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Ability and Flexibility in Reading Comprehension

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ABILITY AND FLEXIBILITY IN READING COMPREHENSION

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This thesis submitted by Dee Rene Doeling in partial fulfillment of the requirements for the Degree of Master of Arts from the University of North Dakota is hereby approved by the Faculty Advisory Committee under whom the work has been done.

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ABSTRACT

The process by which a novice reader becomes a fluent reader is an important area of investigation. Many theoretical models of reading comprehension have been suggested and much research concerning individual differences in reading has been published.

One strategy used by good readers is to spend additional time viewing or reading information which is relevant to their goals or purpose. Additional viewing time of goal-relevant information should lead to superior retention of this information, at the expense of information which is irrelevant to the reader's goals. One way to detect different strategies used by good and poor readers is to measure how much viewing time readers allot to goal-relevant information and how much of this material is recalled. A second method of detecting different strategies used by good and poor readers is to analyze the errors readers make when they read aloud. Better readers seem to produce fewer errors and to make certain types of errors.

This study was designed to examine the impact of reading ability upon reading for a specific goal. Forty fourth-grade and thirty-nine sixth-grade subjects classified as good or poor readers read a story orally and their production was then analyzed for errors. All subjects also read two stories and answered questions about them. In the treatment condition, questions were known beforehand. In the control condition, no questions were given before reading the story. Inspection times were recorded for all subjects while they read at their own rate.

Results showed that both good and poor readers spent more time viewing information relevant to their goal. All subjects also recalled more goal-relevant than irrelevant information. Good readers additionally produced fewer errors when reading orally and corrected more of them, but did not produce more of a certain type of error. Finally, oral miscue analysis scores significantly improved the prediction of performance on goal-relevant recall beyond that predicted by vocabulary scores for fourth-grade subjects, but not for sixth-grade subjects.

The results are discussed as lending support to the concept of the mature reader as an adaptive, flexible processor of information, able to vary strategies as required to obtain the desired reading goal. While both good and poor readers spent more time viewing goal-relevant material and recalled more goal-relevant information, better readers appeared to be more efficient at doing so. Thus, good readers seem to have effective conscious control over their reading processes, a metacognitive skill. Implications of this research and possible future directions of research in this area are also discussed.

CHAPTER I

INTRODUCTION

Reading is a very complex activity involving both perceptual and cognitive skills. It is the process of understanding written language (Smith 1978) or extracting information from text (Massaro 1978). "Reading is an active process, self-directed by the reader in many ways and for many purposes" (Gibson & Levin, p. 5). The reader must not only perceive the written words, but also make sense of them. For the fluent reader, this comprehension process takes only a fraction of a second.

The process by which a novice reader becomes a fluent reader is currently an important area of investigation. Many theoretical models of reading comprehension have been suggested and much research concerning individual differences in reading has been published. There seem to be three basic ways in which mature readers are differentiated from less skilled readers. First, better readers seem to be superior at automatic context-free word recognition (Golinkoff 1975/1976; West & Stanovich 1979). Secondly, better readers appear to be able to exert a greater degree of deliberate conscious control over their reading processes (Brown 1980). Finally, better readers seem to adopt superior reading strategies to accomplish their particular goal in reading (Eamon 1978/1979; Grabe & Prentice 1979; Rothkopf & Billington 1979).

One strategy used by good readers is to spend additional time viewing, reading, or studying information which is relevant to their goals or purpose. Rothkopf and Billington (1979) and Grabe (1981) found that readers spent more time viewing or reading material relevant to their purposes than irrelevant material.

Additional viewing time of goal-relevant information should lead to superior retention of this information, at the expense of information which is irrelevant to the reader's goals. Rothkopf and Billington (1979) found that this is indeed the case with older subjects. The question arises, then, of whether this skill is present in young, elementary-age readers. This question will be addressed and describes the first basic purpose of this research.

A second method of detecting different strategies used by good and poor readers is to analyze the errors readers make when they read aloud. This method of classifying various errors produced during oral reading was proposed by Kenneth and Yetta Goodman (1977). It allows researchers to study the processes involved in reading and is called oral miscue analysis. A study by Beebe (1980) reported that proportion of corrected miscues and proportion of uncorrected acceptable miscues (i.e., the substituted word was semantically and syntactically consistent with the actual word in the passage) were significantly correlated with better comprehension. She also reported that better readers appeared to make fewer unacceptable errors (i.e., the substituted word was not syntactically and semantically consistent with the actual word in the passage). The attempt to replicate Beebe's (1980) experiment describes the second basic purpose of this research.

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Some researchers have proposed that educators regularly use oral miscue analyses in their classrooms to give them information concerning the reading process of each student. If this information is valuable, then perhaps we can predict reading performance (as measured by recall of goal-relevant information) by use of oral miscue analysis beyond that which can be predicted by reading ability (vocabulary scores) alone. This describes the final purpose of this study. Several oral miscue scores will be used in regression analyses in an attempt to improve prediction of goal-relevant performance.

CHAPTER II

REVIEW OF THE LITERATURE

General Structure of Reading Processes

A tremendous amount of research concerning reading and reading comprehension has been generated during the past twenty-five years. These studies have focused on numerous diverse topics such as perception, memory, language, spelling, and speech and their relation to reading. Within these areas, researchers have looked at many factors affecting reading, including developmental trends, individual differences in ability, difficulty of material, and many other factors which affect reading.

Given the diversity of the fields of research related to reading and the complexity of the reading process, it is not surprising that various theoretical models of reading have been proposed to explain certain research findings. These models differ in several important ways. For example, some models stress the importance of recognizing words rapidly, while other models emphasize the role of the reader as an active, adaptive processor of information. Also, some models propose a large number of discrete stages in the reading process, while others postulate a relatively small number of continuously interacting stages.

Regardless of the differences among the various theoretical models of reading, there are two basic elements which all the models have in

common. First, every model acknowledges that certain component skills are essential for reading. For example, all models agree that the reader must be able to recognize letters and words, ascribe meaning to each printed word, and remember each segment of text long enough to assimilate new information to the previous segment of text. In other words, while all models may not agree on the total number of component processes, which components are more important, or what to label each component, all the theoretical models of reading do agree that certain component skills exist which are necessary for comprehension.

A second commonality among all the models of reading involves the flow of information between the component processes. All models agree that the information generated by each component process must be shared with the other components for comprehension to occur. Thus, while the models may not agree on how the information flows between the various components or in what direction the information flows, all the models of reading postulate that a flow of information between components is essential for comprehension.

Before looking more closely at specific theoretical models, it may be useful to discuss in more detail the component processes of reading and the flow of information between these components. Additionally, the conscious cognitive control of these processes will be discussed.

Component Processes of Reading

Reading is a very complex activity involving both perceptual and cognitive skills. It is the process of understanding written language (Smith 1978) or extracting information from text (Massaro 1978). The

reader must not only perceive the written words, but must also make sense of them.

Understanding text requires that the reader be able to integrate many component processes accurately and quickly. These component or subordinate skills can be divided into two areas--visual information and non-visual information (Smith 1978). All theoretical models of reading include both types of information, although some models emphasize one type of information more than the other type.

Visual Information. The visual information necessary for reading refers to the printed material or text. This type of information has also been called graphic information. Component processes related to visual information might include such skills as identifying an individual letter, identifying a consonant or vowel cluster, or recognizing a word. Certainly this information is important. Without it, there would be no reading. However, non-visual information is also essential.

Non-visual Information. Non-visual information refers to the information the reader already possesses and brings to the reading situation or acquires from previous sections of the text being read. It includes such things as knowledge of the subject matter, knowledge of the relevant language, syntactic (grammatical) information, and semantic (meaning) information. Syntactic information refers to how the elements of a language (e.g., nouns, verbs, prepositions, etc.) are related to each other. Semantic information includes the knowledge of word meanings which enables the reader to construct, interpret, and integrate larger units of meaning such as sentences, paragraphs, and entire prose passages.

Reciprocal Interaction. There appears to be a reciprocal relationship between visual and non-visual information (Smith 1978): The better the graphic cues are, the less non-visual information the reader needs to apply. Conversely, readers with richly integrated systems of non-visual information need fewer visual cues to read. For example, a microbiologist would presumably experience relatively little difficulty reading technical articles pertaining to his or her field, while the layman would require more time and effort, clearer print, and superior physical conditions to read the same article. The more non-visual information the reader is able to employ, the easier it is for the reader to read and the more efficient and effective the reading is.

Flow of Information

A second source of difference among various models of reading is the flow of information. While all models state that information must be exchanged between the various components, they do not agree on how or in which direction this information flows.

Bottom-up. One type of information flow has been termed "bottom-up" processing. In this type of model, information processing is assumed to begin at the lowest level (i.e., graphic input). Once processing is complete at the lowest level (e.g., a letter has been recognized), the information from that level is sent to the next highest level (e.g., recognizing a consonant cluster) to facilitate that level of processing. As each level of processing is completed, the information is passed along to successively higher levels until comprehension results.

Bottom-up models have also been termed "outisde-in," "data-driven" (Masson & Sala 1978), and "text-based" (Frederiksen 1977).

Top-down. Top-down processing refers to beginning processing at the highest level. In this way, higher-level processes can influence lower-level ones. For example, a reader who has been reading about a particular topic may begin to generate hypotheses about what he or she expects to read next. These expectations may either facilitate and speed up lower-level processes or they may cause the reader to make errors and slow the reading process when what is expected does not appear.

Top-down models have also been called "inside-out" processing, "conceptually-driven" (Masson & Sala 1978), and "schema-based" (Frederiksen 1977).

Interactive. Top-down and bottom-up models allow information to flow in only one direction. Recent theorists, however, have speculated that reading is the result of an interaction between bottom-up and top-down processing (Rumelhart 1977; Stanovich 1980). These theorists point out that we need both visual and non-visual information with information flowing in both directions for effective and efficient reading.

Metacognition

In addition to the basic component processes of reading and the flow of information among these processes, some models add a higher-level control and evaluation mechanism known as metacognition. "Metacognition refers to the deliberate conscious control of one's own cognitive actions" (Brown 1980).

It is important to differentiate between cognition and metacognition. Cognition refers to cognitive processes such as memory, attention, learning, language, and reading. It includes the strategies engaged in to complete these activities. Metacognition, on the other hand, refers to the active monitoring and controlling of these processes, usually to obtain some concrete goal (Flavell 1976). For example, the ability to recall previously learned information is a cognitive skill; however, the ability to distinguish between what is known but can not be retrieved at the time and what is not known at all is a metacognitive skill.

Brown and DeLoache (1978) suggest that there are several basic metacognitive skills. They list the following:

> predicting the consequences of an action or event, checking the results of one's own actions (did it work?), monitoring one's ongoing activity (how am I doing?), reality testing (does this make sense?), and a variety of other behaviors for coordinating and controlling deliberate attempts to learn and solve problems (pp. 14-15, italics in original).

They suggest that important areas of research concerning metacognitive skills include the tasks of extracting the main idea, visual scanning, and retrieval processes.

John Flavell (1978), an important writer on the topic of metacognition, comments that children may not be efficient at metacognition for three reasons. First, they are novices at many tasks. Secondly, children may not realize that such helpful "almost universally applicable" (p. 98) metacognitive skills exist. Finally, in addition to the lack of experience noted above, maturational factors also constrain the ability to use metacognitive skills.

Metacomprehenseion. Metacognitive skills are quite important in reading comprehension. Reading researchers refer to the application

of metacognitive skills to aid comprehension in reading as metacomprehension.

Ann Brown (1980) lists a number of active metacomprehension strategies used by readers.

> Under the heading reading strategies we incorporate any deliberate planful control of activities that give birth to comprehension. These activities include: (a) clarifying the purposes of reading, that is, understanding the task demands, both explicit and implicit, (b) identifying the aspects of a message that are important, (c) allocating attention so that concentration can be focused on the major content area rather than trivia, (d) monitoring ongoing activities to determine whether comprehension is occurring, (e) engaging in review and self-interrogation to determine whether goals are being achieved, (f) taking corrective action when failures in comprehension are detected, and (g) recovering from disruptions and distractions--and many more deliberate, planful activities which render reading an efficient information gathering activity (Brown 1980, p. 4).

Thus, by utilizing the processes listed above, the reader consciously controls the process of comprehension by evaluating his or her progress and regulating his or her reading to best attain the desired goal.

In summary, various models of the reading process have been proposed. Despite the differences between the theoretical models, all theorists agree that there are certain basic components essential to reading and that information flows among the components. In addition, some models add a higher-level evaluation and control mechanism. Each theoretical model, then, is a unique combination of components, information flow, and control processes. Some of these models will now be examined more fully. Although quite a number of theoretical models of reading have been proposed, it should be noted that only the models of reading selected as important and influential or particularly relevant to this research will be discussed.

Models of Reading Comprehension

Information-processing models generally understand cognitive tasks by analyzing them into sequential, serial stages; they begin with sensory input and end with some type of output or response (Gibson & Levin 1975).

Sequential Processing

The early information-processing models of reading allowed information to flow in only one direction--from graphic to syntactic to comprehension, with many stages in between. Gough (1976) has proposed such a bottom-up model beginning with an eye fixation and ending with the emergence of a spoken word, all in one second. The visual stimulus is first transformed to an icon and the letters are then identified one by one, serially from left to right by a pattern recognition scanner. The letters are decoded by means of a system of phonological rules and are transposed into a string of "abstract systematic phonemes" (p. 515). A lexical search is then conducted to provide the phonemes with meaning. Next, the words and their meanings are put into primary memory, along with syntactic and semantic information. In primary memory, the words are organized into coherent sentences through interaction with a comprehension device. Gough states that we do not yet know how the comprehension device, which he calls "Merlin," really works nor where sentences reside after they have been understood. Gough has termed this spot "Place Where Sentences Go When They Are Understood" (p. 518). Finally, rules are applied to transform the meaning of the sentences to an oral output.

This model focuses on visual information and provides little opportunity for non-visual information to influence the process (i.e., this is a bottom-up model), making it difficult to explain the better comprehension and economical behavior of the skilled reader. Recent information-processing models of reading have provided for the interaction of visual and non-visual information.

Limited Resources

Kahneman (1973) proposed that there is a general limit on the total amount of resources available for performing mental operations. One important cognitive resource that is limited is attention. According to this proposition, we can attend to only one thing at a time, although we may process many items at once if only one requires attention and all others are automatic.

Along these same lines, Hasher and Zacks (1979) contrast encoding operations (a basic component skill of reading) which drain minimal energy from our limited-capacity attentional mechanism with those operations which require considerable attentional capacity. The authors term the former processes automatic operations. These operations require minimal attentional capacity. The processes which use considerable attentional capacity are called effortful operations and are assumed to be in competition for the limited resource of attention.

At least two models of reading are based on the notion of limited resources, with attentional capacity serving as an important limited resource.

LaBerge and Samuels. In the LaBerge and Samuels (1974) model, visual information is transformed through the visual, phonological, and

episodic memory processing stages until it is comprehended in the semantic system. The processing at each stage is assumed to be learned. The degree of learning may be assessed for accuracy, which requires attention, and for automaticity, which does not.

Attention, the limited resource in this model, may be focused at any one level in the system. The skilled and mature reader is one who has achieved automaticity in the lower-level skills of reading such as letter identification, spelling pattern recognition, and word recognition. Attention is not required for these activities and is free to be concentrated on the higher-level skills such as organizing the meaning of sentences and paragraphs or utilizing metacomprehension skills which allow better comprehension and retention. The less skilled reader, on the other hand, has not achieved as much automaticity and must focus his attention on lower-level skills.

Norman and Bobrow. The model proposed by Norman and Bobrow (1975) is very similar to the LaBerge and Samuels (1974) model. They suggest that a process can be limited in performance by either limits in available resources (resource-limited) or by the quality of data available (data-limited). If resources, such as attention, are limited and various processes are competing for the resources, resource-limited processes will be affected, while data-limited ones will not.

Generally, at some level, further resource allocation will have no further benefit and the process becomes data-limited. For example, after a word has been understood or a letter identified, further processing on that particular task will not be beneficial. The efficient reader maximizes performance by operating at exactly that point where the process becomes data-limited; resources are allocated

up to the point where further allocation of resources will yield no further benefit. As processes are learned and practiced they become more efficient and reach a data-limited state much sooner. Thus the efficient skilled reader uses less resources for lower-level processes and attention is free to be concentrated on more demanding processes such as comprehension and metacomprehension skills. In other words, lower-level processes have become data-limited, and the better reader can allocate more attentional capacity to high-level processes.

Partial Processing

In the models presented above, information is assumed to flow from lower to higher levels (bottom-up) through a series of discrete stages. McClelland (1979) has argued that it is not necessary for each component to finish processing its input before sending the results of its own processing to the next higher level. He cites reaction time studies where the subject determines if a string of letters is a word or a nonword which demonstrated a trade-off between speed and accuracy to support his hypothesis.

In McClelland's (1979) "cascade model" of information processing, the components of an information processing system operate continuously and pass information from one stage to the next as it becomes available. This type of relationship has been termed parallel-contingent; the processing at the central level (e.g., comprehension) is contingent on the results at the peripheral level (e.g., letter or word identification) and is occurring at the same time. The processing at any one time at any one level is proceeding on partial and incomplete processing

from the preceding level and is passing the results of its own incomplete processing to the next level.

A beginning or poor reader, or a reader who is rushed may just barely and partially complete lower-level skills such as word recognition, leaving higher-level skills such as comprehension and memory only partial and incomplete. A skilled reader may quickly, easily, and fully complete lower-level skills, leaving ample time to complete comprehension processes fully and accurately.

Bidirectional Processing

The models discussed above all postulate that information flow is a bottom-up process. However, not all theorists would agree with this position. Some theorists believe that information flows in both directions. They cite studies which show higher-level processes affecting lower-level ones. For example, researchers have found that subjects are able to identify the second word in a pair of words more quickly if the two words are semantically related. Thus, "butter" would be identified more quickly when it is part of the pair "bread--butter" than when it is part of the pair "nurse--butter." It seems that somehow the process of perceiving the first word allows the second word to be processed more quickly if the two words are semantically related. This describes a case where semantic level processes modify word level processes (Rumelhart 1977).

Masson and Sala (1978) reported that their research had led them to believe that "reading and recognition are interactive processes, involving conceptually-driven and data-driven operations. The interaction of operations may be either automatic or controlled" (Masson &

Sala 1978, p. 244). They used concepts from both the interactive and resource-limited models, but did not develop a comprehensive model. However, at least two theorists did attempt to develop theoretical models based on an interactive flow of information, and their models will be discussed next.

Rumelhart. The interactive model proposed by Rumelhart (1977) states that the results of processing must flow in both directions to explain the results of studies showing that obtaining information at one level of processing is partly determined by higher levels of analysis.

Rumelhart's (1977) model assumes that the graphic stimuli are stored in a visual information store. Critical features are then extracted and fed into a pattern synthesizer. The pattern synthesizer integrates the sensory information with knowledge sources--orthographic (spelling patterns), lexical, syntactic, semantic, and contextual knowledge--and then produces the most probable interpretation of the graphic input. Hypotheses concerning the actual content of the printed material are generated at every level simultaneously. The processes are parallel and interacting with information flowing in both directions. When a new hypothesis is generated, resources are allocated to the appropriate knowledge source based upon their momentary evaluations. If contextual and/or semantic knowledge is strong, efforts can be focused on generating hypotheses at these levels and passing the information down to lower levels. When little semantic and/or contextual information exists, more effort can be allocated to generating hypotheses based more directly on the graphic input. When some criterion is

obtained, a hypothesis can be accepted and further processing stopped while resources are allocated to other critical areas.

Presumably, skilled efficient readers are able to be flexible in processing--with information flowing in both directions and hypotheses being generated at all levels as described above. Poor readers may rely excessively on one level of processing to the partial exclusion of other levels, resulting in slower and less efficient reading.

Stanovich. The models presented above have generally assumed that poor readers focus more on lower-level information such as letter or word recognition to the exclusion of higher-level factors such as semantic or contextual information. However, some studies have shown that poor readers rely more on contextual (higher-level) information. Allington and Strange (1977), for example, changed one letter of a word in a sentence to form a different word which made the sentence anomalous. For instance, "He leaned too far over . . . " became "He leaned too fan over . . . " The study was done to discover if subjects would read the actual printed word (e.g., "fan") or the word which would make the sentence meaningful (e.g., "far"). Results showed that good readers read the actual word more often than poor readers, indicating a greater reliance on lower-level graphic information.

Stanovich (1980) has proposed an interactive-compensatory model of reading which he believes explains how good readers are sometimes shown to rely more on lower-level information. His model is very similar to Rumelhart's (1977) model, but Stanovich (1980) explicity specifies a compensatory mechanism. The compensatory hypothesis states that a process at any level can compensate for a deficiency at any other level. This leaves open the possibility that a poor reader with poor lower-

level skills such as word recognition may actually rely more on higher-level factors such as the use of context to facilitate comprehension. Similarly, a good reader who ordinarily focuses attention on higher-level processes when reading may rely more on graphic factors when reading difficult or unfamiliar materials. Stanovich has conceptualized his model as "a limited-capacity model with interactive-compensatory processing at the word level" (Stanovich 1980, p. 58). He states that good readers use context more effectively to monitor comprehension and are superior at context-free word recognition. Poor readers, according to this model, are less efficient at context-free word recognition and therefore use context to aid word recognition. This use of context to facilitate word recognition is of course purchased at a cost to the poor reader, namely, his attentional capacity is used for word recognition and thus less capacity is available for comprehension.

Psycholinguistic Model

The models discussed up to this point have been information-processing models focusing on a bottom-up or interactive flow of information. The psycholinguistic model of reading, however, is based on psycholinguistic theory and emphasizes the top-down flow of information.

Goodman has described the reading process as a "psycholinguistic guessing game" (Goodman 1967, p. 507). The process begins with the reader scanning a line of print and focusing at a point. The reader then forms a perceptual image, based on the cues he has selected, and searches his memory for related cues. At this point, the reader makes a guess and then checks it as he proceeds. If the choice is not

syntactically and semantically acceptable, the reader regresses and makes another guess. If the choice is acceptable, the new meaning is assimilated with prior meaning and the cycle continues.

Goodman and Goodman (1978) describe the poor reader as one who is preoccupied with letter and word recognition, at the expense of comprehending what is being read. This particular model will be discussed more fully later.

Individual Differences in Reading

Why should some children exhibit the necessary skills to be accurate and efficient readers while other children fail to do so? Many studies have attempted to answer this question by looking at individual differences in reading ability and by examining the process by which a novice reader becomes a fluent reader. Since there has been such a large number of studies done in this field, it would not be possible or appropriate to attempt to review them all here. However, an attempt will be made to include the studies which are especially important and have influenced the direction of current research and those studies particularly relevant to this research.

The studies concerning individual differences reported here can generally be divided into three basic areas. Some studies have investigated how good and poor readers differ in the performance of specific isolated components. Other studies have focused on the differences in metacomprehension skills demonstrated by good and poor readers. Finally, a third group of studies has looked at the differences in cognitive strategies used by good and poor readers.

Components

One group of studies focused on differences between good and poor readers in performance of component skills. These studies generally attributed lower levels of performance by poorer readers to a limited capacity, where higher-level skills are not fully or adequately performed because lower-level skills consume most of the available cognitive capacity.

Goldman, Hogaboam, Bell, and Perfetti (1980) speculate that the demands of word recognition over longer or more difficult segments of text produce an overload in working memory even within a sentence that is currently being read. Therefore, poorer readers who may be experiencing difficulty with word recognition may overload their working memory to such an extent that they can not even make sense of the very sentence they are reading at the time.

Butler and Hains (1979) showed that reaction time for word naming was affected by word length, word frequency, and the number of syllables in the word. However, better readers (those with higher vocabulary scores) were less affected by word length. The authors suggested that better readers were "adopting a more holistic reading strategy" (p. 75), essentially referring to the better reader's ability to process larger units of meaning.

Curtis (1980) gave her second through fifth-grade subjects comprehension, memory span, word-matching, and vocalization tasks. She showed that skilled and older readers can identify words more quickly and accurately than poor readers and have superior comprehension skills. These results were interpreted as lending support to a two-stage developmental theory of reading ability. First, readers learn to

identify in print what is already understood in spoken form. The second stage consists of developing the same efficiency in comprehending what is read as is already present in listening comprehension. Curtis (1980) theorized that poor readers expend attention on slow verbal coding processes, thereby reducing the amount of attention left for other processes such as comprehension.

Other studies have looked at differences in the performance of component skills from the perspective of automatic processes. These studies demonstrate that older or better readers have fully automated more component processes than younger or poorer readers.

Guttentag and Haith (1978) concluded that poor readers or normal readers with only nine months of instruction can extract meaning from words automatically. They also reported that accurate word processing requires automatic letter processing and that poor and younger readers require more attentional capacity to analyze each letter. West and Stanovich (1979) showed that kindergarteners had fully automated only the recognition of letters, while third-graders had automated the recognition of letters, high-frequency words, and low-frequency words to an equal extent.

Golinkoff (1975/1976) reviewed the literature concerning differences between good and poor readers in performance of component skills. She used the term "good reader" to define a reader who was a good comprehender (proficient in comprehension). The skills of reading comprehension were divided into three subskills:

1. Decoding--the ability to recognize the printed word.

2. Lexical access--the ability to obtain the meaning of the printed word.

3. Text organization--the ability to extract meaning from phrases, sentences, and paragraphs.

She concluded that poor comprehenders make more decoding errors and take more time to decode than good comprehenders. There were essentially no differences in lexical access. Good comprehenders read in larger units and attempted to gain meaning from what they read; poor readers read in smaller units and seemed to be more concerned with word identification. In summary, good and poor readers differed in their abilities to decode and to organize text.

Metacomprehension

Some studies of individual differences in reading have focused on differences in metacomprehension skills. One line of research in this area has examined the comprehension of thematic material. Thematic material can be defined as the information or topic identified as the focal concept of a passage, about which the greatest amount of information is given.

Christie and Schumacher (1975) reported that kindergarten, second, and fifth-grade children all recalled idea units relevant to the story's theme to a greater extent than idea units irrelevant to the main theme.

Brown and Smiley (1977b) had subjects rate units of prose passage in terms of its importance to the structure and theme of a passage. They found that third and fifth-grade subjects were unable to differentiate items in terms of their relative importance to the theme of the text, while seventh-grade and college subjects showed no such difficulty. However, subjects of all ages had better recall of the units rated as most important. Thus, conscious realization of which material is

important or relevant--a metacognitive skill--appears to develop with age. Nevertheless, it should be noted that all subjects were able to use the skill to recall the more important material.

Brown and Smiley (1977a) gave readers extra study time in another study. They demonstrated that mature readers increased their recall of material rated as important significantly more than their recall of material rated as less important. Fifth-grade readers did not show this pattern of results. Thus, it seems that older readers are better able to benefit from extra study time.

Strategies

A third group of studies concerning individual differences has emphasized differences in strategies used by good and poor readers. DiVesta, Hayward, and Orlando (1979) showed that good readers may attempt to link knowledge structures by continuing to read subsequent text. Poor readers tend to reread prior text when they are unsure about the linkage between what is currently being read and what was previously read.

Cromer (1970) described four models which have been proposed to account for reading difficulties. The defect model assumes that some nonfunction or dysfunction (e.g., visual impairment) must be corrected before the individual can learn to read. The deficit model proposes that some function or ability is absent (e.g., vocabulary skills) which must be added before adequate reading is possible. The disruption model assumes that some function (e.g., hyperactivity) is interfering with proper learning. Finally, the difference model assumes that the responses of the reader are not wrong or "sick," but different from the pattern of responses necessary for adequate reading.

Cromer (1970) compared poor readers fitting the difference model, who read word-by-word, and poor readers fitting the deficit group, with inadequate vocabulary skills, with each other and to good readers. He found that the difference readers, but not the deficit readers, comprehended as well as good readers when the text was presented in organized phrases. This suggests that at least one group of poor readers has difficulty comprehending due to troubles in organizing reading input.

Sanders (1973) investigated retention of information when questions concerning the text were presented either before the material was read or after it was read. He found that better undergraduate readers performed significantly better than poor undergraduate readers when the questions were presented prior to reading the passage. However, there was no difference between the performance of the two groups when the questions were not known prior to reading the material. These results suggest that better readers were somehow better able to take advantage of the question's presence before reading the material.

Other research related to differences in strategy between good and poor readers has focused on comprehension of relevant or thematic material. It should be noted that several studies pertaining to comprehension of thematic material were presented in the previous section on metacomprehension. The studies which will be reported next could also be cited as examples indicating the presence of metacomprehension skills, but are being presented in this section concerning strategy differences since they attempt to discuss in more detail the differences in strategy between good and poor readers.

Eamon (1978/1979) found that college students who were better readers rated the importance of statements about a topic over statements about non-topical concepts significantly greater than the differences in the ratings of poorer readers. Better readers were also able to recall information related to the topic better than non-topical information. Poor readers did not show this differential recall. Eamon (1978/1979) postulated that good readers evaluate information in a passage with respect to its relevance to the main topic and then process this information at the expense of unrelated information while poor readers make less of a distinction.

Pichert and Anderson (1977) suggested that one important strategy used by readers is the imposition of structure on a text. They hypothesized that structure is not an invariant property of text, but that it depends upon the structure the reader imposes on the text or the perspective the reader takes. Their subjects all read a story about two boys playing hooky from school and visiting one of the boy's home. One group of subjects was instructed to read the story from the perspective of a potential homebuyer. Another group was instructed to read from the perspective of a burglar. The third group was given no special perspective. They found that subjects given a specific perspective were better able to learn information important to that perspective than information which was not important to that perspective. In this study, for example, subjects who read the story from the perspective of a homebuyer were more likely to learn that the house had a leaky roof, while subjects reading from a burglar perspective were more likely to learn that the house contained a color television set.

This same pattern held for recall of the information one week later. The authors concluded that the significance of an idea in terms of a given perspective determined whether the idea would be learned and later recalled. It was suggested that high-level schemate, or imposed structure, provide the framework for comprehension (Anderson, Reynolds, Schallert, & Goetz 1977; Pichert & Anderson 1977).

Grabe and Prentice (1979) looked at the impact of ability on imposing structure or taking a perspective for sixth-grade subjects. They found that good readers, defined by higher vocabulary scores, instructed to read from a certain perspective recalled significantly more information related to the given perspective when compared to good readers simply instructed to read carefully. The recall of information related to the given perspective occurred at the expense of recall of perspective-unrelated information. Poor readers did not differentially process perspective-related and unrelated information to a significant degree.

Grabe (1980) asked one group of subjects to read a story from a certain perspective and to highlight information important to that perspective. The control subjects were not given a special perspective, but were told to read carefully and highlight important information. All subjects later recalled as much information as possible. Grabe (1980) found that both fourth and sixth-grade subjects were able to take a perspective, as measured by the ability to highlight important information and recall that information later. However, once an idea had been identified by both good and poor readers as important, good readers (defined by higher vocabulary scores) were still more likely to recall the item.

In general, these findings concerning strategy differences between good and poor readers seem to suggest that differences in reading skill are not due to the ability to identify relevant material or to a deficit in memory (since poorer readers do recall some items and in some cases even recall more non-topical than topical information). Somehow better readers are more selective--both in what they rate as important and in what they recall.

One possible explanation for these results is that better readers may spend more time reading perspective-related, important, or relevant material. In fact, Geiselman (1977) found that readers instructed to read a passage from a given perspective read all material more slowly than control subjects who were not given a special perspective.

Graesser, Hoffman, and Clark (1980) examined the components of reading time. One group of undergraduate subjects in this experiment was told to be prepared to answer essay questions after reading the text, while another group was told to prepare for a multiple-choice test. The authors reported that the two different reading goals influenced the amount of time spent on higher-level processes such as interrelating sentences and organizing the passage as a whole, but the different reading goals did not produce any difference in the amount of time spent on lower-level processes such as word recognition.

Rothkopf and Billington (1979) reported that viewing time varies within a passage. Their subjects were asked to memorize five learning goals (questions presented prior to viewing a passage) or ten learning goals or to learn as much from the passage as possible. They discovered that paragraphs containing goal-relevant sentences (i.e., the answers

to the previously memorized questions) received over twice as many eye fixations as paragraphs containing no goal-relevant sentences. They also reported that goal-processing time and goal achievement were positively related, although they speculated that the additional time spent on the goal-relevant paragraphs may just have been time-consuming and bear little relationship to the observed gains in reading.

Grabe (1981) directed his subjects to read a passage either from a given perspective or to read the story carefully. He reported that instructions to read from a given perspective did not produce variable inspection speeds within a text, nor did a general purpose in reading.

A second part of this study required one group of subjects to memorize questions and to be prepared to answer them after reading a story. The control group was instructed to read carefully. Results showed that the former group of subjects spent significantly more time viewing goal-relevant material, while control subjects did not exhibit variable inspection speeds. In both cases, information from the text related to the goal in reading was likely to be retained.

A study by Grabe and Doeling (Note 1) showed that both good and poor readers, defined by scores on a vocabulary test, spent more time viewing paragraphs containing goal-relevant material than paragraphs containing no goal-relevant information. The goal-relevant information in the study was the answers to previously memorized questions. This viewing pattern displayed by all readers did not lead to better retention of the relevant material for everyone, however. While good readers recalled the relevant information significantly better than the irrelevant information, the poor readers did not show this pattern to a significant degree. In other words, the poor readers did not recall

relevant information significantly better than irrelevant material. Somehow the skilled reader is better able to store, process, and/or retrieve the information which is selected as important.

In summary, the good reader seems to have superior automatic word recognition skills and also utilizes higher-level conscious control or metacomprehension skills. Finally, the good reader is one who can employ strategies, such as recognizing and recalling thematic information, effectively.

Reading as a Psycholinguistic Process

One theoretical model of special relevance to this paper is the psycholinguistic model, proposed by Kenneth Goodman (1967). He described reading as a "psycholinguistic guessing game" involving an interaction between thought and language. According to this model, reading is a selective process. "It involves partial use of available minimal language cues selected from perceptual input on the basis of the reader's expectation. As this partial information is processed, tentative decisions are made to be confirmed, rejected, or refined as reading progresses" (Goodman 1967, p. 127).

Efficient reading, according to this model, is not precisely perceiving and identifying the graphic elements, but skillfully selecting the fewest and most productive cues necessary to produce guesses which are correct the first time. In other words, reading is a process of making a hypothesis about what will be read next based on what has been previously read and on other non-visual knowledge, applying semantic and syntactic rules to determine what the graphic input would

look like if the hypothesis were true, and then checking to see if the input is indeed like that.

This model is based on psycholinguistic theory. Goodman views reading as a language process, directly related to the three other language processes of speaking, listening, and writing. Reading is simply understanding written language, while listening is understanding spoken language. The two processes are similar and the same rules are applied to both. In psycholinguistic theory, the speaker (or writer) decides what message he or she wants to convey. This is called the deep structure of the message. The speaker (or writer) then applies rules of transformation to the deep structure. Rules of transformation are rules which specify how deep structure is related to surface structure, the actual printed message (Chomsky 1972; Dale 1972). The rules of transformation applied to the deep structure produce the surface structure. The speaker then applies phonological rules to produce the actual spoken message. To comprehend the message, the listener (or reader) samples the spoken (or written) output, makes tentative guesses about its content, applies rules to determine what the message should sound (or look) like if he or she is correct, and then checks to see if the hypothesis matches the actual message. The listener (or reader) is effective if success if achieved in constructing the meaning of the message and efficient if the minimal effort required to do so is used.

Oral Reading

In oral reading, two tasks must be performed at the same time. The oral reader must produce the oral equivalent of the graphic input

and also reconstruct the meaning of what is being read. Smith (1978) states that the oral reader first comprehends the graphic input (surface structure of writing) by encoding its deep structure (meaning) and then producing the oral output (surface structure of speech). Oral readers thus do not ordinarily go directly from the surface structure of print to the surface structure of speech, but must use an intermediate step involving meaning (deep structure). Note, however, that although meaning is generally involved, this is not always the case. A young student reciting the first lessons in a foreign language may simply read the new foreign words with no real meaning attached. Goodman has termed the transformation from graphic input to oral output with no meaning involved "recoding." He also states that only if the reader engages in "semantic analysis to reconstruct the meaning of the writer . . . is he decoding" (Goodman 1967, p. 503).

Since oral output is not directly related to the graphic input, the oral message may involve changes in vocabulary or syntax, even though the meaning may remain unchanged. In this way, when the reader makes an error as he or she is reading orally, we are given a window on the processes involved in reading (Goodman 1977). It must be recognized, however, that although oral reading can provide us with a good idea of the processes involved in translating printed material to speech, we can never be perfectly sure these are the same processes used in reading since an additional, albeit simultaneous, step occurs in oral reading. Nevertheless, it does seem reasonable to assume that the processes are fairly similar.

Oral Miscue Analysis

If the oral output is identical to the graphic input, the process involved is masked. However, when the oral response is different from what is expected, we can look at the processes involved which were less successfully applied. The technique of looking at deviations from the expected response, or errors in oral reading, has been termed miscue analysis (Goodman 1967).

> Miscues reflect the degree to which a reader is understanding and seeking meaning. Insight can be gained into the reader's development of meaning and the reading process as a whole if miscues are examined and researchers ask: "Why did the reader make the miscue and to what extent is it like the language of the author" (Goodman & Goodman 1977, p. 320)?

Goodman (1969) and Goodman and Burke (1972) have proposed a 28-variable taxonomy for oral miscue analysis. Their proposed categories reflect such variables as number of words in the miscue, correction, repetition, dialect, peripheral responses, graphic similarity, phonemic similarity, grammatical function, morphemic level, word level, phrase level, clause level, sentence level, syntactic similarity, semantic similarity, syntactic acceptability, and semantic acceptability.

Goodman (1969) states that readers have basically three types of information available. These include:

1. Grapho-phonic. This is defined as the information available from the graphic system, from the phonological system, and from the interrelationship of these two systems, known as phonics. This category is roughly similar to Smith's (1978) visual information.

2. Syntactic information. This refers to "information implicit in the grammatical structure of the language" (Goodman 1969, p. 15).

This is part of the reader's non-visual information (Smith 1978) which is brought to the reading situation.

3. Semantic information. This includes the reader's knowledge of word meanings, the reader's conceptual background, and the reader's relevant knowledge of the subject. This category is also a subset of Smith's (1978) non-visual information.

Oral miscues may differ from the expected response in terms of any or all of the above three categories. Consider the sentence "He walked back to his house." If "crazy" were read instead of the word "house," the oral miscue does not resemble the expected response graphically (the words are not visually alike), syntactically ("crazy" is an adjective, while "house" is a noun), or semantically ("crazy" and "house" do not have interchangeable meanings). If "hoarse" were read, the oral miscue would be similar graphically, but not syntactically or semantically. Likewise, "horse" would be similar graphically and syntactically, but not semantically; "home" would be similar graphically, syntactically, and semantically. Thus, different types of miscues may reflect different levels of processing. For example, a miscue which is graphically, syntactically, and semantically different from the expected response represents a less effective strategy than a miscue which is graphically, syntactically, and semantically equivalent to the printed word.

Research on Oral Miscues

Miscue analysis has proved useful in various research efforts. In a comprehensive literature review of miscue studies, Weber (1968) pointed out that while early studies were used to diagnose weaknesses

for remedial purposes, later studies have focused on studying the processes used by a successful learner/reader and the application of research results to help children learn to read more effectively.

Application of Results. Recent studies have focused on using the results of oral miscue analysis to help readers. Leslie and Osol (1978) required their eighth-grade subjects to read passages of varying difficulty. They discovered that passages which were read with less than 95 percent accuracy were understood significantly less than passages which were read with 95 to 100 percent accuracy. They suggested that reading text which results in less than 5 percent error "may result in more efficient use of the cue systems in reading" (p. 442).

Zutell (1977) recommended that teachers respond appropriately and differently to the various types of miscues. For example, Zutell (1977) states that teachers should recognize that semantically acceptable errors or miscues which are corrected do not necessarily detract from comprehension.

Successful Readers. Biemiller (1970, 1979) and Cohen (1974/1975) studied oral miscues in first-grade children. Biemiller (1970) reported that beginning readers use predominantly contextual information. The second phase of learning to read was characterized by non-response errors and graphically constrained errors. The third stage for beginning readers was defined by the co-occurrence of contextually and graphically constrained errors. Cohen (1974/1975) reported that non-response errors initially predominated. Good readers then rapidly changed to nonsense and graphically and syntactically constrained errors, while poor readers showed a gradual increase in nonsense errors.

Biemiller (1979) noted that as passages became increasingly difficult, children made proportionately more non-response and graphically constrained errors. Also, able readers seemed to use less graphic information while reading easy text; however, they used more graphic than contextual information when reading difficult material. It appears that as beginning readers become aware of the one-to-one correspondence between spoken and printed words, they initially rely heavily on contextual information and then shift to a flexible use of both graphic and contextual information.

Pflaum and Bryan (1980) studied oral miscues in learning disabled children. They found that learning disabled children made proportionally more unacceptable errors and corrected fewer of them than did normal children. Leslie (1980) and Goodman (1977b) studied the types of oral miscues produced by good and poor normal readers. They reported that below-average subjects made more semantically unacceptable errors than did above-average readers. In addition, poorer readers corrected fewer of their semantically unacceptable errors.

A study by Beebe focused on substitution miscues because at least half of all oral miscues fall under this classification (Beebe 1980). A substitution miscue refers to any incorrect word, partial word, or nonword used or read in place of the original word in the passage. She found that the total number of miscues produced correlated negatively with comprehension. However, not all substitution miscues detracted from comprehension equally. Substitution miscues were coded into three categories: (a) substitution miscues which were subsequently corrected, (b) uncorrected substitution miscues which were syntactically and semantically acceptable (i.e., the substituted word fit both the

syntactic and semantic role of the original word), or (c) uncorrected substitution miscues which were either syntactically or semantically unacceptable with respect to the meaning of the passage.

After dividing the miscues into three categories, a proportional score for each category was determined by dividing each subject's number of miscues in one particular category by the total number of miscues produced by that subject. For instance, a student who made a total of 20 miscues and corrected 15 of them would have a proportional score of .75 for corrected substitution miscues. This was done to produce equivalent and comparable scores for readers who made varying numbers of miscues. In this way, a student who made only four miscues and corrected three of them would receive the same proportional score as a subject who made 20 miscues, but corrected 15 of them. It was found that proportions of corrected miscues and uncorrected acceptable substitution miscues were correlated with better comprehension, while only uncorrected unacceptable substitution miscues and total number of miscues were negatively correlated with comprehension.

Individual Differences in Oral Miscue Analysis

Up to this point, we have examined two conflicting views of the good reader which have emerged from the miscue literature. One group of researchers (e.g., Goodman 1967; Smith 1978) states that better readers rely less on graphic information and more on contextual information, while the reverse is true for poor readers. On the other hand, a second group of researchers (e.g., Biemiller 1970, 1979; Weber 1970) indicates a greater attention to graphic information by better readers.

Attempting to resolve this difference, Stanovich (1980) states that there are two different types of contextual processes. One type of contextual processing consists of processes involved in constructing a knowledge structure from the text, such as semantic integration or the relation of the newly acquired information to already existing information. It seems apparent that these abilities are superior in the better reader (Cromer 1970; Smiley, Oakley, Worthen, Campione, & Brown 1977; Stanovich 1980). A second type of contextual processing refers to contextual hypothesis-testing whereby readers are better able to use previously read material to facilitate ongoing word recognition. It is this type of contextual processing that Stanovich (1980) and others (e.g., Allington & Strange 1977; Weber 1970) have questioned. These authors doubt whether using cognitive capacity to facilitate ongoing word recognition through improved hypothesis-testing could possibly be an efficient process for the skilled reader. Fischler and Bloom (1979) showed that context facilitated subsequent processing only when the following word was a highly likely response. They suggested that contextual information typically serves to focus attention on a class of responses, but does not facilitate ongoing hypothesis-testing of particular words. This group of authors also believes that since all readers employ the use of contextual information, other factors must account for the differences between good and poor readers (Stanovich 1980).

These results all tend to support an emerging picture of the better reader, as evidenced by higher comprehension scores, as one who produces fewer miscues, corrects miscues more frequently, and who is able to utilize both graphic (visual) and contextual (non-visual)

information effectively, flexibly, and efficiently. The poorer reader, however, makes more substitution miscues, corrects the miscues less often, and is less able to be flexible in the use of graphic and contextual information.

Statement of the Problem

There has been a great deal of research concerning individual differences in reading ability. This review has attempted to briefly summarize some of the research in two broad areas within this domain: goal-directed reading and oral miscue analysis.

Goal-Directed Reading

Goal-directed research in reading has shown that better readers appear to be able to guide and control their reading to obtain a goal or purpose they have for reading. For example, Sanders (1973) demonstrated that better readers performed significantly better than poor readers when questions were presented prior to reading a passage, while the two groups did not differ when the questions were presented after the story. Good readers seem to have the use of metacomprehension skills which allow them to effectively evaluate and control the entire process of reading. Thus, they are able to use the appropriate strategies to obtain their goals in reading.

One indicator of metacomprehension that good readers seem to demonstrate consistently is flexibility. Goal-directed research in reading has suggested that good readers are flexible in two ways. First, good readers should be able to identify which information is relevant or important to obtain their goal in reading and should spend significantly more time viewing or reading the goal-relevant information.

Secondly, good readers should recall significantly more information which is relevant to their goal when compared to recall of goal-irrelevant information.

In the present research, the subjects read two stories and answered questions about each story immediately after reading it. The questions were keyed to certain segments of the text. For the question-cued treatment, questions were known beforehand. The segments containing the answers to those questions were designated as the relevant segments. The segments which contained the answers to questions which were not known prior to reading the story were designated as the irrelevant segments. In the control condition, no questions were given before the reading of the story.

Inspection times were recorded for each subject while he or she read at his or her own rate. One measure of flexible processing was obtained by examining the differential recall of answers to questions known before reading the story and the answers to questions not given until after the story was read. A second measure of flexible processing was obtained by examining the differential inspection times of paragraphs containing goal-relevant information with those paragraphs which contained no goal-relevant information. The purpose of the first part of this research was to replicate using elementary-age readers earlier studies which used goal-directed methodology with college students.

Specifically, it was hypothesized that subjects will have the necessary metacomprehension skills to retain the goal-relevant information to a greater degree than the goal-irrelevant information. This would replicate studies done with adults (e.g., Rothkopf & Billington 1979; Sanders 1973) and studies using different methods of designating

goal-relevant information (e.g., Brown & Smiley 1977a; Eamon 1978/1979). It was also hypothesized that good readers will show superior differential recall--recalling the relevant information at the expense of the irrelevant information. Although poor readers will also recall more relevant information, good readers should show a larger difference in recall of the two types of information. This would be a replication of the Grabe (1981) and the Grabe and Prentice (1979) studies which showed a superior differential recall by better readers. Finally, it was hypothesized that subjects will have the necessary metacomprehension skills to identify the relevant information and allocate extra time to read/study those designated segments of the text. This would replicate studies done with adults which show that readers differentially allocate reading time within a passage (e.g., Geiselman 1977; Grabe 1981; Rothkopf & Billington 1979), spending more time viewing goal-relevant information.

Oral Miscue Analysis

Goodman (1977) has proposed that oral miscue analysis gives researchers a window on the processes involved in reading and that different types of miscues reflect different levels of processing. Some evidence has indicated that this seems to be the case. Beebe (1980), for example, found that better readers were more likely to produce certain types of miscues. She reported that reading ability was significantly positively correlated with proportion of corrected miscues and with proportion of syntactically and semantically acceptable uncorrected miscues, but negatively correlated with proportion of syntactically and semantically unacceptable uncorrected miscues and

with total number of miscues. Her results may be seen as lending support to the notion that better readers rely more on higher levels of information, such as contextual information. Thus a good reader who makes a miscue which is syntactically and semantically acceptable may not even be aware of the discrepancy since he or she is supposedly relying on contextual information and is not bound by graphic, word-by-word reading. Beebe (1980) further reported that better readers made fewer oral miscues, corrected more of them, and made fewer syntactically and semantically unacceptable errors.

The second part of the present experiment was designed to replicate Beebe's (1980) study of oral miscues. Subjects were required to orally read a passage appropriate to their grade level. An oral miscue analysis was performed on the data, using four categories. The categories were similar to Beebe's (1980) miscue categories, except that the corrected miscue category was divided into two separate categories: corrected miscues in which the substituted word was syntactically and semantically acceptable and corrected miscues in which the substituted word was not syntactically and semantically acceptable.

Specifically, it was hypothesized that reading ability will be positively correlated with proportion of syntactically and semantically unacceptable corrected miscues and with proportion of syntactically and semantically acceptable uncorrected miscues, but negatively correlated with proportion of syntactically and semantically unacceptable miscues, with proportion of syntactically and semantically acceptable corrected miscues, and with total number of miscues. It was further hypothesized

that better readers would make fewer oral miscues, correct more of their errors, and would make fewer semantically unacceptable miscues.

Goal-Directed Reading and Oral Miscue Analysis

The third purpose of this study was an attempt to link the results of the goal-directed research and the oral miscue analysis. If better readers make certain types of miscues which indicate that they are relying on higher levels of information and utilizing higher-level processing, then the results of an oral miscue analysis should be quite useful and helpful to elementary teachers. In fact, some researchers have suggested that educators routinely use oral miscue analyses to provide an additional source of information concerning student's reading processes and progress.

The third portion of this study attempted to predict recall of goal-relevant information from the first part of the study using two measures of reading ability. The first predictor was vocabulary scores, a relatively traditional and standard way of defining ability. The second predictor was oral miscue scores. If better readers make certain types of oral miscues which indicate that they are using higher and more effective levels of processing, then oral miscue scores should be particularly predictive of performance on tasks which require higher-level processing or top-down processing. One such task requiring metacomprehension skills is recalling answers to questions memorized prior to reading the text--the task in the first part of this experiment.

Specifically, it is hypothesized that prediction of performance

on the goal-relevant recall task will be significantly improved beyond that predicted by vocabulary scores by using oral miscue scores.

CHAPTER III

METHOD

Subjects

The subjects for this study were 40 fourth-grade and 39 sixth-grade students from two elementary schools in Grand Forks, North Dakota. The experiment was conducted during the final six weeks of the fall and spring semesters. Within each grade the subjects were classified as good or poor readers using a median split on scores from the vocabulary subtest of the Iowa Silent Reading Tests--Level 1 Form E. This vocabulary subtest correlates .84 with the comprehension subtest (Farr 1973). The good and poor fourth-grade students obtained mean scores of 29.4 and 16.3, respectively, on the vocabulary subtest. The mean scores for the sixth-grade good and poor readers were 36.0 and 25.4, respectively. The scores from the median split were used to classify readers for the analyses of variance. Actual vocabulary scores were used in the correlational analyses and the regression analyses.

Materials

The materials for the oral miscue analysis were two short passages from the Such-Allred Reading Placement Inventory. Selection H and Selection J were appropriate for the fourth and sixth-grade levels and contained 176 and 199 words, respectively. An attempt was made to select materials at the upper end of the grade level in difficulty to

ensure errors. Dale-Chall (1948) readability analyses for the stories yielded scores of 5.78 and 6.21. See Appendix A for the two stories used for the analysis of oral miscues.

For recall of questions, two passages of 387 and 408 words were used. One passage was a story used in the Pichert and Anderson (1977) research and the second passage was taken from the SRA Reading Inventory IIb (1969). The stories had Dale Chall (1948) readability analyses of 5.20 and 5.54. See Appendix B for the two stories used in the goal-directed portion of this research.

The first story was divided into six segments and the second into five based on paragraph structure. The middle four segments from the first story and the final four from the second story were designated as critical segments. Two questions which required specific answers were constructed for each critical segment. Segments were presented as projected photographic negative slides.

Procedure

All subjects first orally read the appropriate passage for the oral miscue analysis into a tape recorder. They were instructed that the experimenter could not help them, to do their best, and to guess at words if necessary.

In the question-cued treatment condition, the subjects were required to memorize and then recite four questions prior to viewing the slides. The questions were taken from two randomly selected critical segments. The segments which contained the assigned questions were labelled as relevant segments. The other two critical segments were labelled as irrelevant segments. The subjects were not required

to repeat the questions exactly, but were expected to preserve the meaning of the question. If the subject's paraphrase did not preserve the meaning of the question, or the subject was unable to recite all four questions, the subject was required to review the questions until he or she could recite them acceptably.

Immediately after reciting all four assigned questions, the subjects were asked to read the story in such a way that they could answer the questions. Subjects were allowed to read at their own rate by using an advance key to move from segment to segment, but were not told that their reading rate for each segment was being timed. The length of time the reader spent viewing each segment was timed in milliseconds using a Lafayette Clock/Counter Model 54419-A.

Immediately after viewing the slides, the subjects were asked to recite the assigned questions. This was done to help ensure that they did attend to the questions and possibly were using them to guide their reading. Subjects not recalling at least one question from each segment were to be dropped. All subjects were able to meet the criterion of recalling one question per segment.

Subjects were then given the assigned (relevant) questions in written form and asked to write the answers. After answering the questions, the subjects were then told that the experimenter was also interested in what else was learned while they were reading. They were then given the nonassigned (irrelevant) questions in written form and asked to write the answers.

Each subject also participated in the control treatment condition. In this condition, subjects were told to read carefully and to be prepared to answer questions after reading the story. After viewing

the slides, the subjects were asked to write the answers to eight questions presented in the same order as the questions were presented in the question-cued condition. By pairing subjects, the eight control questions were given the relevant and irrelevant labels assigned in the question-cued condition for the other member of the pair. While this does leave open the question of order effects, it does not seem practical to ask some subjects in the question-cued condition to recite and answer assigned questions after answering non-assigned irrelevant questions. Treatment order, story order, assignment of story to treatment, and assignment of questions as relevant and irrelevant were counterbalanced across subjects.

Oral Miscue Analysis

The results of the oral miscue analysis were categorized according to the procedure described by Beebe (1980) with one exception. Beebe (1980) classified the substitution miscues in her study as follows: corrected substitution miscues, uncorrected acceptable substitution miscues, and uncorrected unacceptable substitution misuces. The corrected substitution miscues in this study were further divided into two categories--corrected acceptable substitution miscues and corrected unacceptable substitution miscues. The mean number of total miscues for the fourth and sixth-grade subjects, respectively, was 9.6 and 11.1. Other means for fourth and sixth-grade subjects, respectively, were as follows: unacceptable corrected, 1.7 and 1.8; unacceptable uncorrected, 3.9 and 4.9; acceptable corrected, 0.3 and 0.1; and acceptable uncorrected, 3.7 and 4.3.

Ten stories were randomly selected and their substitution miscues categorized by a second trained independent rater to ensure reliability of the analysis. The agreement between the raters produced a reliability coefficient of .87.

Retention Scores

Retention results are expressed as the number of correctly answered questions for each subject in each treatment and each relevance condition. For each treatment X relevance condition, there was a possibility of four correct answers.

Viewing Rates

The recorded viewing rate of each subject for each segment was based on the standardization of inspection times for that particular segment. The reading times for each segment were standardized across all subjects and treatments.

Statistical Analyses

Retention. In order to assess reading ability differences in retention, an analysis of variance was performed on the data. Factors were grade (4 or 6), treatment (question-cued or control), relevance (relevant or irrelevant), story order (which story was assigned to the question-cued treatment), and reading ability (high or low) in a 2 X 2 X 2 X 2 X 2 mixed design analysis of variance. Between-subject factors were grade, reading ability, and story order. Within-subject factors were relevance and treatment.

Inspection Time. An analysis of variance was performed on the standardized viewing time data to assess the effects of ability on

inspection time. Factors were grade (4 or 6), treatment (question-cued or control), relevance (relevant or irrelevant), story order (which story was assigned to the question-cued treatment), and reading ability (high or low) in a 2 X 2 X 2 X 2 X 2 mixed design analysis of variance. Between-subject factors were grade, reading ability, and story order. Within-subject factors were relevance and treatment.

Miscue Analysis of Variance. To determine the effect of reading ability on substitution miscues, an analysis of variance was performed on the oral miscue data. Analyses were performed separately for the fourth and sixth-grade subjects since they read different stories. Factors for each analysis were reading ability (high or low), type (semantically acceptable or unacceptable), and correction (corrected or uncorrected) in a 2 X 2 X 2 X 2 mixed design analysis of variance. The between-subject factor was reading ability and the within-subject factors were type and correction. Separate analyses were done both for proportional miscue scores and for the raw number data. The proportional miscue scores were derived by dividing the number of each subject's miscues in one particular category by that subject's total number of miscues. For example, a reader who made a total of ten miscues, four of which were unacceptable but corrected, would have a proportional unacceptable corrected score of 4/10 = .4 and a raw unacceptable corrected score of 4.

Oral Miscue Correlations

The correlational analyses were done between the retention score of relevant information from the goal-directed study and five oral miscue scores (the four categories of oral miscues plus total number of

miscues). These analyses were performed to determine which types of miscues reflect reading processes which are positively correlated with understanding and which types of miscues reflect reading processes which are negatively correlated with comprehension. Again, separate analyses were done with proportion and raw miscue scores.

Regression Analyses. Regression analyses were done to predict the relevant recall totals from the goal-directed study using several oral miscue scores, including proportion unacceptable uncorrected, number unacceptable uncorrected, proportion acceptable uncorrected, and number acceptable uncorrected, after removing the impact of reading ability (vocabulary). These particular miscue scores were chosen because they showed the least amount of positive correlation with reading ability. The fourth and sixth-grade analyses were done separately.

The regression procedure used in the regression analyses was an R^2 improvement technique (Kerlinger & Pedhazur 1973). In all analyses, the vocabulary score, a relatively traditional or standard way or defining ability, was used as the first predictor. The second predictor was one of four miscue scores. Only one miscue predictor was used in each analysis to ensure an adequate number of subjects per variable and because the various oral miscue scores may reflect similar or redundant information.

CHAPTER IV

RESULTS

Retention

In the analysis of variance performed on the retention data of the goal-directed study, grade level, F (1,71) = 34.43, $p < .001$, ability, F (1,71) = 19.39, $p < .001$, relevance, F (1,71) = 9.17, $p < .001$, and story order, F (1,71) = 5.47, $p < .05$ were associated with significant differences in retention scores. Older and better readers recalled more information and material which was designated as relevant was recalled more frequently. Story order was included as a factor to remove some of the variance since one story was more difficult to read and consequently the questions pertaining to that story may have been more difficult to answer. However, since the story order factor is not especially pertinent to this research and did not play a large role in higher-order interactions, no further story order effects for this analysis will be reported. The treatment X relevance interaction was also significant, F (1,71) = 4.30, $p < .02$. The Newman-Kuels test (Kirk 1968) was used to compare means. Relevant questions were answered correctly more frequently in the question-cued treatment condition (2.20 vs. 1.63), but not in the control condition (1.97 vs. 1.87). Ability did not further modify the relevance by treatment interaction (see Table 1). See Appendix C for the results of the analysis of variance on the retention data.

TABLE 1

MEAN RECALL SCORES

	Question-Cued		Control	
	Relevant	Irrelevant	Relevant	Irrelevant
Grade 4 Poor	1.540	1.131	1.424	1.308
Grade 4 Good	1.750	1.450	2.000	1.800
Grade 6 Poor	2.372	1.822	1.672	1.867
Grade 6 Good	3.150	2.100	2.800	2.500

Inspection Time

The analysis of variance performed on the inspection time data yielded the following significant main effects: grade, F (1,71) = 11.35, $p < .002$, ability, F (1,71) = 8.60, $p < .005$, and relevance, F (1,71) = 9.25, $p < .005$. In this analysis, the story order effect produced only one significant higher-order interaction which again is not especially pertinent to this research and will not be disucssed. Older and better readers read significantly faster than younger and poorer readers. All subjects spent significantly more time viewing segments designated as relevant compared to those segments designated as irrelevant.

Several two-way interactions involving grade were also significant, These effects were grade X ability, F (1,71) = 9.38, $p < .005$, grade X treatment, F (1,71) = 6.10, $p < .02$, and grade X relevance, F (1,71)

= 6.61, $p < .02$. The Newman-Kuels test of the grade X ability interaction showed that better fourth-grade subjects read significantly faster than poor fourth-grade readers, while sixth-grade good and poor readers did not read at significantly different rates. This suggests that the stories were sufficiently easy for all sixth-grade subjects to read relatively quickly. The Newman-Kuels test of the grade X treatment interaction revealed that fourth-grade subjects read both the question-cued and control treatment information significantly slower than sixth-grade subjects. It is not meaningful to discuss the grade X relevance interaction since relevance in the control condition was designated by matched assignment and has no particular meaning. The most important interaction from these data comes from the treatment X relevance interaction, F (1,71) = 11.32, $p < .002$. While many comparisons between means may be of interest, the most relevant for this study involves the comparison of relevant and irrelevant information in the question-cued and control conditions. The results of the Newman-Kuels test showed that segments designated as relevant were viewed significantly longer when part of the question-cued treatment (.147 vs. -.238), but not in the control condition (.053 vs. .102). See Table 2 for the means of this analysis and Appendix D for the results of the analysis of variance on the inspection time data.

Oral Miscue Correlations

Proportional. The correlational analysis between proportional oral miscue scores and reading ability for both the fourth-grade and sixth-grade subjects resulted in no correlations reaching statistical significance (see Table 3).

TABLE 2

MEAN STANDARDIZED INSPECTION TIME SCORES

	Question-Cued		Control	
	Relevant	Irrelevant	Relevant	Irrelevant
Grade 4 Poor	1.660	1.193	1.752	1.807
Grade 4 Good	- .743	- .733	- .290	- .007
Grade 6 Poor	- .081	- .844	- .767	- .677
Grade 6 Good	- .248	- .746	- .482	- .714

TABLE 3

CORRELATIONS OF PROPORTIONS OF MISCUES WITH READING ABILITY (VOCABULARY)

	Grade 4		Grade 6	
Type of Miscue	Correlation	Prob.	Correlation	Prob.
Prop. Unacceptable Corrected	.26	.12	.03	.82
Prop. Unacceptable Uncorrected	-.24	.13	.07	.66
Prop. Acceptable Corrected	-.12	.46	.18	.28
Prop. Acceptable Uncorrected	.07	.66	-.15	.34

Numbers. When the actual numbers of oral miscues were correlated with reading ability (vocabulary scores), statistically significant correlations were produced by unacceptable uncorrected miscues, acceptable corrected miscues, acceptable uncorrected miscues, and total number

of miscues for fourth-grade subjects. Statistically significant correlations produced by the sixth-grade subjects included the correlations between reading ability and unacceptable uncorrected miscues, unacceptable uncorrected miscues, and total number of miscues (see Table 4).

TABLE 4

CORRELATIONS OF NUMBERS OF MISCUES WITH READING ABILITY (VOCABULARY)

	Grade 4		Grade 6	
Type of Miscue	Correlation	Prob.	Correlation	Prob.
Total Number	-.49	.002	-.40	.01
Number Unacceptable Corrected	-.21	.19	-.17	.31
Number Unacceptable Uncorrected	-.46	.003	-.32	.04
Number Acceptable Corrected	-.32	.05	.05	.74
Number Acceptable Uncorrected	-.37	.02	-.42	.01

Oral Miscue Analysis of Variance

Proportions. The analysis of variance performed on the oral miscue data using proportional miscue scores yielded the following significant effects for fourth-grade subjects: correction, F (1,38) = 55.43, $p < .001$ and type X correction, F (1,38) = 10.36, $p < .003$. A significantly higher proportion of the miscues were not corrected. Results of the Newman-Kuels test indicated that among the miscues which were not corrected, a greater proportion were semantically unacceptable than acceptable (.425 vs. .332), while among the miscues which were corrected, a greater proportion were semantically acceptable (.207 vs.

.034). For sixth-grade subjects, significant main effects were type, F (1,37) = 23.48, $p < .001$ and correction, F (1,37) = 141.48, $p < .001$. Significantly higher proportions were semantically unacceptable and uncorrected. No significant higher-order interactions were found. See Table 5 for the means of this analysis and Appendix E for the results of the analysis of variance on the proportional oral miscue data.

TABLE 5

MEAN PROPORTIONAL ORAL MISCUE SCORES

	Acceptable		Unacceptable	
	Corrected	Uncorrected	Corrected	Uncorrected
Grade 4 Poor	.036	.411	.146	.407
Grade 4 Good	.032	.440	.268	.260
Grade 6 Poor	.004	.394	.186	.417
Grade 6 Good	.023	.332	.182	.463

Numbers. The oral miscue analysis of variance for fourth-grade subjects using raw scores produced significant main effects for the factors of ability, F (1,38) = 9.62, $p < .005$, type, F (1,38) = 7.62, $p < .01$, and correction, F (1,38) = 33.95, $p < .005$. Better readers made significantly fewer errors, more errors were semantically unacceptable and significantly more errors were uncorrected. One significant higher-order interaction was produced: ability X correction, F (1,38) = 10.48, $p < .003$. The results of the Newman-Kuels test

revealed that poor readers corrected significantly fewer of their errors (5.475 uncorrected vs. 1.100 corrected), while good readers showed no differences between number of corrected and uncorrected miscues (2.725 uncorrected vs. .875 corrected). There was no interaction between ability and type.

Essentially the same pattern of results was found for the sixth-grade subjects. Again, main effects were found for ability, F (1,37) = 4.07, $p < .05$, type, F (1,37) = 23.63, $p < .001$, and correction, F (1,37) = 54.23, $p < .001$. Better readers made significantly fewer errors, more errors were semantically unacceptable, and significantly more errors were uncorrected.

Two two-way interactions were observed: ability X correction, F (1,37) = 4.02, $p < .05$ and type X correction, F (1,37) = 6.47, $p < .02$. The results of the Newman-Kuels test of the ability X correction interaction indicated that among the errors which were not corrected, poor readers produced significantly more of them (5.632 vs. 3.575), while there was no difference between good and poor readers in the number of errors which were corrected (.925 vs. 1.000). The results of the Newman-Kuels test of the type X correction interaction showed that all four means were significantly different from each other. Ability did not interact with type (see Table 6). See Appendix F for the results of the analysis of variance on the oral miscue data using raw scores.

Regression Analyses

Several oral miscue scores significantly improved the prediction of recall of relevant information beyond that predicted by reading ability (vocabulary) scores for the fourth-grade subjects. The oral

miscue scores which improve the predictive power include proportion of unacceptable uncorrected miscues, number of unacceptable uncorrected miscues, and proportion of acceptable uncorrected misuces. However, for the sixth-grade subjects, none of the tested oral miscue scores significantly improved the predictive power (see Table 7).

TABLE 6

MEAN ORAL MISCUE SCORES

	Acceptable		Unacceptable	
	Corrected	Uncorrected	Corrected	Uncorrected
Grade 4 Poor	.35	5.00	1.85	5.95
Grade 4 Good	.20	2.45	1.55	1.80
Grade 6 Poor	.05	5.58	1.95	5.68
Grade 6 Good	.20	3.00	1.65	4.15

TABLE 7

REGRESSION ANALYSES OF ORAL MISCUE DATA

Fourth Grade

Variable	Multiple R	R^2	R^2 Change	Simple R
Vocabulary	.057	.003	.003	.057
Proportion Unacceptable Uncorrected Miscues	.395	.156	.153	-.393
Unacceptable Uncorrected	.340	.115	.112	-.324
Proportion Acceptable Uncorrected Miscues	.374	.140	.137	.373
Acceptable Uncorrected	.200	.040	.037	-.199

Sixth Grade

Variable	Multiple R	R^2	R^2 Change	Simple R
Vocabulary	.418	.175	.175	.418
Proportion Unacceptable Uncorrected Miscues	.437	.191	.017	.158
Unacceptable Uncorrected	.486	.236	.061	-.370
Proportion Acceptable Uncorrected Miscues	.427	.182	.007	.019
Acceptable Uncorrected	.472	.223	.048	-.374

CHAPTER V

DISCUSSION

This study had three basic purposes. The first general purpose was to replicate using elementary-age subjects the results of goal-directed studies. Earlier studies were done using adults as subjects and using various methods of defining relevant material. The second general purpose was to replicate oral miscue studies which showed that certain types of miscues are correlated with better comprehension, while other types of miscues are negatively correlated with comprehension. Finally, the third purpose of this study was an attempt to further examine the relationship between reading ability in goal-directed reading and oral miscue analysis by linking the results of the two efforts at replication. This part of the study attempted to improve prediction of goal-relevant recall through the use of oral miscue scores after removing the impact of vocabulary.

Goal-Directed Replication

Retention. Earlier goal-directed studies found that mature readers recall more goal-relevant than irrelevant information, regardless of whether relevance is defined as the main topical information in a paragraph, the information pertinent to a certain given perspective, or the answers to specific questions (e.g., Brown & Smiley 1977b; Christie & Schumacher 1975; Eamon 1978/1979; Grabe 1980; Grabe & Prentice 1979; Pichert & Anderson 1977; Sanders 1973). The results of

this study support those findings and suggest that this ability is present in elementary-age children as young as fourth grade. Interestingly, however, the better readers in this study did not recall significantly more goal-relevant than irrelevant information when compared with poor readers, as shown in several earlier studies (e.g., Eamon 1978/1979; Grabe 1981; Grabe & Prentice 1979; Sanders 1973; Smiley, Oakley, Worthen, Campione, & Brown 1977). Nevertheless, it should be noted that other studies with children as subjects did not designate answers to memorized questions as relevant material.

Inspection Time. Previous goal-directed studies have suggested that readers spend significantly more time viewing material designated as relevant than material which is irrelevant (Grabe 1981; Rothkopf & Billington 1979). The results of this study support these findings, suggesting that this ability is present as early as the fourth grade.

The goal-directed replication in general shows that all readers are able to identify and spend more time viewing the material designated as relevant and also recall more goal-relevant material. Whether or not the extra time spent viewing the relevant material was causally related to the observed learning gains or simply additional, time-consuming "superstitious" processing is debatable. However, Rothkopf & Billington (1979) point out that there is a positive correlation between relative processing time and goal achievements. Since good readers do recall more information overall, we might speculate that somehow they are able to use the extra viewing time profitably. Indeed, Brown and Smiley (1977a) showed that better readers were more able to profit from extra study time.

The two dependent variables used in this study to examine goal-directed reading, viewing time and retention, may both be thought of as indicating the presence of flexibility. The reader must be flexible to differentially allocate inspection time to goal-relevant and irrelevant material and to differentially allocate processing resources to allow superior retention of the goal-relevant information. However, poorer or younger readers were not prevented from or unable to engage in differential processing of relevant and irrelevant information.

One possible reason for the failure to replicate previous studies showing superior differential recall of good readers is that this study has defined a good reader as one who scores, within each grade, in the top half of scores obtained on a vocabulary test. Although there is a high correlation between this vocabulary subtest and the entire comprehension test, perhaps using a median split on the vocabulary scores did not yield extreme enough groups. Smiley et al. (1977), for example, identified poor readers as those reading at least two grade levels below their present grade level. Eamon (1978/1979) defined poor readers as those scoring at or below the 20th percentile (using national percentile ranks) on the composite score of the Iowa Silent Reading Test--Advanced (1973). Nonetheless, Grabe and Prentice (1979) were able to find superior differential retention by good readers using a median split using the same vocabulary subtest to identify good and poor readers in the sixth-grade, although relevant information in that study was information related to a certain given perspective. It should be remembered, however, that even though superior differential retention for good readers was not found, good readers still were able to recall significantly more information overall. These results suggest that

although both good and poor readers are able to utilize flexible processing to some degree, perhaps better readers are more successful or more efficient in doing so, resulting in superior overall retention.

Oral Miscue Replication

Proportions. Although none of the correlations between proportions of miscues and reading ability reached statistical significance, several of them were in the same direction as that reported by Beebe (1980). In the proportional miscue analysis of variance, type of miscue and whether or not the miscue was corrected were significant factors, but ability did not produce any significant interaction.

There are several possible reasons why the replication of Beebe's (1980) study using proportional scores was unsuccessful. First, reading ability was again defined in a different manner. Beebe (1980) used grade-equivalent scores resulting from the administration of the Canadian Tests of Basic Skills (1975). She also used only boys and all were required to read at or above a grade 4.0 level. In addition, Beebe (1980) defined good readers as the top 20 percent of her sample. Secondly, there is always the problem in any oral miscue study of equating the difficulty levels of text. The passage read by the subjects has to be difficult enough so errors will be made, but not so difficult that the errors which are produced do not yield any information on the type of processing used. In this study, fourth and sixth-grade subjects produced a mean number of 9.6 and 11.1 total miscues, respectively. It is not known how these scores compare to the mean total number of miscues in Beebe's (1980) study. A second concern related to this problem is Biemiller's (1979) hypothesis that good

readers rely more on graphic information when reading difficult or unfamiliar material and rely more on contextual information when reading easy or familiar material. In that case, we would expect to find different levels of text difficulty producing different types of oral miscues which reflect different levels of processing, making it even more difficult to compare error rates across stories and subjects. The third possible reason for the failure to replicate Beebe's (1980) results involves the logic behind using proportional miscue scores. Beebe (1980) claims that proportions of corrected acceptable miscues were positively correlated with comprehension. However, it can easily be seen that a good reader who makes very few errors will have high proportional scores in the categories in which his or her errors fit. Conversely, a poor reader is likely to have more errors of every type. Given these problems, it is difficult to see exactly when information is gained by converting the data to proportional scores.

Numbers. The correlations between raw miscue scores and reading ability revealed that all categories of miscues were negatively correlated with reading ability. Many of these correlations were significant, although the number of unacceptable corrected substitution miscues did not significantly correlate with ability.

The oral miscue analysis of variance using raw scores showed that ability, type, and whether or not the miscue was corrected were significant factors. However, Beebe's (1980) observation that the better readers make significantly fewer unacceptable uncorrected errors was not supported by this study. If good readers are able to automatically utilize both top-down and bottom-up approaches as Stanovich (1980) hypothesizes, then they should not only correct more of their unaccepta-

ble miscues, but should also correct more of their acceptable miscues since they would presumably be aware of inconsistencies both at the word level and at the semantic level. In fact, Allington and Strange (1977) showed that good readers actually paid more attention to graphic than contextual information. Thus, good readers should not only make fewer errors, but should correct more of their errors of all types. In this case, perhaps the most important information from the oral miscue analyses of variance is the ability X correction interaction, showing that better readers correct more miscues. We may be able to interpret the findings concerning oral miscues by using an interactive-compensatory model such as Stanovich's (1980): Perhaps good readers are able to rely more on graphic information for unfamiliar and difficult material and can use contextual information to facilitate comprehension (not to facilitate word recognition as poor readers may do) when reading orally.

Regression Analyses

The results of the regression analyses for fourth-grade subjects showed that proportion unacceptable uncorrected substitution miscues, number unacceptable uncorrected miscues, and proportion acceptable uncorrected miscues significantly improved the prediction of recall of goal-relevant information beyond that predicted by vocabulary alone. However, this result may have occurred since vocabulary was such a poor predictor for the fourth-grade subjects in the first place ($r = .057$). To support this conclusion, we see that the predictive power was not significantly improved for the sixth-grade subjects, for whom vocabulary was quite a good predictor ($r = .418$). Perhaps remembering answers to specific questions is a rather difficult task for most of the younger

subjects and thus reading ability or vocabulary scores are poor predictors. In general, the results of these analyses would seem to show that while the results of an oral miscue analysis can show a reader's preference for one type or level of information (e.g., graphic or semantic), it is difficult to differentiate between good and poor readers based on the type of miscue produced. However, it does appear that ability is significantly correlated with total number of miscues and the number of miscues corrected, with better readers making fewer miscues and correcting more of their errors.

Reading Flexibility

It appears that both good and poor readers in this study were able to be flexible in their reading processing as evidenced by spending more time viewing goal-relevant than irrelevant text segments and recalling more goal-relevant than irrelevant information.

While the better readers in this study neither spent significantly more time viewing relevant than irrelevant segments when compared with poor readers nor recalled significantly more goal-relevant than irrelevant information when contrasted with poor readers, they were able to spend significantly less viewing time overall and still show overall significantly superior recall. In addition, better readers made significantly fewer oral miscues and corrected significantly more of them. The most plausible way to explain this pattern of results seems to be to postulate that better readers are more efficient in their processing. Apparently, better readers are somehow better able to store, organize, and/or retrieve the information. In this sense, using a time spent-benefits received ratio, good readers are more efficient

in achieving their goal. Presumably, good readers could allocate their processing time and resources according to various purposes in reading.

It seems likely that very different processes would be required to enjoy a poem, understand a highly detailed technical or scientific report, scan the dictionary to discover the meaning of one particular word, or to read for general enjoyment. Gibson and Levin (1975) point out that there are many purposes in reading. They describe reading as an adaptive process, with the mature reader adapting his reading processes to best obtain his goal. They state that readers spontaneously vary strategies to deal with different kinds of text and for different purposes and list five active strategies of the reader.

> 1. The mature reader exhibits flexibility of attentional strategies in reading for different types of information.
> 2. Strategies shift with characteristics of a text such as difficulty of concepts and style.
> 3. They shift with feedback (rate of gain of knowledge) as the reader progresses (e.g., he slows down under some circumstances, skim under others).
> 4. They shift with newness or oldness of information.
> 5. They shift with the reader's personal interest (he likes science fiction but doesn't like Jane Austen, or vice versa) and his educational objectives, and with instructions (his teacher said to prepare for a quiz on the history text) (Gibson & Levin 1975, p. 471).

This study has demonstrated that readers do indeed exhibit flexibility of attentional strategies (as stated in strategy number one above) and do shift with instruction (as stated in number five above). In fact, mature readers appear to be able to exhibit flexibility not only between stories or passages, but within a single passage. These adaptive or flexible processes may be viewed as indicators of metacomprehensive skills the mature reader uses to direct his or her reading

in the most effective and efficient manner possible to meet his or her goals and purposes in reading.

The notion of the mature reader as an adaptive flexible processor of information has at least three implications. First, researchers in the area of reading (and individual differences in reading, in particular) need to specify exactly what goals are or are not being given to their subjects, what type of text is being used, and spell out precisely what definition of ability is being used. Given these constraints and requirements, we might wonder whether one model can ever completely explain the complicated process called reading, especially when there are so many purposes in reading.

Secondly, this study has shed some light on the notion of using oral miscue analyses to provide useful information to educators beyond that provided by traditional reading tests. The results of this research suggest that while better readers make fewer miscues and correct more of them, type of miscue produced is not a sensitive predictor of reading ability as defined by vocabulary scores. The regression analyses suggested that results of an oral miscue analysis add knowledge about the reading processes in fourth-grade subjects, although not for sixth-grade students. Whether this result is simply an artifact, or implies that only a portion of fourth-grade students have developed the necessary higher-level skills to monitor and correct miscues while these skills are present in a majority of sixth-grade students and thus does not discriminate between good and poor readers, can not be known until additional research has been done.

The third implication applies to educational instruction. Since better readers do seem to be more efficient, might it not be wise to

include reading for various purposes and goals as a part of a reading instructional program? Perhaps readers at the junior high level, once they have learned the basic skills necessary for reading but before their reading patterns become set, could most benefit from this type of instruction. For example, students could be given formal practice at picking out the main theme of a passage or story or given questions prior to reading the story with instructions to find the answers while reading. They might also be formally instructed on how to read for general enjoyment, how to scan a passage for a particular word or phrase, or given practice in extracting details from a text. They may be given practice with different styles of text or with texts containing information at different levels of familiarity and difficulty. Students might be required to read about subjects they do not like as well as encouraged to read about subjects which interest them. All of these exercises should help develop the important metacomprehension skill of flexibility. Other important metacomprehension skills which may benefit from practice include realizing when the important content is fully understood and making certain that it will be remembered.

Future directions for research in this area include a systematic study of various metacomprehension skills and metacognitive processes. One small example would be the certainty with which a reader proclaims that he has gained knowledge. It was obvious to this author while doing this study that poorer readers were much more likely to report that they had read the four questions and were ready to recite them, when they were actually unable to repeat all four questions. Better readers were more likely to ask for additional study time if they felt they were unprepared and to be able to recite all four memorized

questions when they reported they were ready to do so. Another possibility for studying metacomprehension processes would have been to ask the subjects in this experiment what they were doing to ensure their recall of the goal-relevant material. Perhaps they could be asked to estimate which slides they viewed longer or which questions would be easier to answer. This would have allowed a more direct examination of the conscious control exerted in reading flexibly and efficiently, although this method is obviously limited in accuracy by the cognitive awareness and verbal self-reports of the subjects.

Some research is beginning to be done concerning metacognitive processes with a fair degree of success. Hayes (1976) reported improvements in metacognitive skills (self-reported) for college students after one semester in an intensive course on problem-solving skills. Brown and DeLoache (1978) reported success in initial attempts to teach simple checking and monitoring strategies to educable retarded children. Metacognitive skills, as well as their implications and applications, might profitably be explored in future research.

APPENDICES

APPENDIX A

STORIES READ FOR THE ORAL MISCUE ANALYSIS

Selection H (1973)

Three hundred years ago there lived in Holland a great explorer named Anton. He was not the usual kind of explorer, however, for he seldom journeyed far from home. Anton found a hidden world by looking through a microscope.

At an early age Anton became interested in making lenses. He became the greatest lens maker of his time. His curiosity led him to use lenses to enlarge things that could not be seen with his eyes alone.

Anton's lenses were small but very good. Some magnified up to 300 times. With his microscope he made many discoveries.

Anton wrote of tiny animals that he saw in rainwater, in seawater, in vinegar, and in mixtures of spices and water. He told of how they moved and of how they were shaped.

Many important visitors came to look through Anton's microscopes. The King and Queen of England, the ruler of Germany, Peter the Great of Russia, and many scientists paid visits to the simple Dutch storekeeper.

Selection J (1973)

Mark Twain's name is famous throughout the world for his tales of Tom Sawyer and Huck Finn.

Twain tried many kinds of work, though, before he became an author. He worked as a printer, river pilot, soldier, and newspaper reporter and editor.

In 1865 he and a friend, Jim Gillis, were in the California mountains of Calaveras County prospecting for gold. The two young men spent the rainy times in the tavern of the mining camp.

One rainy day at the tavern they met an old prospector, Ben Coon. Coon spent hours telling endless tales, all in a flat, monotonous tone of voice and with a deadpan face. Twain and Gillis thought that the old prospector's stories were excruciatingly funny because of the way he told his stories with absolutely no expression or suggestion of humor.

A few afternoons later, Coon told them a ridiculous anecdote about a jumping frog. Twain thought the story was so amusing that he decided to write the story of the jumping frog. He sent it east to a friend, who had it published. The story caught the fancy of the public and was given the name "The Celebrated Jumping Frog of Calaveras County."

APPENDIX B

STORIES FOR THE GOAL-DIRECTED STUDY

The two boys ran until they came to the driveway. Tall hedges hid their presence from the road as they walked toward the house. The lawn was lush and well landscaped.

"I never knew your place was so big," said Pete.

"Yeah, but it's nicer now than it used to be since Dad had the new stone siding put on. He also had them build a fireplace for the den."

"See, I told you today was good for skipping school," said Mark as they approached the garage. "Mom is never home on Thursday," he added.

The garage was empty except for three parked ten speed bikes. They went in the side door, Mark explaining it was always open in case his younger sister got home earlier than their mother. Pete wanted to see the house so Mark started with the living room. It, like the rest of the downstairs, was newly painted. Mark turned on the stereo, the noise of which bothered Pete.

"Don't worry, the nearest house is a quarter of a mile away," Mark shouted.

Pete felt more comfortable observing that no houses could be seen in any direction.

The dining room, with all the china, silver, and cut glass was no place to relax. The boys moved on into the kitchen where they made sandwiches. Mark said they wouldn't go to the basement because it was damp and musty down there. His father had just installed new plumbing, but who wanted to look at a bunch of pipes anyway.

"This is where my dad keeps his famous painting and his coin collection," Mark said as they peered into the den.

There were three upstairs bedrooms. Mark showed Pete his mother's closet which was filled with furs and the locked box which held her jewels. His sister's room was uninteresting except for the color TV which Mark carried to his room. Mark bragged that the bathroom in the hall was his. One had been added to his sister's room for her use. The big highlight in his room was a leak in the ceiling where the old roof had finally rotted.

When bicycles first appeared in 1816, they were simple wooden contraptions. Karl von Drais, the man who invented the bicycle, would have loved today's models. Drais was a forest ranger in Germany. Every night when he got home from patrolling the narrow forest trails he would be very tired. "If I could only do all my walking sitting down!" he would sigh.

Then one day he hit upon the answer to his problem. He built a wooden machine that looked much like today's bicycle--only it had no pedals. Sitting astride it, he pushed himself along with his feet. Soon riding academies opened all over Europe. Gentlemen went to these places to ride around on "dandy horses," as the machines were nicknamed.

In 1840 a Scottish blacksmith fitted cranks, rods and foot pedals to the axle of the rear wheel. It worked! A rider could take his feet off the ground and stay on. The "velocipede" (swift walker), as the bicycle was now called, gained favor.

Twenty years later, two Frenchmen had an even better idea. They attached cranks and pedals to the axle of the front wheel. This made pedaling easier, but the going was still slow. "The front wheel should be twice its size," said bicycle fans. "Then we could cover twice the distance with each turn of the pedal." So by 1870 the front wheel had grown to the stately height of 54 inches. To offset the greater weight of the front wheel, the rear wheel was reduced to 18 inches. The smallest bump would send the rider over the handlebars. Such headers were no laughing matter.

Lately, though, more and more Americans have rediscovered the fun of cycling. In a recent year, 5 million persons bought bicycles and joined the 54 million who were already cycling.

Could anyone ask more of a bike? "Yes," said some California teenagers. "You can't make a tight turn with a standard bike. The wheel base is too long." These teens searched in their garage for the bikes they had used as five-year-olds. The wheelbases were the right length. But if the teens, with their long legs, were going to pedal the little bikes, the seats had to be raised. The high seats demanded high handlebars. When leading bicycle manufacturers got ahold of the boys' idea and added a banana seat a new bicycling craze began. You probably see these motocross bikes everyday in the summer months.

APPENDIX C

TABLE 8

RETENTION DATA: ANALYSIS OF VARIANCE RESULTS

Source	SS	DF	F	P
Grade	42.51	1	34.43	.001
Ability	23.95	1	19.39	.001
Story Order	6.75	1	5.47	.02
Grade X Ability	1.83	1	1.48	.23
Grade X Story Order	.06	1	.05	>.50
Ability X Story Order	2.56	1	2.07	.16
Grade X Ability X Story Order	.09	1	.08	.50
Treatment	.004	1	.004	>.50
Grade X Treatment	1.97	1	1.87	.18
Ability X Treatment	1.91	1	1.81	.18
Story Order X Treatment	141.11	1	133.80	.001
Grade X Ability X Treatment	.03	1	.03	>.50
Grade X Story Order X Treatment	.11	1	.11	>.50
Ability X Story Order X Treatment	.43	1	.40	.50
Grade X Ability X Story Order X Treatment	.00	1	.00	.50
Relevance	9.17	1	12.86	.001
Grade X Relevance	.57	1	.80	.37
Ability X Relevance	1.16	1	1.62	.21
Story Order X Relevance	1.36	1	1.91	.17
Grade X Ability X Relevance	1.28	1	1.80	.19

RETENTION DATA: ANALYSIS OF VARIANCE RESULTS--(Continued)

Source	SS	DF	F	P
Grade X Story Order X Relevance	.00	1	.00	>.50
Ability X Story Order X Relevance	4.69	1	6.58	.01
Grade X Ability X Story Order X Relevance	.00	1	.01	>.50
Treatment X Relevance	4.38	1	6.06	.02
Grade X Treatment X Relevance	1.49	1	2.06	.16
Ability X Treatment X Relevance	.04	1	.06	>.50
Story Order X Treatment X Relevance	.03	1	.05	>.50
Grade X Ability X Treatment X Relevance	.05	1	.07	>.50
Grade X Story Order X Treatment X Relevance	1.70	1	2.35	.13
Ability X Story Order X Treatment X Relevance	.09	1	.12	>.50
Grade X Ability X Story Order X Treatment X Relevance	2.16	1	2.98	.09

APPENDIX D

TABLE 9

INSPECTION TIME DATA: ANALYSIS OF VARIANCE RESULTS

Source	SS	DF	F	P
Grade	104.03	1	11.35	.002
Ability	78.82	1	8.60	.005
Story Order	17.84	1	1.95	.17
Grade X Ability	86.02	1	9.38	.004
Grade X Story Order	.62	1	.07	>.50
Ability X Story Order	31.58	1	3.45	.07
Grade X Ability X Story Order	.50	1	.06	>.50
Treatment	1.67	1	1.22	.27
Grade X Treatment	8.36	1	6.10	.02
Ability X Treatment	.77	1	.56	.46
Story Order X Treatment	.60	1	.44	>.50
Grade X Ability X Treatment	.03	1	.02	>.50
Grade X Story Order X Treatment	.16	1	.12	>.50
Ability X Story Order X Treatment	.48	1	.35	>.50
Grade X Ability X Story Order X Treatment	.00	1	.00	>.50
Relevance	2.85	1	9.25	.004
Grade X Relevance	2.04	1	6.61	.01
Ability X Relevance	.52	1	1.68	.20
Story Order X Relevance	.04	1	.13	>.50
Grade X Ability X Relevance	.72	1	2.32	.13
Grade X Story Order X Relevance	.05	1	.17	>.50

INSPECTION TIME DATA: ANALYSIS OF VARIANCE RESULTS--(Continued)

Source	SS	DF	F	P
Ability X Story Order X Relevance	.40	1	1.30	.26
Grade X Ability X Story Order X Relevance	.66	1	2.15	.15
Treatment X Relevance	4.51	1	11.32	.002
Grade X Treatment X Relevance	.13	1	.33	>.50
Ability X Treatment X Relevance	.86	1	2.15	.15
Story Order X Treatment X Relevance	.56	1	1.39	.24
Grade X Ability X Treatment X Relevance	.14	1	.35	>.50
Grade X Story Order X Treatment X Relevance	1.94	1	4.85	.03
Ability X Story Order X Treatment X Relevance	.10	1	.25	>.50
Grade X Ability X Story Order X Treatment X Relevance	.11	1	.27	>.50

APPENDIX E

TABLE 10

PROPORTIONAL ORAL MISCUE DATA: ANALYSIS OF VARIANCE RESULTS

Fourth Grade

Source	SS	DF	F	P
Ability	.00	1	---	---
Type	.06	1	1.1	.30
Ability X Type	.01	1	.11	>.50
Correction	2.61	1	55.43	.001
Ability X Correction	.14	1	2.87	.10
Type X Correction	.69	1	10.36	.003
Ability X Type X Correction	.22	1	3.37	.08

Sixth Grade

Source	SS	DF	F	P
Ability	.00	1	---	---
Type	.60	1	23.48	.001
Ability X Type	.02	1	.70	.41
Correction	3.58	1	141.48	.001
Ability X Correction	.00	1	.08	>.50
Type X Correction	.09	1	3.76	.06
Ability X Type X Correction	.04	1	1.85	.18

APPENDIX F

TABLE 11

RAW-SCORE ORAL MISCUE DATA: ANALYSIS OF VARIANCE RESULTS

Fourth Grade

Source	SS	DF	F	P
Ability	127.81	1	9.62	.004
Type	24.81	1	7.62	.01
Ability X Type	7.66	1	2.35	.13
Correction	316.41	1	33.95	.001
Ability X Correction	97.66	1	10.48	.003
Type X Correction	16.20	1	3.33	.08
Ability X Type X Correction	5.26	1	1.08	.31

Sixth Grade

Source	SS	DF	F	P
Ability	44.27	1	4.07	.05
Type	51.54	1	23.63	.001
Ability X Type	.88	1	5.40	>.50
Correction	516.62	1	54.23	.001
Ability X Correction	38.26	1	4.02	.05
Type X Correction	10.64	1	6.47	.02
Ability X Type X Correction	5.40	1	3.29	.08

NOTES

NOTES

Note 1. Grabe, M., & Doeling, D. Age and reading ability differences in reading flexibility: A possible example of metacognitive skill. Paper presented at the American Educational Research Association, April 1981.

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