

units of analysis, experimenters often feel that they have less control over the subject's processing of the material. Thorndyke (Note 1), for example, states that language comprehension involves "integration of incoming language into the situation or context . . . use of previously learned world knowledge, the generation of inferences . . . [and] of expectations" (p. 2). However, this feeling of more control with consonant-vowel-consonant (CVC's) is illusory: To the extent that subjects are successful at remembering CVC's, word lists, etc., they are using their long-term memory in unpredictable ways to create mnemonics and integrate them into a "meaningful structure," (Montague, Adams, & Kiess, 1966; Prytulak, 1971). If anything, the experimenter should have a better idea of the nature of subjects' processing with paragraph material because the nature of integration should be more predictable.

Another reason experimenters have shied away from using prose material is the difficulty in determining the similarity and differences among passages. This makes comparisons across experiments that use prose difficult. There have been two main dependent measures employed in the study of prose comprehension and retention: question answering and free recall of the passage. Anderson (1972) has argued that not enough attention has been placed on the selection of questions that are intended to measure comprehension. Just as it is difficult to evaluate the similarity of prose passages, so it is difficult to score recall of prose in a meaningful way to determine how much has been retained.

The new willingness to study prose comprehension, despite its problems of imprecision, is due to several factors. First of all, some investigators have lost faith in the idea that results from simple laboratory experiments will generalize to natural materials.² Second, it is now easier to conduct research and develop theories related to reading than it was a few years ago, due to the developments in computer science and linguistics.

Computers are an aid to the study of prose in two ways. Paragraphs can now be presented to the subject "on-line" (on the computer TV monitors), each sentence displayed for only the time a specific subject needs to read it. Reading times can be recorded, questions can be asked at any desired point, eye movements can be monitored, and speed versus accuracy in answering the questions can be manipulated. Computers are also an aid to theoretical development as they allow simulation of prose processing. It would be very difficult to develop a model of prose processing in much detail without implementing it on a computer as the complexity is not conceptually tractable. Another reason theorists have returned to prose processing is

² There is an interpretation of these remarks with which I do not wish to be associated. A common position of late is that the "correct" domain in which to work is prose processing or, even more specifically, "story" processing; that working with more "impoverished" material leads to distortions of the normal processing. This point of view and the methodological imperialism to which it leads are nonsensical. The human engages in a wide variety of behavior. There is no reason to believe that story comprehension of the kind currently in vogue is more representative of normal processes than is free recall. In fact, there are probably more adult behaviors (e.g., remembering a grocery list) that come close to a free-recall experiment than adult behaviors that come close to reading one of the very simple stories typically employed. It seems ill-advised to regard any paradigm as prototypical. A theorist may miss important generalities in human behavior if the tasks studied are restricted to a narrow paradigm.

the concomitant development of text grammars in linguistics, (e.g., Lakoff, 1972). Psychologists and simulators use theoretical notions from linguistics to suggest experiments or ways to simulate. Linguistics is also influenced by work done in the other two fields.

There are other groups of investigators apart from cognitive psychologists who have been studying prose. Researchers in the field of education have been exploring this issue for many years (e.g., Ausubel, Frase, Gagné, Rothkopf). Memory theorists who have uncovered a number of principles using the "verbal learning materials" (e.g., lists of nonsense syllables or words) have investigated to what extent the principles generalize to connected discourse.

One of the problems, of course, in studying prose comprehension is the need to pare down the morass of complexities associated with prose. Thus far, the strategy to deal with the enormous complexity seems to be to partition the problem of prose understanding into subproblems and only focus on one or two aspects; for example, the structure and grammars of stories, how the "content" (words and topics) affects recall, how orienting tasks affect comprehension, or the role of knowledge bundles (scripts or frames) in understanding.

Hopefully, this problem can be partitioned into different aspects, but unless investigators are aware of all aspects of the problem, little success is likely. For example, those concerned with developing story grammars should consider what kind of process model or mechanism would enable the reader to build a representation from a given story using the grammar. What world knowledge is needed to comprehend the story and how does the grammar use it? Those concerned with developing "comprehension" or process models necessarily assume an end representation for the story. Use of a specified story grammar would facilitate theory-builders' decisions concerning the importance of various aspects of a story already parsed and would influence expectations about material not yet processed from the text.

The first section of this paper will review some of the research that has focused on applied, practical questions of interest to education. The results from some of this research indicate the need for a more sophisticated understanding of text structures and internal representations of text. A review of current work on text grammars is given, followed by a discussion of work on processing models. Finally in the last section, we can see how some of the theoretical work has implications for the educational questions with which we began.³

A recurrent theme within this review will be how notions about the role of elaboration in comprehension can be used to interpret the available data. The paper does not focus on the role of elaborations, but frequently during the review these notions will be discussed. It therefore seems useful to give a brief description of the notion of elaborations here. This notion is that the more extra processing one does that results in additional, related, or redundant propositions, the better will be

³ Letter identification, word identification, phonetic coding, etc. are important aspects of reading, but how they are performed is not addressed in this review. It has been shown (Anderson & Biddle, 1975; Smiley, Oakley, Worthen, Campione, & Brown, 1977) that the differences between good readers and poor readers maintain regardless of the input modality of the message to be retained (visual or verbal). Many people's problems with reading are not ones of encoding but of comprehension which they would have whether they listened to the message or read it.