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# Reading Comprehension

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**ABSTRACT:** *Four major assumptions drive current psychological research on the reading comprehension process: (a) Skilled reading depends on the complex interaction of cognitive, linguistic, and perceptual processes; (b) reading is an interactive process; (c) our ability to process textual information is constrained by the limits of our information processing ability; and (d) reading is strategic. Emerging evidence points to prior knowledge and cognitive and metacognitive processes as critical for the development of skilled reading comprehension. Evidence suggests that instruction on the processes underlying comprehension can improve a reader's comprehension skills.*

Basic issues in reading were a part of research in experimental psychology from its inception in the late 19th century until the 1940s, when interest in them waned. The advent of the "cognitive revolution" in the 1960s heralded a return to the earlier level of interest (Schwartz, 1984). At the present time, reading issues are being vigorously investigated from the perspective of psychology. In addition to the motivation to understand basic issues involved in reading, researchers are attempting to understand the social and educational consequences of reading difficulty experienced by many children, especially those in low-income urban communities. It is important to note that psychology shares these foci on the investigation of reading issues with such disciplines as linguistics, education, and medicine.

From the perspective of education, issues in reading research have centered on instruction (Schwartz, 1984). A classic discussion of these instructional issues appeared in Chall (1967), who concluded that decoding, at the early stages of reading, should lead to better achievement in reading (Williams, 1979). The present article focuses not on reading instruction, but rather on basic aspects of the reading comprehension process as they have been pursued in psychology for skilled and nonskilled readers.

## Current View of the Reading Process

Currently, reading research and theory are concerned with memory for prose and text processing (Anderson, 1987; Perfetti, 1985; Schwartz, 1984). In the present view, skilled reading is text based and interactive as opposed to sequential. From this perspective, reading for comprehension is purposive and resides as much in the person reading as in the text to be read (Bransford & Johnson, 1972). Moreover, it is assumed that the reader brings to a text his or her expectations, prior knowledge of language structure and content, and cultural background in order

to construct an interpretation of the written word as it is being read.

The current perspective on the reading process is anchored in several disciplines: linguistics, psychology, computer science, and anthropology. New developments in these disciplines have affected formulations about the reading process (Orasanu, 1986).

## New Developments in Various Disciplines

### Psychology

In psychology, the shift from behaviorism to an information-processing perspective and its impact on language theory profoundly affected reading comprehension research (Orasanu, 1986; Schwartz, 1984; Spiro, Bruce, & Brewer, 1980). Three articles by Miller (1956, 1965, 1973) were significant in forging new developments in psychology that had an impact on the direction of theory and research in reading comprehension. In the 1956 article, Miller proffered that we are able to hold seven, plus or minus two, units of information in immediate memory at one time. The 1965 article stimulated psychologists' interest in investigating problems in psycholinguistics from a Chomskian perspective. Miller put forth seven ideas that had implications for research:

1. Not all physical features of speech are significant for vocal communication, and not all significant features of speech have a physical representation.
2. The meaning of an utterance should not be confused with its reference.
3. The meaning of an utterance is not a linear sum of the meanings of the words that comprise it.
4. The syntactic structure of a sentence imposes groupings that govern the interactions between the meanings of the words in that sentence.
5. There is no limit to the number of sentences or the number of meanings that can be expressed.
6. A description of language and a description of a language user must be kept distinct.
7. There is a large biological component to the human capacity for articulate speech. In 1973 Miller analyzed the knowledge base existing on reading issues and concluded,

It would seem appropriate to support research into the cognitive processes (reasoning and perceptual abilities) that are involved in basic literacy skills. In addition, it would seem appropriate to support studies dealing with the analytic component of basic literacy skills, and which aim at calibrating and ranking these skills and building them into a comprehensive early reading program. (p. 39)

Two other developments in psychology were important in helping to forge the current perspective on the reading process. Bruner (1957) proposed the idea of going beyond the information given in processing information. This idea was critical for research on our understanding of reading as an inferential process. Bruner's ideas are reflected in current schema theory, which is having a profound impact on our understanding of the reading process. Schema theory refers to how knowledge is stored in memory, to the ways this knowledge is used in comprehension, to the acquisition of new knowledge, and to the recall of old knowledge (Rumelhart, 1980).

### *Linguistics*

New developments in linguistics emphasized the structural aspects of language as put forth by Chomsky (1959). He argued that we are both comprehenders and producers of novel sentences, and direct experience with a sentence is not a significant factor in the way we understand language. Recent research in semantics, discourse processes, and language development has affected the course of research on reading comprehension (Hall, White, & Guthrie, 1986). This work forged the idea that the meaning of certain elements of sentences (e.g., pronouns) often depends on information beyond individual sentences, that is within either the discourse or the nonlinguistic context (Carroll & Freedle, 1972). These formulations have made it possible to study language units larger than the sentence. This in turn broke ground for research on discourse structures, information integration, inferencing, cohesion devices, and schema theory (Orasanu, 1986). One direct consequence of this work has been the development of models to account for the way we process a text. Perhaps the most comprehensive of these models for our understanding of the processes involved in comprehension is that of Kintsch (Kintsch & Van Dijk, 1978). This model of text is based on propositions that have their own internal structure. Propositions are psychologically valid in that they affect how we process a text. Specifically, each proposition affects the amount of time it takes to read text (Kintsch & Keenan, 1973).

### *Cultural Anthropology*

The role of culture in behavior continues to have an impact on our thinking in behavioral sciences. Among the influential pieces of work on this issue were those of Cole, Gay, Glick, and Sharp (1971) and Scribner and Cole (1981). A basic claim of the Cole et al. cross-cultural work was the existence of a close fit between the range of contexts in a culture within which particular kinds of practice were provided on the one hand and the generality of cognitive consequences on the other. Admitting that the totally general case may be virtually impossible to demonstrate, Scribner and Cole (1981) succeeded in applying these ideas to the case of literacy among the Vai. Remarkable for having invented their own syllabic writing

system, the Vai also engage in literate practices in English and Arabic. Each writing system is associated with particular areas of life: Vai is used for personal affairs including family businesses, Arabic for religious purposes, and English for dealing with the government and national commercial interests. The research of Scribner and Cole showed that each kind of literacy produced script-activity-specific cognitive consequences, which mapped very nicely onto the associated areas of cultural practice. These practices were in turn constrained by the larger sociopolitical situation.

An important line of research on the comprehension process emanating from the line of thinking put forth by Cole et al. (1971) and Scribner and Cole (1981) is reflected in some recent findings by Steffensen, Joag-dev, and Anderson (1979), who found that subjects from different cultures employed elaborations and distortions specific to their own culture when interpreting a text.

### *Computer Science*

In computer science, significant developments in designing interactive models of information processing are reflected in the specification of computer programs that solve problems and play chess (Newell & Simon, 1972). An important result of these developments has been the development of models of human cognitive processes. Regarding the reading comprehension process, the newly developed models of human cognitive processes opened the way to research on how knowledge is represented (Orasanu, 1986).

From the current perspective, then, reading is conceptualized as an active search for meaning, requiring that the reader employ a set of interacting processes and strategies related to his or her purpose.

### **Some Major Findings**

Several major findings since the mid-1970s have greatly advanced our knowledge of the comprehension process in reading. These findings have to do with metacognition, prior knowledge, cognitive processes, and development.

### *Metacognition*

Significant work has been done in metacognition, or reflecting on one's knowledge. A child who says "I would like to know more than I do" is engaging in metacognition. This research has found that readers, including children, are aware of their knowledge and use strategies to attain their goals. Perhaps most important, this line of research has shown that the reader can establish his or her own internal criteria for learning, monitor his or her own progress in terms of these criteria, and act to satisfy his or her goals as a reader (Brown, Armbruster, & Baker, 1986).

A portion of the research on metacognition has centered on individual differences among good and poor readers in interaction with age. A major finding in this regard, according to Brown et al. (1986), is that young children find it difficult to identify central issues in complex prose. It is the case, however, that young children as

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early as age 6 are sensitive to many characteristics of a story, for example, main character and sequence of events. Brown et al. (1986) also point out some other differences between good and poor comprehenders. Persons good at comprehension make use of context in developing and understanding what they are reading, whereas poor readers do not. It should be noted, however, that this is not the whole story. Poor readers make good use of context when it comes to word identification (Perfetti & Roth, 1981; Stanovich, 1980).

### ***Prior Knowledge***

It is clear from another line of research that a reader's prior knowledge is a significant factor in his or her comprehension of a text. According to Anderson and Wilson (1986), a reader comprehends the intended message of a text when he or she is able to activate, or construct, a schema that gives a good account of the objects and events described. A schema is a structure in semantic memory that details how a body of information is expected to be arranged. A story schema, for example, might include setting plus theme plus plot plus resolution. Setting might consist of characters plus location plus time. Theme might consist of events plus goal. Plot might consist of episodes (Thorndyke, 1977). Classic studies on the role of schema activation and text comprehension are those of Bransford and Johnson (1972) and Bransford, Stein, Arbitman-Smith, and Vye (1985). The findings from these investigations substantiate those expressed by Anderson and Wilson (1986) on the role of prior knowledge in the processing of information.

An aspect of prior knowledge that has enjoyed a substantial amount of research is a person's knowledge of the structure of a story. Indeed, story structure research has been one of the most prolific areas of inquiry regarding text structure in the last 10 to 15 years. Interest in this aspect of text structure can be traced to Rumelhart's version of simple story structure. The essential idea behind this formulation is that stories can be analyzed into episodes focused on attempts to resolve a problem. In a well-formed story, the episodes and their related events can be ordered sequentially in a causal manner. Versions other than Rumelhart's (1980) have been put forth (Mandler & Johnson, 1977; Stein & Glen, 1979; Thorndyke, 1977). Research by Black and Bower (1980) and Omanson (1982) presented data generally supportive of these formulations. Further research, for example, by Day, Stein, Trabasso, and Shirey (1979), indicated that as early as age 4 children can infer the motives and feelings of the characters in a well-constructed story. This knowledge also affects children's recall of a story's elements in a way similar to that for adults. The ability to draw inferences from a text has been reported to appear in children by at least the second grade (Paris & Lindauer, 1976).

### ***Cognitive Processes***

Considerable progress has also been made in recent years in unraveling some of the cognitive processes involved in reading comprehension. Progress has occurred on several fronts. One has been development of, and capitalization

on, methods of investigating cognitive processes in comprehension and its implications for the process of comprehension itself. A second has been specification of perceptual processes underlying comprehension. A third has been the development of theoretical models to explain the comprehension process (Carpenter & Just, 1986).

### ***Methods of Investigation: Eye Movements***

The question of the reader's eye movements has bedeviled and interested students of comprehension for some time. The reason for the interest in eye movements (fixations and nonfixations) during reading is that, theoretically, these behaviors are assumed to provide a window on difficulty or ease of understanding a text. We have learned much about a person's moment-by-moment processing of a text through the medium of eye movements (Carpenter & Just, 1986; McConkie, Underwood, Zola, & Wolverton, 1985). Modern technology in the area of perception has allowed us to address questions of the relation between eye movements and reading. It is fairly clear that fixations, or discrete pauses of the eyes, occur during the reading of a text and that readers' eyes do not move along without disruption. Carpenter and Just (1986) estimated that most of a person's time during reading, up to 90-95%, is taken up by these fixations.

Other specific findings have been developed from this line of work. Fixation patterns differ for different categories of words. Nouns, verbs, adjectives, and content words in general produce eye fixations 80% of the time, whereas function, or connecting, words and words like *the* are fixated 40% of the time during the process of reading (Carpenter & Just, 1986).

### ***Specific Perceptual Processes***

Along with the development of the powerful method of eye movements has come other progress in the area of perception and reading. It seems clear that our perceptual span during reading is quite small (Rayner, 1975). We do not see very far into the periphery when reading.

A continuing aspect of perceptual processes that has commanded the attention of reading researchers is decoding. Several facets of decoding have been investigated with success. The attack on these facets has been of two sorts: model building and data collecting. The major finding on this topic is that semantic context facilitates word identification. The point is that knowing a good bit about the relation among words aids decoding. An important experiment on this topic is that reported by Meyer and Schvaneveldt (1971), who found that in comprehension, we can process the word "doctor" much more productively if we have recently processed the word "nurse."

### ***Modeling***

Attention has also been directed to trying to match computer models to human performance. One significant instance for reading can be found in the work of Thibadeau, Just, and Carpenter (1982) on eye fixations. These researchers found a high correlation between the time that a computer model spends on words in a text and the eye fixations displayed by human readers. One motivation

for this kind of model building is to understand the differences between good and poor readers.

A number of findings exist on the topic of good versus poor readers. The findings concern a reader's ability to access words (Perfetti & Lesgold, 1979), functional reading span (Daneman & Carpenter, 1980), and a reader's vocabulary (Hall et al., 1986). Of particular note is the work on functional reading span ascertained from eye fixation research. Fixation of the eye during reading depends on several factors. Chief among these are reading proficiency and content of the text. Variance in fixation time is hypothesized to reflect processing difficulty. The interaction of parts of a text is also related to variation in fixation time of the eyes. Ease or difficulty in integrating portions of a text with each other affects fixation variation when reading (Daneman & Carpenter, 1980).

### ***Developmental Findings***

Children bring a good many relevant skills to the reading comprehension task. The skills are largely those they have experienced in oral communication. To communicate in an oral context, one must draw inferences, extract meaning, and make interpretations. Children beginning formal reading exercises are fairly fluent in these abilities, all of which enter into the task of reading comprehension. What the child must learn is how to use these skills in the understanding of written language (Carroll, 1986). Specifically, the child must learn how to analyze words into their constituent parts. Skilled readers use a variety of methods to accomplish this purpose. Moreover, the child must learn how to relate a given word to the overall meaning of a sentence and the sentence to the overall meaning of the text. Mature readers are more skilled at accomplishing this purpose than are less mature ones. Further, the child must learn to recognize the structure of a text and how to interpret its overall meaning. As noted earlier in this article, children early on in their development have many skills related to this task. For example, second-grade children are sensitive to the order of sentences in a text, children have an adult model for the way a story is structured by early elementary school (Mandler & Johnson, 1977), and children can make adultlike inferences from a text (Paris & Lindauer, 1976). On the other hand, long and difficult stories seem to tax the younger child's (fourth graders) information-processing skills (Bowey, 1982).

### ***Schooling and Reading Comprehension***

The question arises: Does our current state of knowledge allow us to address the social and educational consequences of reading difficulty experienced by many children? An answer to this question is neither easy nor clear cut. Suffice it to say that a good deal of information is accumulating on the reading comprehension process from the perspective articulated in this article. Our knowledge of memory for prose and text processing and appreciation of the role of the reader's prior knowledge have greatly increased during the past decade. We know, for example, that skilled comprehension requires fluent word processing skills and that this skill is facilitated by both practice and instruction (Beck & McKeown, 1986).

It also seems clear that the schema a reader develops concerning what is in a story and propositions underlying sentences in a story play crucial roles in developing comprehension skills. Moreover, research suggests that teaching how a text is organized facilitates a reader's understanding of the content of a text. Evidence also points to the possibility of increasing a reader's prior knowledge so as to facilitate his or her comprehension of a text. Specifically, evidence is accumulating that suggests a reader can be taught to access his or her existing knowledge about a text, thus facilitating comprehension, especially for average readers. Other evidence on the prior knowledge issue suggests that methods are available for assisting readers to increase their background knowledge, which in turn improves their comprehension (Beck & McKeown, 1986).

### **Conclusion**

Recent research on reading has focused on the basic delineation of the comprehension process and differences between skilled (mature) and nonskilled (less mature) readers. Four major assumptions underlie this work (cf. Spiro, Bruce, & Brewer, 1980). The first is that skilled reading is a complex task depending on perceptual, cognitive, and linguistic processes. This assumption suggests the second, namely, that reading is an interactive process that does not proceed in strict sequence from basic perceptual units to overall interpretation of a text. Rather, the skilled reader derives information from many levels simultaneously, integrating graphophonemic, morphemic, semantic, syntactic, pragmatic, schematic, and interpretive information simultaneously. The third assumption is that the human information-processing system is a powerful constraint acting to limit our capacity for processing textual information. We are limited in the amount we can perceive in a single fixation, how quickly the eyes can move, the number of chunks of information we can hold in short-term memory, and the rapidity with which we can retrieve information from long-term memory. When applied to skilled reading, the limited-capacity assumption suggests that lower level processes such as decoding function automatically, thereby allowing the reader to attend to higher order comprehension processes. The final assumption is that reading is strategic. The skilled reader is purposive and a continuous monitor of his or her own comprehension. Moreover, the skilled reader is alert to breakdowns in understanding, selective in the allocation of his or her attention to various aspects of text, and progressively refining the interpretation of a text.

Against this general backdrop of data and theory, research is continuing on the reading comprehension process. Several questions are being investigated. First, how do we come to understand novel texts, and what role does crisscrossing of domains of knowledge play in this process (Anderson, 1987)? Second, how do we learn so many words? Quite remarkable growth in vocabulary takes place in the preschool, elementary, and high school years, an observation that has clear implications for policy and theory (Hall et al., 1986).

Even the most ruthlessly systematic direct vocabulary instruction could neither account for a significant proportion of all the words children actually learn, nor cover more than a modest proportion of the words they will encounter in school reading materials. (Nagy & Anderson, 1982, p. 1).

Moreover, "If the year to year growth in vocabulary for the average child is as large as some figures suggest then the best advice . . . is to help children become independent word learners" (Anderson & Freebody, 1982, p. 5). And third, what is the role of reading in later syntactic development among children? Children do not fully control several kinds of complex sentences when they begin formal reading instruction, and they continue to demonstrate gains in syntactic skill until they are at least 12 years of age. How is this accomplishment facilitated by learning to read (Hall et al., 1986)?

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