in reading comprehension. Hillsdale, NJ: Erlbaum.

Sadker, M., & Sadker, D. (1982). Sex equity handbook for schools. NY: Longeman.

Samuels, S. J. (1976). Automatic decoding and reading comprehension. Language Arts, 53, 323-325.

Samuels, S. J., & Kamil, M. L. (1984). Models of reading process. In P. D. Pearson (Ed.), Handbook of reading research (pp. 185-224). NY: Longman.

Schacter, D. L. (1996). Searching for memory: The brain, the mind, and the past. NY: BasicBooks.

Schank, R. C., & Abelson, R. (1977). Scripts, plans, goals, and understanding: An inquiry into human knowledge structures. Hillsdale, NJ: Erlbaum.

Schneider, P. (1996). Effects of pictures versus orally presented stories on story retellings by children with language impairment. American Journal of Speech-Language Pathology, 5, 86-96.

Schneider, P., & Watkins, R. V. (1996). Applying Vygotskian developmental theory to language intervention.

Language, Speech and Hearing Services in Schools, 27, 157-170.

Scott, C. (1988). Spoken and written syntax. In M. Nippold (Ed.), Later language development: Ages 9-19 (pp. 49-96). Austin, TX: Pro-Ed.

Semel, E., Wiig, E. H., & Secord, W.A. (1996). Clinical Evaluation of Language Fundamentals-Third Edition. San Antonio, TX: The Psychological Corporation.

Semon, R. (1904/1921). The mneme. London: George Allen & Unwin.

Semon, R. (1909/1923). Mnemic psychology. London: George Allen & Unwin.

Spiro, R. J. (1980). Constructive processes in prose comprehension and recall. In R. J. Spiro, B. C. Bruce, & W. F. Brewer (Eds.), Theoretical issues in reading comprehension: Perspectives from cognitive psychology, linguistics, artificial intelligence, and education (pp. 245-278). Hillsdale, NJ: Erlbaum.

Spiro, R. J., & Myers, A. (1984). Individual differences and underlying cognitive processes in reading. In P. D. Pearson (Ed.), Handbook of reading research (pp. 471-501). NY: Longman.

Stein, N. L., & Glenn, C. G. (1979). An analysis of story comprehension in elementary school children. In R. O. Freedle (Ed.), New directions in discourse processing (Vol. 2, pp. 53-120). Norwood, NJ: Ablex.

Stein, N. L., & Trabasso, T. (1985). The search after meaning: Comprehension and comprehension monitoring. In F. J. Morrison, C. Lord, & D. Keating (Eds.), Applied developmental psychology (Vol. 2, pp. 33-58). San Diego, CA: Academic Press.

Suh, S. Y., & Trabasso, T. (1993). Inferences during reading: Converging evidence from discourse analysis, talk-aloud protocols, and recognition priming. Journal of Memory and Language, 32, 279-300.

Thorndyke, P. W. (1977). Cognitive structures in comprehension and memory of narrative discourse. Cognitive Psychology, 9, 77-110.

Tierney, R. J., & Pearson, P. D. (1981). Learning to learn from text: A framework for improving classroom practices. In E. Dishner, J. Readence, & T. Bean (Eds.),

Reading in the content area: Improving classroom instruction (pp. 50-65). NY: Kendall Hunt.

Trabasso, T. (1981). On the making of inferences during reading and their assessment. In J. Guthrie (Ed.), Comprehension and teaching: Research reviews (pp. 56-76). Newark, DE: International Reading Association.

Trabasso, T., & Suh, S. Y. (1993). Using talk-aloud protocols to reveal inferences during comprehension of text. Discourse Processes, 16, 3-34.

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1987). The collected works of L.S. Vygotsky, Vol. 1. NY: Plenum.

Wallach, G., & Miller, L. (1988). Inference and cohesion. In Language intervention and academic success. San Diego: College-Hill.

Weaver, C. A., & Kintsch, W. (1983). Expository text. In R. Barr, M. L. Kamil, P. B. Mosenthal, & P. D. Pearson (Eds.), Handbook of reading research. Vol. II (pp. 230-245). NY: Longman.

Wertsch, J. V. (1984). The zone of proximal development: Some conceptual issues. In B. Rogoff & J. V. Wertsch (Eds.), Children's learning in the "zone of proximal development" (pp. 7-18). San Francisco, CA: Jossey-Bass.

Westby, C. (1990). The role of the speech pathologist in whole language. Language, Speech, & Hearing Services in Schools, 21, 228-237.

Westby, C. (1984). Development of narrative abilities. In G. P. Wallach & K. G. Butler (Eds.), Language-learning disabilities in school-age children. Baltimore, MD: William & Wilkins.

Wiederholt, J. L., & Bryant, B. R. (1992). Gray Oral Reading Tests- Third Edition. Chicago, IL: The Riverside Publishing Company.

Wilson, M. M. (1979). The processing strategies of average and below average readers answering factual and inferential questions on three equivalent passages. Journal of Reading Behavior, 11, 235-245.

Winne, P. H., Graham, L., & Prock, L. (1993). A model of poor readers' text-based inferencing: Effects of explanatory feedback. Reading Research Quarterly, 28, (1), 53-66.

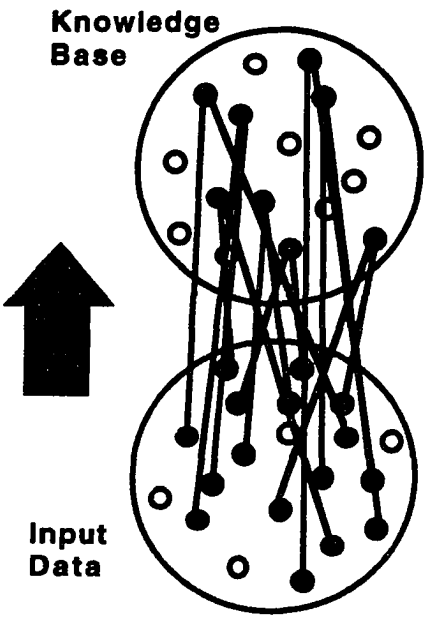
Wood, D., Bruner, J., & Ross, G. (1976). The role of tutoring in problem-solving. Journal of Child Psychology and Psychiatry, 17, 89-100.

Wong, B. (1980). Activating the inactive learner: Use of question/prompts to enhance comprehension and retention of implied information in learning disabled children. Learning Disability Quarterly, 3, 29-37.

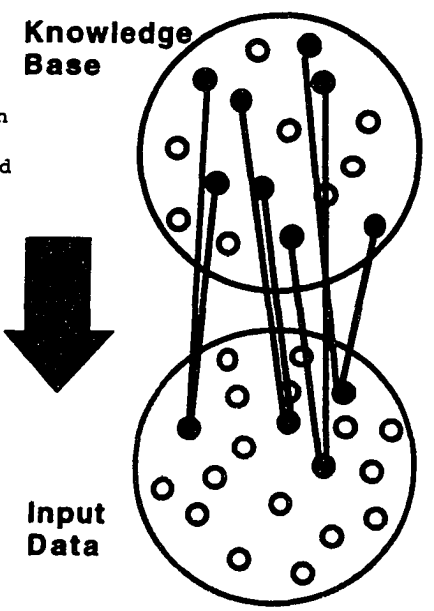
APPENDIXES

APPENDIX A A CONNECTIONIST-CONSTRUCTIONIST MODEL OF INFERENCING

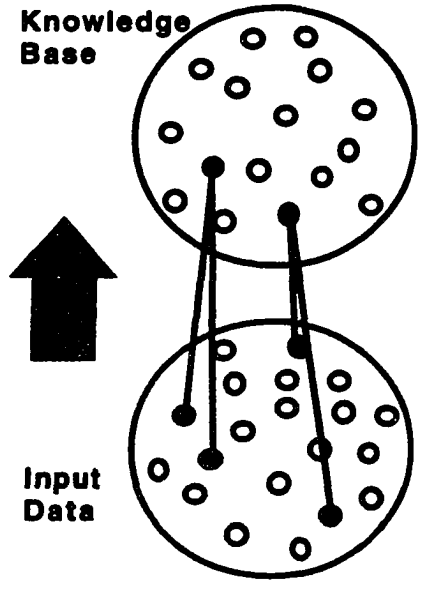
Bottom-up Processing: Data Driven- polymodal input from environment enters system and activates partial generalized schemata (previously acquired knowledge structure). Pattern with strongest connection weights (based on experience) is activated first.



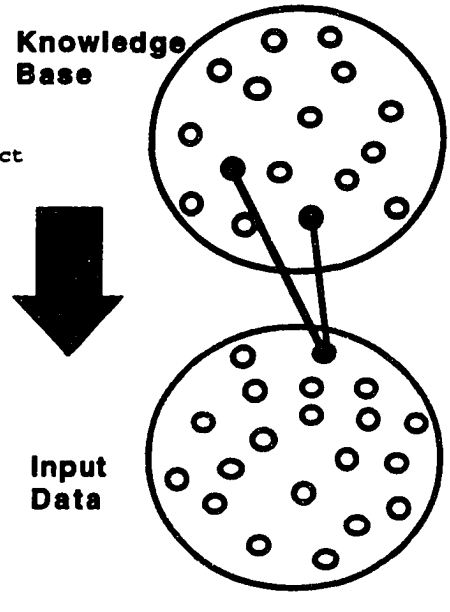
Top-Down Processing: Conceptually Driven- System makes predictions based on general schemata and searches input for information to fit into partially satisfied schemata (i.e. to confirm schema-based predictions)



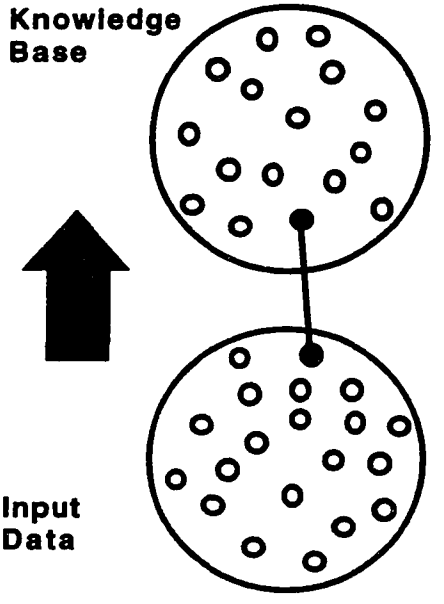
Bottom-up processing: continued data from input are needed to "fill out" the schemata. Bottom-up processing ensures that listener/reader will be sensitive to novel information or information that does not fit ongoing hypothesis about the data. (When there is a mismatch between top-down prediction and bottom-up information, system must re-examine input and revise interpretation, i.e. activate a different pattern or schemata, retest it against the data, and so on).



Top-Down Processing: continues to help listener/reader resolve ambiguities or select between alternative interpretation of the data.



Through simultaneous top-down / bottom-up processing, a "best-fit" between top-down predictions and bottom-up information is eventually achieved, and the inference is made.



APPENDIX B CRS TECHNIQUES

Preparatory Sets
- assist the reader in activating appropriate background knowledge
- link new information to previously stated ideas in the story
- help reader learn to expect meaning when reading
- help reader remain focused on the theme or topic of the passage
- direct the reader to more abstract interpretations of the language in the story
- can prep set any linguistic unit of text (word, phrase, sentence, paragraph)

Examples: Text says: "The milkman delivered milk to the families on Bright Street every morning. He loved driving along the street at daybreak, just as the sun was coming up on a clear, crisp autumn morning."
Prep set: "Find out who is bringing the milk." (labels)
"Tell us what the milkman is doing." (actions)
"Tell us how the milkman feels." (interpretations)
"Tell us what the milkman does everyday." (inferences)
"Tell us the sound that begins the word "milkman." (metalanguage)

Constituent Questions
-similar to prep sets (with focus on alerting child to information that is needed), but requires that the child reverse interrogative syntactic forms as opposed to responding to the more direct form of a prep set.

Example: "What will the milkman do next?"

Acknowledgement
-provides feedback to reader by confirming what has been read and understood
-treats reading as a natural communicative act where speakers and listeners take turns and attempt to communicate meaningful information

Example: Text says "I feel grumpy."
Acknowledgment: "Oh, he's in a bad mood."

Expansion
-rewording text information into grammatically more complete or complex sentence
- more complete or complex sentences generally include relational terms, such as conjunctions (e. g., because, so, when), verb tense markers (e. g., will, did, should), adjectives, adverbs, or subordinate clauses

Example: Text says, "Along came Monkey."
Expansion: "Along came Monkey into the jungle."
(Appendix B continued)

Expatiation
- consists of elaborations on an idea or concept to establish greater meaning, to clarify unfamiliar vocabulary or (Appendix B continued)

concepts, to explain a metaphor or other figurative language, or to model inferences and interpretations

Example: Text says, "I feel grumpy," said Elephant.
Expatiation: "He does look grumpy. His eyes are narrow and his mouth is frowning. Something bad must have happened."

Association
-links are established between new information read and ideas that have been stated in previous episodes, pages, paragraphs or sentences
- helps reader understand that meaning crosses the boundaries of sentences, paragraphs, and pages (i.e., cohesion)

Example: Text says: "Parrot jumped and fell over Giraffe."
Association: Clinician reviews the previous page and makes an association such as "Elephant bellowed, or yelled so loudly, that it scared Parrot. Parrot got so scared that he..." (pointing to new text).

Generalization
- links events, morals, or states in the story to similar situations in other contexts, such as the reader's own experiences or community, national, or world events

Example: Text says, "Parrot jumped and fell over Giraffe."
Generalization: "He was startled, just like we were when the fire alarm went off."

Parsing
- chunking complex sentences into smaller units to aid processing of the ideational relationships within sentences
- helps reader to see how sentence is made up of smaller constituents and semantic units

Example: Text says, "Poor old Elephant, I'll dance for you," Giraffe said.
Parsing: "This is who Elephant was talking to." (pointing to word "Giraffe."
"This is what the long-legged Giraffe was doing. (pointing to word "dance" or picture of Giraffe dancing)

"This tells you Giraffe dances because he feels sorry for Elephant. (pointing to phrase "poor old elephant")

Semantic Cue
- assist in retrieving or recognizing a word that is miscued or difficult to decode
-synonyms, definitions, or related words are given to help establish the correct network of information
- if the word is not in the child's lexicon, it may be modeled in context

Example: If child miscues on word "grumpy."
Semantic Cue: "This word tells you he's in a bad mood; he's grouchy, unhappy, grumbling at everybody."

Fluent Reading
- fluent reading of a sentence or phrase is used to model how the elements of the sentence work together to communicate meaning
- used when reader struggles with text, and other scaffolding strategies alone are not successful in helping reader to construct meaning
-direct reader to look at the written words while the facilitator reads
- simultaneously lets reader see and hear how the sentence or phrase functions as a whole

Example: If child reads, "I fell gr-, grume, groupy,"
Fluent Reading: Clinician models fluent reading of the sentence, "I feel grumpy," followed by expatiation or other scaffolding strategy, to help child associate the words with the meaning.

Paraphrase
-rewording the text after it is read
-difficulty of the vocabulary or concept may be reduced
-unfamiliar words may be defined through descriptions or use of synonyms
-complex sentences can be reworded in shorter, simpler sentences
- interpretations, inferences, or other cues to more abstract meaning can be modeled

Example: Text says, "Stop that noise! bellowed Elephant.
Paraphrase: "Elephant was so upset by all the noise, he yelled, "Stop that noise!" He yelled it in an angry cry, a loud and mad bellow."

Summarization
- can be oral retelling or summary of previously read information
- can include rereading parts of passages to integrate ideas

Example: "Can you explain to us what has happened so far in the story?"
(Appendix B continued)

"Can you tell us what happened on this page?"
"Can you read that paragraph again for us?"

Graphic Organizers
- visual representations of information consisting of key words or concepts in a visual array
- allows for metalinguistic analysis of story grammar constituents (i.e., characters, setting, initiating event, plans, attempts, resolutions, moral, etc.) and understanding of how author constructs a story for the reader
- topic or concepts can be held in focus long enough to be compared and placed in relationship with new and old information

- can be reviewed for recall
- helps child learn how to retell or summarize a story
Example: flow charts, diagrams, semantic webs, story maps, time lines, etc.

Turn Assistance
- on completing a turn in the dialogue about the story, the clinician supples a form of turn assistance to cue child to take the next turn. Forms of turn assistance include:

-Binary Choice
Example: "The milkman picks up the empty bottles, or the full bottles?"

- Cloze Procedure
Example: "The milkman picks up the empty ..." (bottles)
"The milkman is smiling. He must be ..." (happy)
"Every day, the milkman..." (delivers the milk)

- Cloze Procedure with Pointing and Gestures
Example: The milkman is carrying the ..."(pointing to bottles in picture).
"The milkman is..."(gesturing action of carrying).

-Cloze Procedure with Phonemic Cues
Example: "The milkman sees the /k/..." (cat)
"The milkman is /s/..." (smiling)

-Cloze Procedure with Relational Terms
Example: "The milkman is smiling so ..." (he must be happy)
"If the milkman gives the cat some milk, then..." (the cat will be happy)
"The milkman gives the cat some milk because..." (the cat is thirsty).

LEARNING DISABILITIES

I. DEFINITION

Learning Disabilities mean severe and unique learning problems as a result of significant difficulties in the acquisition, organization, or expression of specific academic skills or concepts. These learning problems are typically manifested in school functioning as significantly poor performance in such areas as reading, writing, spelling, arithmetic reasoning or calculation, oral expression or comprehension, or the acquisition of basic concepts. The term includes such conditions as attention deficit, perceptual handicaps, process disorders, minimal brain dysfunction, brain injury, dyslexia, developmental aphasia, or sensory-motor dysfunction, when consistent with these criteria. The term does not include students who have learning problems which are primarily the result of visual, hearing, or motor impairments , mental disabilities , a behavior disorder, environmental deprivation, cultural difference or economic disadvantage.

II. CRITERIA FOR ELIGIBILITY

Criteria A through D must all be met.

A. The learning problems are not due primarily to such factors as:
   a. lack of educational opportunity,
   b. emotional stress in the home or school,
   c. difficulty adjusting to school,
   d. curricular change or temporary crisis situations,
   e. other disabling conditions,
   f. environmental deprivation or economic disadvantage
   g. cultural differences, and/or
   h. lack of motivation.

B. There must be evidence that the student, after receiving supportive and remedial regular educational assistance, still exhibits a learning disability consistent with the definition.

C. There must be evidence that the student, after receiving intervention services specific to the identified learning problems, exhibits a learning disability consistent with the definition.

D. There must be evidence of a severe discrepancy between achievement and ability as demonstrated by a difference of at least one standard deviation between the student's strongest and weakest performance in academic areas described as follows:

   1. A relative academic strength as demonstrated by performance no more than one standard deviation below the mean in grades 3 through 12 or one-half standard deviation below the mean in grades K through 2 for the grade level appropriate for the child's chronological age in one or more of the areas listed under 2 below. The relative academic strength must in addition be at least one standard deviation higher than the lowest academic area identified in 2 below.

2. An academic deficit or deficits, as demonstrated by performance greater than one and one-half standard deviations below the mean in grades K through 2, or two standard deviations below the mean in grades 3 through 12 for the grade level appropriate for the student's chronological age in one or more of the following areas.

    a. Reading recognition
    b. Reading comprehension
    c. Math calculations
    d. Math reasoning
    e. Oral expression
    f. Listening comprehension
    g. Written expression
    h. Other age-appropriate developmental skill areas when more appropriate for kindergarten students

The multidisciplinary team may use its professional judgement to determine if a learning disability exists, when an academic strength is indicated by a preponderance of the data collected as a part of the evaluation. These data must include, at a minimum, the implementation and analysis of the results of individual interventions, the results of the student observation, curriculum based assessment, teacher interview(s), and may include any other data collected through formal or informal procedures. Whenever the multidisciplinary team decides to use these data to classify a student with Learning Disabilities, a full explanation and justification must be included in the evaluation report.

III. PROCEDURE FOR SCREENING

General Screening Procedures shall be followed.

IV. PROCEDURES FOR EVALUATION

A. Sensory screening, if not previously conducted.

B. A review of the student's educational, social, and medical history, including the attendance record.

C. An interview with the student.

D. An interview with the student's teacher in order to specify and behaviorally define the areas of concern, determine the teacher's expectations for the student and class, and clarify any previous interventions.

E. A family interview conducted by a school social worker or other qualified pupil appraisal staff member to determine the impact of social, cultural, developmental, emotional, and/or health factors on the student's current performance.

F. Observation and study of the student's academic and/or social behaviors in daily activities.

G. The development and implementation of individual interventions which must be conducted by pupil appraisal personnel for a reasonable period of time.

The intervention requirement may be waived only in circumstances in which the multidisciplinary team, after a thorough review and analysis, determines that previously conducted interventions met the requirements as stated in the Procedures for Evaluation for designated exceptionalities. Interventions conducted prior to the initiation of the individual evaluation must have included such procedures as systematic measurement, pre and post tests, etc. in order to be substituted for the intervention requirement. All intervention results must be analyzed and included in the evaluation report.

H. A review and analysis of the results of the individual intervention(s) including systematic measurement of academic and/or social behaviors of concern conducted prior to and following implementation of the intervention, or prior to implementation with repeated measures during the intervention.

I. An educational evaluation conducted by an educational assessment teacher or other qualified pupil appraisal staff member to determine the student's level of performance in academic areas, which includes a curriculum based assessment of academic errors, an analysis of the appropriateness of the curriculum, informal and formal assessments, and an estimate or determination of instructional and frustrational levels.

J. A psychological assessment conducted by a certified school psychologist, in an effort to identify and describe the student's primary learning disability and, when necessary, to rule out a mental disability as the primary condition. The psychological assessment shall include:

1) an assessment of the student's learning problems within the educational context and with respect to the referral problem;

2) an appraisal of emotional or cultural factors which may be causing or contributing to the student's problems;

3) an assessment of the student's achievement motivation; and

4) may include an intellectual assessment or assessment of basic psychological processes.

K. A speech/language evaluation by a certified speech/language/hearing specialist or speech pathologist shall be conducted when oral expression is suspected to be an area of impairment.

L. When neurological or other health problems are suspected, an evaluation shall be conducted by a physician, neurologist, or neuropsychologist.

V. REEVALUATION

The reevaluation of students classified with Learning Disabilities shall consist at a minimum of the following:

1. All requirements specified under the Individual Evaluation Process: Reevaluation Section of this Bulletin.

2. If, as a result of the reevaluation conducted according to 1. above, it is suspected that the student does not have learning disabilities in accordance with the definition, an evaluation according to all procedures specified under the Procedures for Evaluation for Learning Disabilities section shall be conducted. In such cases, the student shall meet the current eligibility criteria for continued classification as a student with learning disabilities.

SPEECH IMPAIRMENTS

I. DEFINITION

Speech impairments are communication disorders such as stuttering, impaired articulation, a language impairment, or a voice impairment which adversely affects a student's educational performance. The basic communication system (whether oral, gestural, or graphic) evidences disorders or deviations in language, articulation, fluency or voice, which interfere with the student's educational performance or developmental functioning. Dialectal variations alone do not qualify a student to be classified with speech impairments.

II. CRITERIA FOR ELIGIBILITY

Criteria A in addition to B, C, D, or E must be met for students to be classified as having Speech Impairments.

A. There is documented evidence that the impairment significantly interferes with the student's educational performance or significantly interferes with the child's developmental functioning to a degree inappropriate to his cultural and social background or overall developmental level.

B. Language - Impaired receptive, associative or expressive disorders of phonology, morphology, syntax, semantics, or pragmatics. Children shall exhibit a deficit of at least 1.5 standard deviations below the mean based on chronological age.

> Some language difficulties cannot be described as a difference from the norm either because specific norms are not available or because the individual's language is deviant in a way not described adequately by developmental norms. In such cases, language samples should be analyzed and language behavior documented with deviations described in various settings. An overall picture of language behavior should be described. Students who are non-oral communicators shall be described according to their augmentative and/or alternative communication needs.

C. Articulation - Non-maturational speech disorders of one or more phonemes characterized by consistent omission or incorrect production of speech sounds.

D. Fluency - Inappropriate rate and time patterning of speech at least 5 percent of the time, characterized by any of the following: sound and syllable repetitions, sound prolongations, audible or silent blocking, interjections, broken words, circumlocutions, or words produced with an excess of tension and accompanied by ancillary movements that are indicative of stress or struggle. A child exhibiting normal non-fluencies occurring during the developmental speech stage does not meet this criterion.

E. Voice - Any inappropriate consistent deviation in pitch, intensity, quality, or other basic phonatory or resonatory attribute.

III. PROCEDURES FOR SCREENING

1. General Screening Procedures shall be followed for enrolled students; and Sections B, C, D, and G for non-enrolled students.

2. A developmental screening for children aged 3 through 5, to rule out the presence of additional impairments.

> Follow Noncategorical Preschool procedures if delays, other than speech, are evident as a result of screening.

IV. PROCEDURES FOR EVALUATION

A. A speech/language evaluation shall be conducted by a licensed speech pathologist or certified speech/hearing/language specialist and shall include:

1. Use of standardized test instruments and/or published normative data in speech pathology or child development.

2. Formal or informal analysis of a communication sample.

3. Additional information gathered from sources such as criterion-referenced materials, communication-related data collected by other professionals (including other pupil appraisal personnel and teachers), and an observation of communication skills.

4. An evaluation of the structure and function of the oral peripheral mechanism.

5. Augmentative communication needs when appropriate.

B. An educational assessment to review academic skills and to determine if the speech impairment significantly interferes with the student's educational performance. This assessment may be conducted by the student's classroom teacher and shared with the certified speech/hearing/language specialist or speech pathologist. The effect of the speech impairment on educational performance must be documented in the evaluation report.

C. An evaluation conducted by an appropriate medical specialist in all cases in which there is a suspected voice impairment.

D. Information from a parent conference or other communication with the parent(s) shall be obtained to determine if developmental, health, or other factors may be causing, contributing to, or sustaining the speech/language problem.

E. Medical, psychological, and additional educational assessments shall be requested by the evaluation coordinator when appropriate to the evaluation of a suspected disability.

V. REEVALUATION

The Reevaluation of students with speech impairments shall consist at a minimum of:

A. All requirements as specified under the Individual Evaluation Process: Reevaluation Section.

B. A description of current speech/language behavior gathered through observation and language sampling. Standardized instruments may be used when deemed necessary by the multidisciplinary team.

C. A review of a report of hearing acuity which was conducted within the previous 24 months.

APPENDIX D.1 PARENTAL INFORMATION AND CONSENT LETTER(SPECIAL EDUCATION OR SPEECH IMPAIRED STUDENT)

Dear _____

INVITATION TO PARTICIPATE

Your child _____has been selected as a potential subject for an educational research project conducted by Kathryn DeKemel,
M.A. CCC-SLP. Ms. DeKemel is employed as a speech-language pathologist (SLP) in Jefferson Parish schools. She is currently on leave of absence from her position, in order to complete her doctoral studies at Louisiana State University in Communication Sciences and Disorders.

PURPOSE OF THE STUDY

The research project in question is designed to determine if a form of treatment known as *Communicative Reading Strategies* can be used to improve the reading, story retelling (narrative) and question-answering abilities of students who exhibit language and/or learning disabilities.

EXPLANATION OF PROCEDURES

Should you decide to allow your child to participate in the study, he/she would be randomly assigned to one of two groups; a treatment group or a no-treatment group. Both groups will receive a battery of formal and informal tests to assess reading and language abilities at the beginning and end of the study. Informal testing will include having each child read a story aloud, answer questions about the story, and retell the story when the reading is completed. This same informal testing procedure will be repeated during week 3, week 6, and week 9 of the study. In addition to participating in the testing sessions, students assigned to the treatment group will be seen by Ms. DeKemel for three, thirty to forty-five minute therapy sessions each week.

POTENTIAL RISKS AND BENEFITS

This study involves no risk to your child. Should your child be assigned to the no-treatment group, he/she will continue to receive the speech-language therapy services he normally receives from the school-based speech-language pathologist (SLP); participation in this study will in no way interfere with those sessions. If your child is assigned to the treatment group, he/she will be seen for speech-language therapy by Ms. DeKemel instead of the regular school-based SLP for the duration of the 9 week treatment phase of the study. At the end of the treatment phase, your child would again be serviced by the school-based SLP. Every effort will be made to schedule diagnostic and therapy sessions at times that do not interfere with critical academic subjects.

PROTECTION OF CONFIDENTIALITY

All information generated as a result of this study will be kept strictly confidential. However, at your request, information from the study will be shared with your child's teacher and/or the school-based SLP. Your child's name will not be used on any recording forms (codes will be used instead), nor will names be used should the data eventually be published. Sessions with your child will be videotaped by Ms. DeKemel, to allow for later in-depth analysis, and to provide a permanent record of the data. These videotapes may also be viewed by one or two additional examiners (e. g., professors at LSU and/or other doctoral students at LSU) in order to ensure inter-examiner reliability (i. e., to check to see if different examiners agree with the scores given for certain responses).

WITHDRAWAL FROM THE STUDY

You may withdraw your child from the study at any time. Your child may also withdraw from the study at any time at his/her request, with your approval.

OFFER TO ANSWER QUESTIONS

You may ask questions at any time before, during and after the project has been completed. Please feel free to contact any of the researchers listed below if you have questions.

YOU ARE VOLUNTARILY MAKING A DECISION WHETHER OR NOT TO ALLOW YOUR CHILD TO PARTICIPATE IN THIS PROJECT. YOUR SIGNATURE BELOW INDICATES THAT YOU HAVE DECIDED TO ALLOW YOUR CHILD TO PARTICIPATE IN THE PROJECT.

I _____, parent/guardian of child _____ hereby grant permission for my child to participate in the research project described above. I certify that the above information has been thoroughly explained to me, and that I have had the opportunity to ask questions about the study. I understand that all information related to my child will be kept strictly confidential. I understand that sessions with my child will be videotaped. I understand that I may withdraw my child from the study at any time (and that my child may withdraw at his/her request, with my permission). I understand that if I have questions about the project, I may contact the investigators at the numbers listed below.

Signature of Parent

Date

Signature of Investigator
Janet Norris, PhD
LSU (504) 388-3936

Signature of Investigator
Paul Hoffman, PhD
LSU (504) 388-2545

Signature of Student Investigator
Kathryn DeKemel M. A. CCC-SLP
(504) 483-6906

APPENDIX D.2 PARENTAL INFORMATION AND CONSENT LETTER (REGULAR EDUCATION STUDENT)

Dear _____

INVITATION TO PARTICIPATE

Your child _____has been selected as a potential subject for an educational research project conducted by Kathryn DeKemel,
M. A. CCC-SLP. Ms. DeKemel is employed as a speech-language pathologist (SLP) in Jefferson Parish schools. She is currently on leave of absence from her position, in order to complete her doctoral studies at Louisiana State University in Communication Sciences and Disorders.

PURPOSE OF THE STUDY

The research project in question is designed to determine if a form of treatment known as *Communicative Reading Strategies* can be used to improve the reading, story retelling and question-answering abilities of students enrolled in Special Education for language and learning disabilities. Because **your child** exhibits **normal** speech, language, and reading abilities, he/she has been selected as a potential **control** subject for the study. Should you allow your child to participate, his/her performance on certain tasks would be used as a basis for comparison for the Special Education students, who exhibit deficits in reading and language abilities.

EXPLANATION OF PROCEDURES

Should you decide to allow your child to participate in the study, he/she will be assigned to a no-treatment control group. First, your child will participate in a pre-test "probe," where he/she will be asked to read a story aloud, answer questions about the story, and retell the story after the reading is completed. Your child's performance (along with the performance of the other Regular Education students) will then be compared with the performance of the Special Education students on these same tasks. This same testing procedure will be repeated during week 3, week 6, and week 9 of the study, again allowing for comparisons between the two groups.

POTENTIAL RISKS AND BENEFITS

This study does not involve any risk to your child, and will not interfere with your child's regular classroom activities in any significant way. The testing probes will be conducted in a quiet room in the school building, and should take no longer than one hour to complete on each occasion. Your child's teacher will be consulted regarding the best time for scheduling the probes, and your child will be allowed to make up any work missed as a result of participating in the project.

PROTECTION OF CONFIDENTIALITY

All information generated as a result of this study will be kept strictly confidential. However, at your request, information from the study will be shared with your child's teacher.

Your child's name will not be used on any recording forms (codes will be used instead), nor will names be used should the data eventually be published. Sessions with your child will be videotaped by the student investigator (Ms. DeKemel), to allow for later in-depth analysis, and to provide a permanent record of the data. These videotapes may also be viewed by one or two additional examiners (e. g., professors at LSU and/or other doctoral students at LSU) in order to ensure inter-examiner reliability (i. e., to check to see if different examiners agree with the scores given for certain responses).

WITHDRAWAL FROM THE STUDY

You may withdraw your child from the study at any time. Your child may also withdraw from the study at any time at his/her request, with your approval.

OFFER TO ANSWER QUESTIONS

You may ask questions at any time before, during and after the project has been completed. Please feel free to contact any of the researchers listed below if you have questions.

YOU ARE VOLUNTARILY MAKING A DECISION WHETHER OR NOT TO ALLOW YOUR CHILD TO PARTICIPATE IN THIS PROJECT. YOUR SIGNATURE BELOW INDICATES THAT YOU HAVE DECIDED TO ALLOW YOUR CHILD TO PARTICIPATE IN THE PROJECT.

I _____, parent/guardian of child _____ hereby grant permission for my child to participate in the research project described above. I certify that the above information has been thoroughly explained to me, and that I have had the opportunity to ask questions about the study. I understand that all information related to my child will be kept strictly confidential. I understand that sessions with my child will be videotaped. I understand that I may withdraw my child from the study at any time (and that my child may withdraw at his/her request, with my permission). I understand that if I have questions about the project, I may contact the investigators at the numbers listed below.

Signature of Parent	Date
Signature of Investigator Janet Norris, PhD LSU (504) 388-3936	Signature of Investigator Paul Hoffman, PhD LSU (504) 388-2545

Signature of Student Investigator
Kathryn DeKemel M. A. CCC-SLP
(504) 483-6906

APPENDIX D.3 STUDENT CONSENT FORM

Student Consent Form

I, _____, a student at _____ school, understand that by signing this form, I am agreeing to participate in a research project with Ms. DeKemel, a speech-language pathologist at my school. I understand that this project is designed to help improve my reading, story retelling, and question-answering abilities. I understand that my parents have given permission for me to participate in the project. I understand that my parents have the right to withdraw me from the project at any time, and that I may withdraw at my own request, with permission from my parents. I understand that I may ask questions about the project at any time.

_____	_____
Signature of Student	Date
_____	_____
Signature of Investigator Janet Norris, PhD LSU (504) 388-3936	Signature of Investigator Paul Hoffman, PhD LSU (504) 3882545

_____
Signature of Student Investigator
Kathryn DeKemel, M. A. CCC-SLP
(504) 483-6906

APPENDIX E.1 SUMMARY OF DIAGNOSTIC TEST RESULTS AND SUBJECT DATA

	DOB	Chron. Age	Race/ Gender	Special Education Classification	Teacher Estimate Read	Group Assign	Clinical Evaluation Language Fundamentals Receptive	Expressive	Total	Grade	NonVerbal IQ TONI
TLD 1	01/06/87	10-1	BF	LD/SI	beg 3	TLD	75	75	73	4	114
TLD 2	07/10/87	9-7	BF	LD/SI	1.5-2	TLD	82	75	77	4	100
TLD 3	29903	11-3	BM	SI	1-2	TLD	65	50	55	4	89
TLD 4	07/21/86	10-7	WM	LD/SI	beg. 2	TLD	78	50	62	4	79
TLD 5	04/17/86	10-10	BF	LD/SI	2-3	TLD	80	78	77	4	100
NLD 1	08/03/86	10-6	BF	OHI/BD/SI	beg 2	NLD	69	50	57	5	87
NLD 2	09/12/86	10-6	BM	LD/SI	beg 3	NLD	78	69	72	5	101
NLD 3	07/18/86	10-8	WF	LD/SI	beg 3	NLD	75	69	70	5	101
NLD 4	01/24/86	11-2	WF	SI	2-3	NLD	61	53	54	5	98
NLD 5	06/29/85	11-8	WM	LD/SI	beg 3	NLD	78	75	75	5	98
RAM 1	02/26/89	8-0	WF	Reg. Ed.	2-3	RAM	90	88	88	2	107
RAM 2	06/19/88	8-8	BF	Reg. Ed.	2-3	RAM	98	92	94	2	105
RAM 3	09/24/88	8-5	WF	Reg. Ed.	2-3	RAM	112	118	115	2	99
RAM 4	08/06/89	7-6	WF	Reg. Ed.	2-3	RAM	110	118	114	2	93
RAM 5	07/04/89	7-7	WM	Reg. Ed.	2-3	RAM	98	120	109	2	114

APPENDIX E.2 READING GRADING LEVELS

	BRI Estimate of Levels			Teacher Estimate of
Subject	Independent	Instruc	Frust	Reading Levels
TLD 1	1-2	2-3	3-4	beg 3
TLD 2	PP-P	1-2	2-3	1.5-2
TLD 3	PP-P	1-2	2-3	1-2
TLD 4	none	PP-P	P-1	1.5-2
TLD 5	1-2	2-3	3-4	2-3
NLD 1	PP-1	1-2	2-3	beg 2
NLD 2	1-2	2-3	3-4	beg 3
NLD 3	1-2	2-3	3-4	beg 3
NLD 4	1-2	2-3	3-4	2-3
NLD 5	1-2	2-3	3-4	beg 3
RAM 1	P-1	1-2	2-3	late 2-beg. 3
RAM 2	1-2	2-3	3-4	late 2-beg. 3
RAM 3	1-2	2-3	3-5	late 2-beg. 3
RAM 4	P-1	1-2	2-3	late 2-beg. 3

APPENDIX F MISCUE ANALYSIS SYSTEM

Miscue	Symbol	Coding Procedure
Accuracy Related Miscues		
Substitution	Dad ~~father~~	Line drawn through miscued word; substituted word (including mispronunciation, partial, or non-word substitution) is written above misplaced word ; phonetic transcription used when necessary to transcribe mispronunciations, partial, or non-word substitutions.
Addition/Insertion	∧	Caret placed below line of text at point of miscue. Added word(s) written above text.
Omission	~~brown~~	Line drawn through omitted word(s).
Reversal		Transposition marks placed around reversed words.
Fluency Related Miscues		
Repetition	R	"R" written over repeated word(s). (Note: A curved arrow will be used to indicate at what point the subject reverted backward to repeat a phrase; each repeated word in the phrase will be counted as one repetition miscue). Ex:  She's a very quiet baby.
Pause		Elongated "P " to indicate inappropriate pause.
Phrasing		Slash mark placed through missed punctuation.
Intonation	↑ ↓	Inappropriate intonational rise or fall marked with arrows.
Word by Word Reading	on time	Underline word(s) read "word by word"

Other Notations (these deviations from the text will not be counted as errors)

Dialectal variation	(D)	Circled "D" placed above the miscue attributed to dialect.
Self-correction	SC	"SC" written above and to the right of another error notation, to indicate that the reader self-corrected

Ex: Dad/SC
~~father~~

APPENDIX G QUESTION RESPONSE SCORING SYSTEM

Question Type	Score	Description
Factual (F)	0	Inaccurate, Incomplete
	1	Partially Correct, Incomplete, Plausible but not Probable
	2	Accurate, Complete, Most Plausible
Interpretation (IP)	0	Inaccurate, Incomplete
	1	Partially Correct, Incomplete, Plausible but not Probable
	2	Accurate, Complete, Most Plausible
Inference (IF)	0	Inaccurate, Incomplete
	1	Partially Correct, Incomplete, Plausible but not Probable
	2	Accurate, Complete, Most Plausible

APPENDIX H NARRATIVE SCORING CRITERIA

Subject: _____ Date: _____

Obligatory Features:
Score items 1-10 according to the following criteria:
0 = No evidence
1 = Meager to fair evidence
2 = Strong evidence

Adherence to story structure
1. Setting (indication of time/place, or implication of setting through other description) _____
2. Identification of central characters _____
3. Clear beginning _____
4. Clear ending _____

Major plot episodes
5. Statement of problem _____
6. Statement of plans/attempts to solve problem _____
7. Statement of consequences/resolution of problem _____

Coherence
8. Correct sequence of events (temporality) _____
9. Logical cause-effect relationships (causality) _____
10. Correct use of relational and transitional terms (ex: connectives *and, then, so, if, because;* deixis, anaphora) _____

Subtotal _____

Optional Features:
Add *one (1) point to subtotal if present:*

Use of stylistic devices
11. Formal beginning (Ex: "Once upon a time"; "There once was...") _____
12. Formal ending (Ex: "The End") _____

Evaluative Statement
13. Metalinguistic statement concerning personal, world, or social significance of the story; an abstract "moral" or "lesson learned" from the story _____

Subtotal _____

Subtract *one (1) point from subtotal if present:*

14. Incorrect/erroneous info; addition of episodes or info not present in original story _____

TOTAL _____

(Adapted from Koskinen et al., 1993; Fox & Wright, 1997)

APPENDIX I STORY MAP

TITLE:

CHARACTERS (WHO):

SETTING (WHERE, WHEN):

INITIATING EVENT:

PROBLEMS:

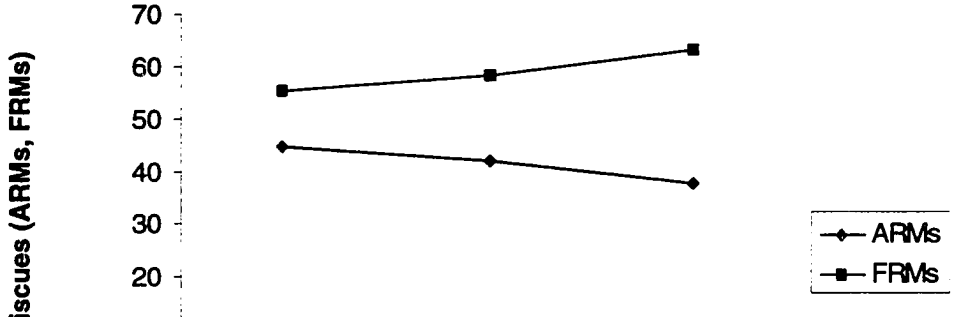
ATTEMPTS:

CONSEQUENCES:

RESOLUTION:

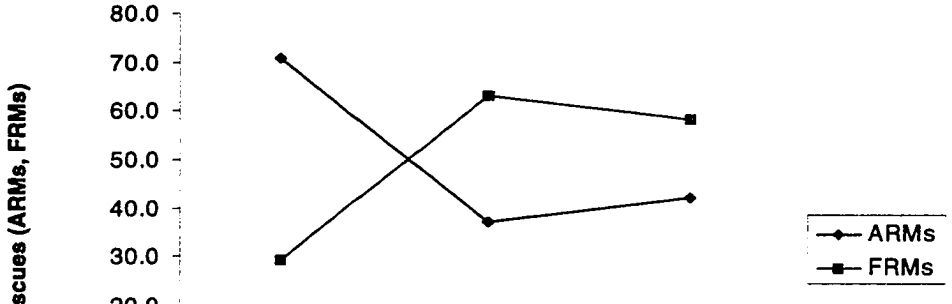
MORAL:

APPENDIX J.1 SUBJECT TLD1 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



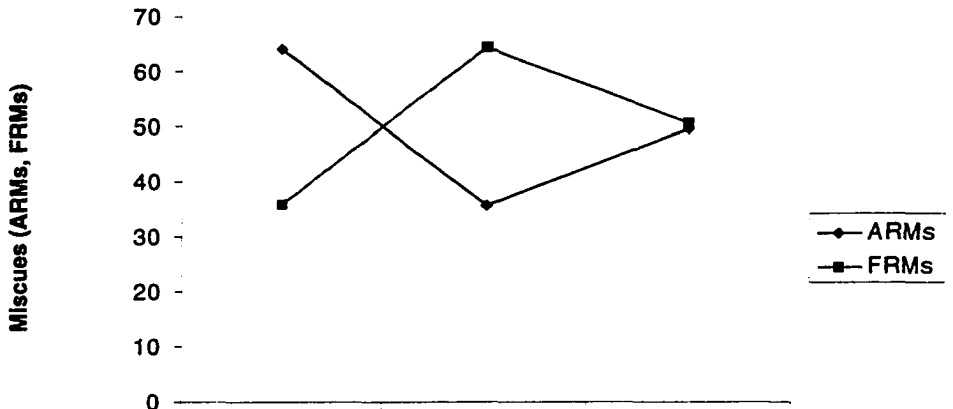
	P1 (A)	P2(B)	P4 (A)
ARMs	44.6	41.8	37.2
FRMs	55.4	58.2	62.8

APPENDIX J.2 SUBJECT TLD2 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



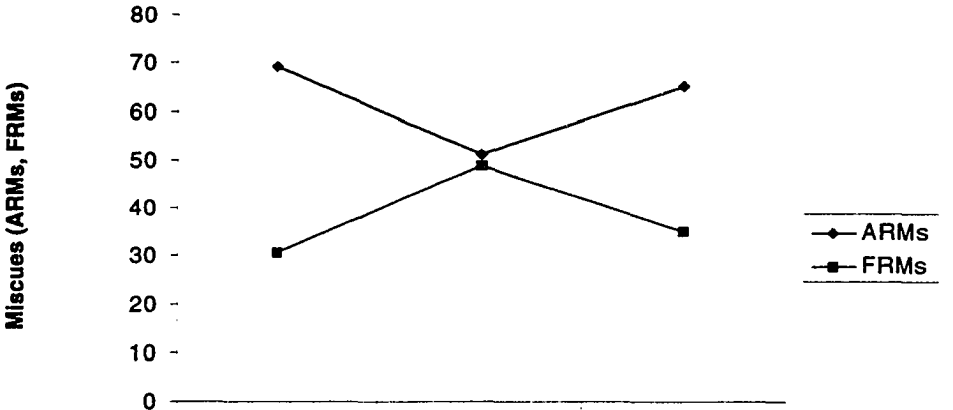
	P1 (A)	P2(B)	P4 (A)
ARMs	70.7	37.0	42.0
FRMs	29.3	63.0	58.0

APPENDIX J.3 SUBJECT TLD3 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



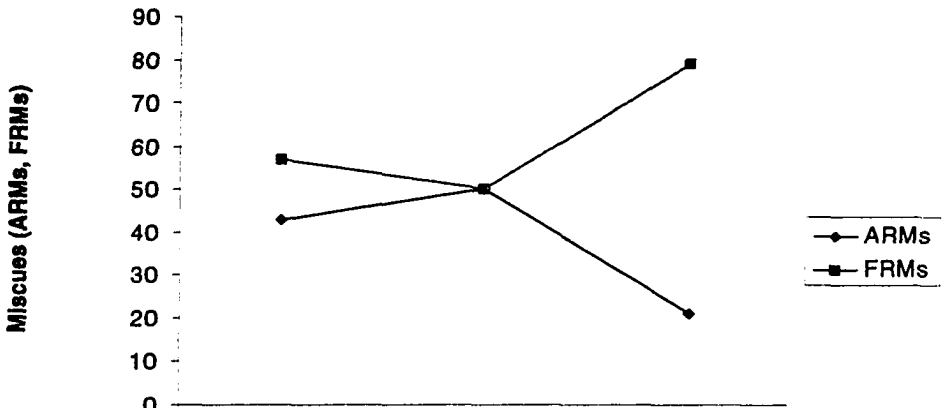
	P1 (A)	P2(B)	P4 (A)
ARMs	64.1	35.7	49.5
FRMs	35.9	64.3	50.5

APPENDIX J.4 SUBJECT TLD4 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



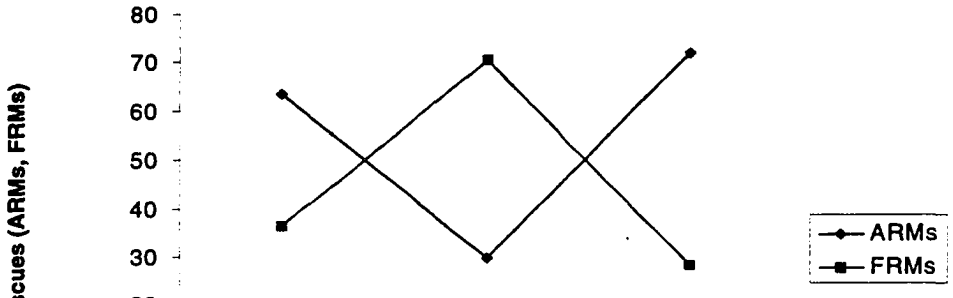
	P1 (A)	P2(B)	P4 (A)
ARMs	69.2	51.2	65
FRMs	30.8	48.8	35

APPENDIX J.5 SUBJECT TLD5 COMPARISION OF ARMS TO FRMS ACROSS PROBES 1,2,4



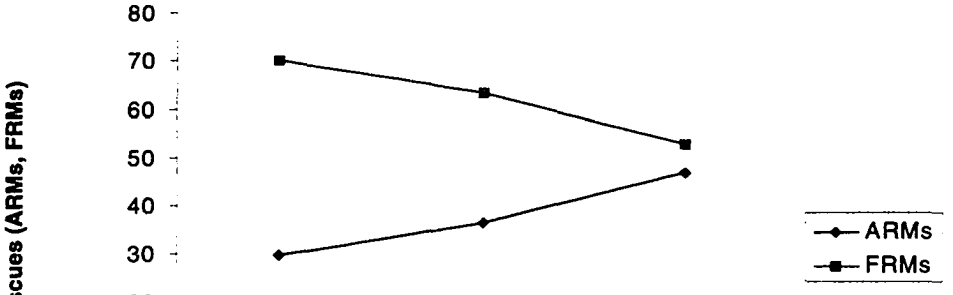
	P1 (A)	P2(B)	P4 (A)
ARMs	42.9	50	21.1
FRMs	57.1	50	78.9

APPENDIX K.1 SUBJECT NLD1 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



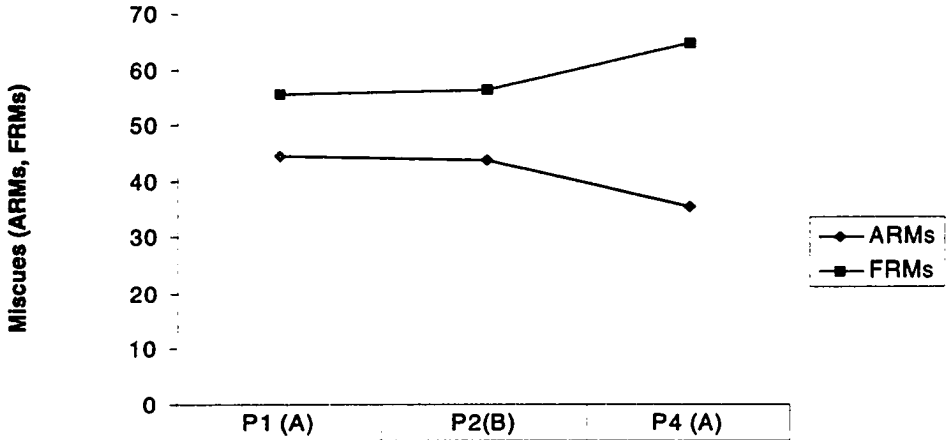
	P1 (A)	P2(B)	P4 (A)
ARMs	63.5	29.6	71.9
FRMs	36.5	70.4	28.1

APPENDIX K.2 SUBJECT NLD2 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



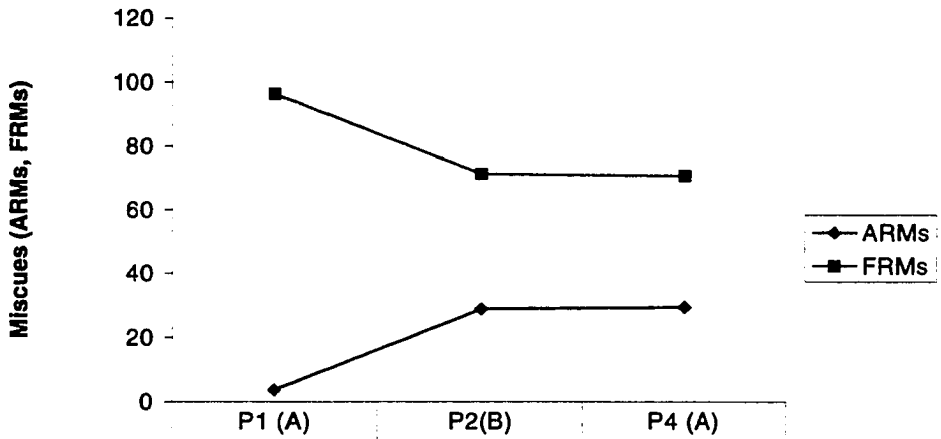
	P1 (A)	P2(B)	P4 (A)
ARMs	29.9	36.5	47.1
FRMs	70.1	63.5	52.9

APPENDIX K.3 SUBJECT NLD3 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



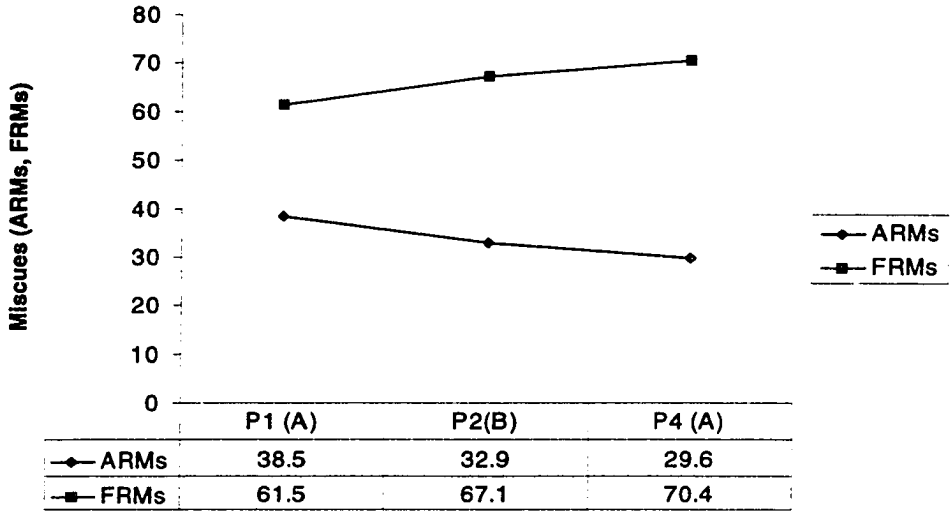
	P1 (A)	P2(B)	P4 (A)
ARMs	44.4	43.8	35.3
FRMs	55.6	56.3	64.7

APPENDIX K.4 SUBJECT NLD4 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



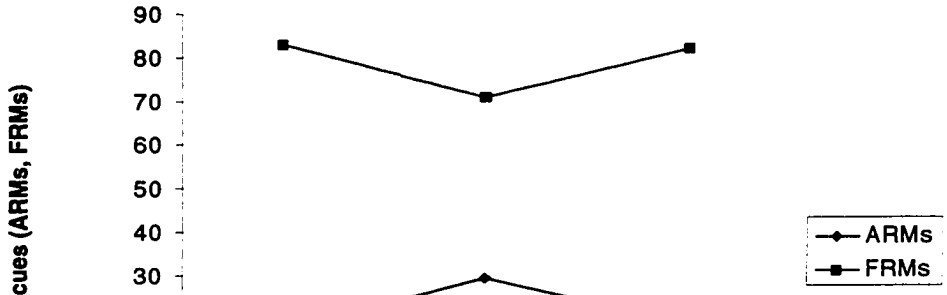
	P1 (A)	P2(B)	P4 (A)
ARMs	3.7	28.8	29.4
FRMs	96.3	71.2	70.6

APPENDIX K.5 SUBJECT NLD5 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



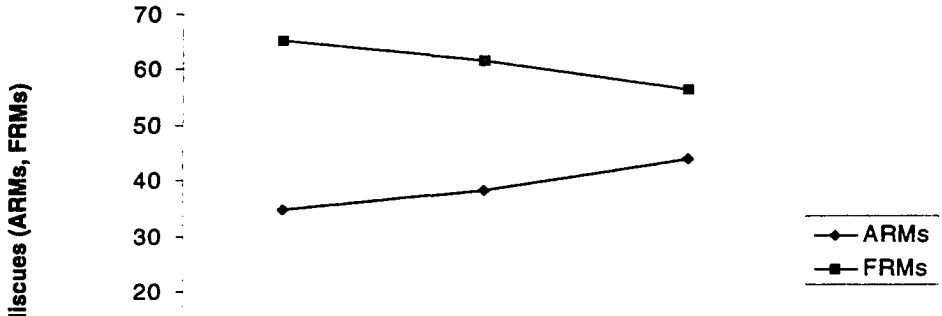
	P1 (A)	P2(B)	P4 (A)
ARMs	38.5	32.9	29.6
FRMs	61.5	67.1	70.4

APPENDIX L.1 SUBJECT RAM1 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



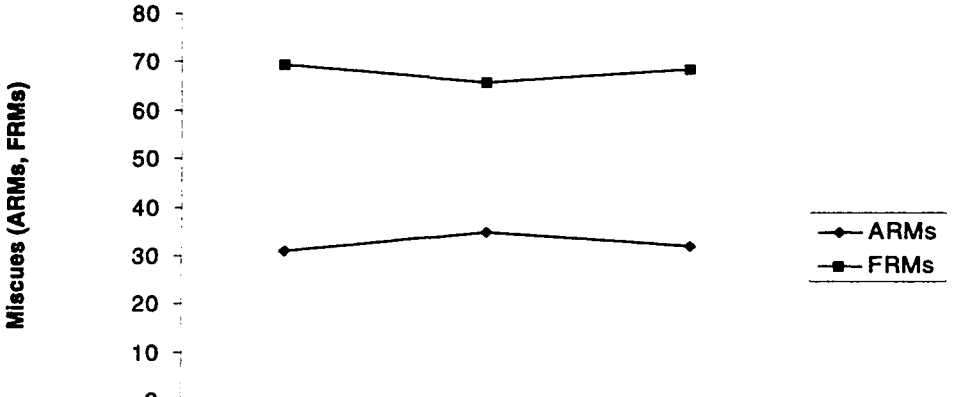
	P1 (A)	P2(B)	P4 (A)
ARMs	17.2	29.2	18.2
FRMs	82.8	70.8	81.8

APPENDIX L.2 SUBJECT RAM2 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



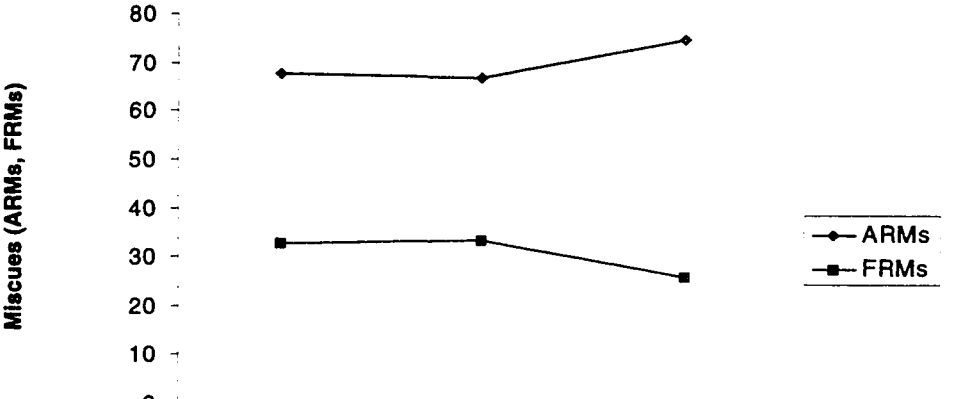
	P1 (A)	P2(B)	P4 (A)
ARMs	34.7	38.4	43.8
FRMs	65.3	61.6	56.3

APPENDIX L.3 SUBJECT RAM3 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



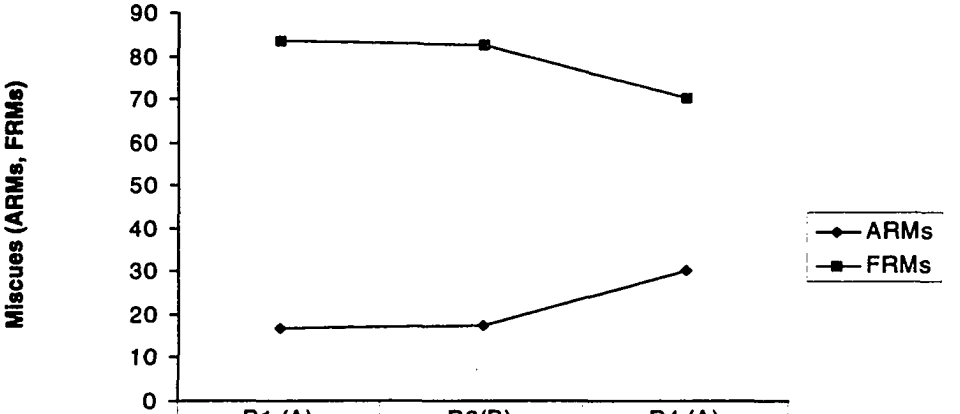
	P1 (A)	P2(B)	P4 (A)
ARMs	30.8	34.5	31.8
FRMs	69.2	65.5	68.2

APPENDIX L.4 SUBJECT RAM4 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



	P1 (A)	P2(B)	P4 (A)
ARMs	67.5	66.7	74.4
FRMs	32.5	33.3	25.6

APPENDIX L.5 SUBJECT RAM5 COMPARISON OF ARMS TO FRMS ACROSS PROBES 1,2,4



	P1 (A)	P2(B)	P4 (A)
ARMs	16.7	17.5	30.1
FRMs	83.3	82.5	69.9

VITA

Kathryn P. DeKemel is a licensed, certified speech-language pathologist (SLP) currently employed as an instructor in the Department of Speech and Hearing Sciences at the University of North Texas (UNT) in Denton, Texas, where she teaches undergraduate and graduate courses in language development and language disorders. She received a bachelor of arts degree in Speech from Louisiana State University (L.S.U.) in 1982, and a master of arts degree in Speech-language Pathology from L.S.U. in 1985. She has thirteen years experience as a practicing SLP in a variety of work settings including public schools, universities, hospitals, Head Start, home health, and private practice. She will receive the degree of Doctor of Philosophy in Communication Sciences and Disorders from L.S.U. in December, 1998.

DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate: Kathryn DeKemel

Major Field: Communication Disorders

Title of Dissertation: Using Scaffolded Interaction to Improve LLD Readers' Inferencing and Narrative Abilities

Approved:

Major Professor and Chairman

Dean of the Graduate School

EXAMINING COMMITTEE:

Date of Examination:

05/07/98