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RESEARCH ON TEACHING READING COMPREHENSION

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November 1980

Center for the Study of Reading

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Research on Teaching Reading Comprehension

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The present paper represents an attempt to address the "state of the art" relative to research on teaching reading comprehension. The reading researcher and practitioner will find the paper a review of what we know about reading comprehension instruction, and a framework for addressing the adequacy and promise of existing and forthcoming lines of inquiry. Two basic questions drive our discussion: With whom, in what situations, and in what ways does teaching improve reading comprehension? How should research in teaching reading comprehension proceed?

Our purpose was threefold: (a) Describe the nature and distribution of research in teaching reading comprehension in the context of stated and/or implied instructional goals; (b) consider issues of methodological significance as they emerge; and (c) suggest some reasonable guidelines for future research in accord with rising research interests and alternative approaches to investigation. We have adopted two discussion headings which represent the nature and scope of this research in terms of two fundamental goals for instruction: increasing learning from text and increasing ability to learn from text. The former reviews the large array of studies which examine the efficacy of teacher intervention intended to improve students' ability to understand, recall, or integrate information from specific text passages. The latter addresses those studies whose goal is to improve general and specific reading comprehension abilities which will transfer to students' reading of passages

they later encounter on their own. These two discussions then merge in the final section of the paper where we consider future directions for reading comprehension instructional research and guidelines for how that research might or should be conducted.

We recognized from the outset that a review which exhausted the literature was neither realistic nor within the bounds of our goals. Instead, we decided that studies cited in the context of our remarks should be selected largely for their representativeness, significance, or promise. And, with respect to research paradigms, an attempt was made to include descriptive studies dealing with theoretical issues of relevance to teaching reading comprehension, empirical studies involving such prototypical methodology as treatment group comparisons, research syntheses of instructional procedures, and discussions relating aspects of pedagogical intuition. To these ends, we believe the present review is comprehensive.

INCREASING LEARNING FROM TEXT/PROSE

It is the purpose of this section to highlight research which studies instructional intervention as a means to improve students' understanding, recall, and integration of information, stated in or inferable from specific text passages. Our review of such interventions includes prereading activities, guided reading activities and postreading activities. Note that we have drawn a distinction between activities or strategies based upon when and for what purpose intervention takes place. This distinction might be characterized in the following trichotomy: building upon

background knowledge, activating readers' existing background knowledge and attention focusing before reading to learn; guiding reader-text interactions during reading to learn; and providing review, feedback, or cognitive stimulation after reading to learn.

Prereading Activities

Most reading lessons include a prereading activity which provides a bridge of sorts between a reader's knowledge base and the text. Most lesson frameworks used in conjunction with basals and content area textbooks consider this step a preparatory one in which purpose setting and concept development are primary goals. In principle most of these activities are directed at the reader's background knowledge; implicitly, they reflect at least tacit acceptance of the role of background knowledge and the importance of building and activating readers' knowledge before reading to learn.

The Role of Background Knowledge

In general, both theory and research support the notion that background knowledge affects how much information is recalled and what information is recalled from reading, as well as readers' perceptions of such aspects of the reading situation as an author's background and purposes. Recent theorists, such as Ausubel, 1963, 1968, 1978, and the schema theorists of the past decade (Anderson, Spiro, & Anderson, 1978; Rumelhart & Ortony, 1977; Spiro, 1977) have addressed the role of background knowledge and its relation to text comprehension, in particular as it applies to

broader issues of processing and recalling information. In the process of confirming this relationship, several recent investigations have contributed toward specifying the differential impact of background knowledge upon the type and amount of information recalled by readers. For example, a study by Anderson, Reynolds, Schallert, and Goetz (1977) found that recall and comprehension of passages capable of two alternative interpretations were highly related to the background knowledge of the readers. More physical education students took a wrestling perspective in response to a prison/wrestling passage and a card-playing perspective in response to a card/music passage; for music students the reverse was true. Similarly, Steffensen, Joag-Dev, and Anderson (1979), in a cross-cultural study involving subjects from the United States and India, found that subjects tend to read more rapidly, recall more information, and produce more consistent elaborations for passages dealing with culturally relevant material. A study by Pearson, Hansen, and Gordon (1979) again demonstrated this differential effect, as the extent to which young readers were able to respond to questions tapping implicit and explicit information tended to vary with respect to their idiosyncratic backgrounds of experience. More recently Tierney, LaZansky, Raphael, and Mosenthal (Note 1) have observed familiarity to manifest itself not only in terms of what information is recalled, but also in readers' perceptions of an author's purposes, intended audience, and relationship with that audience.

In addition to providing empirical evidence for longstanding notions regarding the role of background knowledge, such findings compel one to

suppose that activating or building a reader's existing knowledge prior to reading to learn will improve or at least alter comprehension and recall. As we have already suggested, if one examines the conventional wisdom of reading practices, one encounters a number of references to the importance of activating or building background knowledge prior to reading, and an even greater barrage of specific suggestions, strategies, and activities directed toward these ends. Yet, examining results of intervention studies which make use of specific strategies intended to activate or build readers' background knowledge, one is confronted with a rather fragile generalization: namely, whatever positive effects these strategies may have, in general their effects tend to vary considerably across such variables as texts, teachers, and readers. Rather than suggesting the futility of attempting to activate and build background knowledge, this situation serves to point out that: (a) we may not, at the present time, know enough about the relationship between intervention and learning; (b) experimental methodology may be so distorting the instructional environment that whatever effects would occur under typical learning conditions are either lost or distorted; (c) it would be naive to assume any strategy sensitive enough to warrant its implementation across all reading situations; and (d) current means of measuring a reader's background knowledge or assessing the impact of its activation are in need of further development.

We begin our discussion of specific intervention techniques in the context of building background knowledge during <u>prereading</u> instruction. We

hope that this discussion, and the three which follow, will provide an introduction, some illustration, and a partial explanation of the problems to which we have only just alluded.

Building Background Knowledge Prior to Reading

When readers apparently lack the prior knowledge necessary to read to learn, what can be done to compensate? Three suggestions appear most often in instructional literature: teach vocabulary as a prereading step; provide experiences, vicarious or otherwise, which fill in and expand upon students' existing knowledge; or introduce a conceptual framework analogous to that of the text which will enable students to build appropriate background for themselves.

Preteaching vocabulary. An enduring piece of conventional wisdom in reading education is the recommendation that students be taught crucial word meanings prior to encountering them in text. In most directed reading lessons which accompany basals and content area textbooks, introduction to new vocabulary is an integral first step. As Bridge (in press) suggests, introduction to new vocabulary is perceived as serving "the function of arousing previous conceptual associations and providing new associations . . . to help students to relate the unfamiliar concepts to familiar ones." In a similar vein, Pearson and Johnson (1978) describe such activities as providing anchors for new information. Or as Beck, McKeown, McCaslin, and Burke (1980) have suggested, teaching vocabulary is a specialized aspect of developing background knowledge essential for comprehension

and is widespread in most reading programs. In fact, one person (Becker, 1977) has recommended that disadvantaged students be taught 25 word meanings per week, starting in third grade and continuing through twelfth grade, in order to compensate for the students' lack of conceptual knowledge.

The fact that vocabulary development is such a widespread instructional focus may be partially a function of that research which alludes to the relationship between vocabulary and reading comprehension. Correlations between knowledge of word meanings and ability to comprehend passages containing those words, between knowledge of word meanings and verbal intelligence, as well as between word difficulty and passage difficulty are all high and well established. (For a review of this work, see Anderson & Freebody, 1979; Davis, 1971.) These relationships have been further demonstrated by studies which show that not only do good and poor readers appear to differ with respect to knowledge of word meanings (Belmont & Birch, 1966), but replacing high-frequency words with low-frequency synonyms in texts decreases subjects' passage comprehension (Marks, Doctorow, & Wittrock, 1974; Wittrock, Marks, & Doctorow, 1975).

Less encouraging, however, are those findings related to the effects of vocabulary instruction upon reading comprehension. Researchers employing carefully designed interventions in which subjects are pretaught word meanings have consistently found that such instruction improves students' knowledge of the words taught but does not significantly improve their passage comprehension (Jackson & Dizney, 1963; Jenkins, Pany, & Schreck, 1978;

Lieberman, 1967; Pany & Jenkins, 1978; Tuinman & Brady, 1974). While these results may seem counterintuitive, they do suggest either that conventional wisdom is astray, or that "the effects of vocabulary knowledge on reading comprehension are far more subtle than either conventional wisdom or reading educators had imagined" (Jenkins & Pany, in press). We would posit that the subtle effects of vocabulary knowledge may have been short-circuited by the failure of researchers to fully consider readers' background knowledge and purposes for reading as well as such aspects of text as key vocabulary and the relationships which exist between concepts. Thus, it may be more instructionally beneficial to ask questions similar to the following: What types of vocabulary activities would likely build a reader's background knowledge prior to reading a text? To what extent should these vocabulary activities be individualized and extended over time? In what situations is vocabulary development likely to be essential? In what ways (during or after reading) will differences in background knowledge due to vocabulary development most likely be manifested?

Analogy. Analogy might be defined as an expositional method for comparing sets of information which are similar enough in certain essential respects to permit transposition of attributes across sets, usually from familiar to unfamiliar information. The classroom being what it is, explanation must often suffice for experience. Teachers, therefore, have long operated under the assumption that while explanation via analogy is not a substitute for experience, it affords a practical means for introducing students to unfamiliar information in the context of a familiar

framework. Many philosophers (Black, 1962; Campbell, 1920) and psychologists (Rumelhart & Ortony, 1977), especially those advocating a schema-theoretic point of view, concur on this point.

Despite the potential utility of analogy claimed by educators, philosophers, and psychologists, research on its pedagogical efficacy has been reported by only a few studies, and some of these studies only indirectly address analogy's instructional utility. Dowell (1968) and Drugge (1977) found no significant effects stemming from the instructional use of analogy. Mayer (1975) and Royer and Cable (1975, 1976) found results which favored the advance presentation of analogous material but did not directly address questions related to analogy's instructional utility per se. The most positive evidence of analogy's value comes from a study by Ausubel and Fitzgerald (1961), who found a superiority for readers given an advance expository passage on an analogous familiar topic, and a study by Hayes and Tierney (1980), who found that students given different modes of presenting or embedding analogous information had an advantage on certain measures over students not given analogies. Generally, the results suggest that if analogy is to be used effectively to increase background knowledge, care must be taken in: (a) the selection of students, as one would expect the benefits of analogy to manifest themselves differently for readers of varying abilities and backgrounds of experience; (b) the presentation of the analogous information, as it is likely different modes will have different impacts; and (c) the methods used to assess effects. In terms of our third point, we would posit that any research attempting to improve background knowledge

needs to consider the possibility that a complex interaction exists among teaching methodology, texts, topics, and readers, and needs to recognize that the influence of changes in background knowledge may be subtle and difficult to measure except with a variety of on-line as well as posttest measures which are sensitive to the idiosyncratic nature of the analogy to be studied.

Activating Background Knowledge and Attention-Focusing

If readers have the necessary background knowledge prior to reading to learn, what can or should be done to activate that knowledge or focus attention in order to expedite their learning from text? Many theorists and practitioners advocate strategies which encourage students to actively relate the new information they gain from reading to their prior knowledge. Such strategies are based on the assumption that learning is a constructive process rather than merely one of acquisition. A number of suggestions for activating background knowledge have arisen as a result, a great many directed at teachers, a very few directed at students, and still fewer directed at texts. For the purposes of discussion, we have selected the following as illustrative of teacher initiated/directed strategies for activating background knowledge: advance organizers, objectives, and pretests and prequestions. From among those strategies indicative of student generated/monitored activity, we will consider student centered/generated questions and purposes. With respect to text adjuncts we will discuss prefatory statements, pictures, and titles.

Advance organizers. One of the most widely researched and controversial strategies designed to activate a reader's background knowledge is that of the advance organizer, proposed by Ausubel (1963, 1968). In Ausubel's (1968) words, the intent of the advance organizer is "to bridge the gap between what the reader already knows and what the reader needs to know before he/she can meaningfully learn the task at hand" (p. 148). Based upon Ausubel's theory of verbal learning, which posits the existence of hierarchically organized cognitive structures, the function of the organizer is to provide ideational scaffolding for the stable incorporation and retention of the more detailed and differentiated material that follows in the passage. In a practical sense, its purpose is to prepare readers to gain information from reading they could not have otherwise gained (Bransford, 1979).

Ausubel (1978) has suggested that for advance organizers to function effectively they must be written at a higher level of abstraction or generality than the material to be learned, address the conditions of their specific use, account for both the reader's existing subsumers and the unfamiliar concepts presented within the text, and take into account those factors involved in posttesting. In the case of unfamiliar material, Ausubel prescribes the use of an expository organizer to provide "relevant proximate subsumers." With familiar material, he suggests a comparative organizer to facilitate the integration of new ideas and to increase discrimination between ideas.

There is some evidence that advance organizers effect the subsequent learning of some students some of the time with some texts when readers have some prerequisite knowledge (Ausubel, 1978; Bransford, 1979). However, despite the fact that several hundred research studies and any number of synthesis attempts have explored the differential worth of advance organizers, we still lack any "real" closure regarding their instructional value. Over the years researchers intent on synthesizing the bulk of advance organizer research have resorted to extensive literature reviews (Barnes & Clawson, 1975; Hartley & Davies, 1976; Lawton & Wanska, 1977; Mayer, 1979) and, most recently, meta-analysis, a statistical technique suggested by Glass (1978) to standardize and compare treatment effects (Luiten, Ames, & Ackerson, Note 2; Moore & Readence, 1980). One such review of the research by Sledge (1978), which focused on the use of advance organizers with secondary students, reported that the majority of studies did not favor advance organizers and, in studies for which differences did favor advance organizers, less capable students benefited most. A more recent synthesis, a meta-analysis which examined trends across 135 advance organizer studies (Luiten, et al., Note 2), suggested the following: most advance organizer treatment groups tended to perform better than control groups; the effect of advance organizers had a variable impact across special education, elementary, secondary, and college students; the impact of aural and visual organizers varied with the age level of students; and the effect of advance organizers tended to increase rather than decay over time.

Two major problems have had the effect of diminishing the worth of most individual advance organizer research studies and synthesis attempts. The first, manifest in the lack of a clearly specified operational definition of advance organizers, has left advance organizer research largely nonreplicable. Theoretical position papers, research reviews, and research reports have virtually failed to provide either teachers or researchers with specific guidelines for developing advance organizers. Unfortunately, Ausubel (1978) suggests that "apart from describing organizers in general terms with an appropriate example, one cannot be more specific about the construction of an organizer. For this always depends on the nature of the learning material, the age of the learner, and his degree of prior familiarity with the learning passage" (p. 251). These "general terms" to which Ausubel refers are scattered throughout his writings and in what appears to us to be poorly articulated examples. The result is such that for any single text, a variety of advance organizers might be generated and the differential effect of any one might become a legitimate research question.

The second problem relates to the global nature of those questions researchers tend to ask about advance organizers. Given Ausubel's warning with respect to the differential nature of learning material and varying needs of learners, it seems misguided for researchers and practitioners to continue to explore the efficacy of the advance organizer without regard for the different potential effects these variables may have. Questions should be pursued that go beyond the general

issue of whether or not advance organizers work. Clearly, only in the context of examining a variety of data across a variety of specific texts can researchers hope to develop descriptions which address the instructional and theoretical significance of the advance organizer in a useful manner.

In content reading classes, for example, social studies and science, there exists a hybrid of the advance organizer--the structured overview--whose widely advocated use deserves some comment. In theoretical papers, both Barron (1969) and Earle (1969a) proposed the development and use of a visual overview to introduce students to the concepts and relationships represented within a text or a unit within a course. They proposed that the overview incorporate the terms arranged in outline form to effectively highlight to students the content of a text or unit, including its logical structure. In so doing, it was believed that the overview assumed the properties of Ausubel's advance organizer; that is, it related "new content to relevant subsuming concepts that have previously been learned" (Barron, 1969, p. 33). Unfortunately, to date the research dealing with the effectiveness of these graphic overviews suffers from one of the same major problems ailing advance organizer research--namely, the probes which have driven the research have failed to systematically examine the impact of the strategy beyond whether or not it works. Studies conducted in various content classrooms have provided general support that under certain conditions with certain students structured overviews have a positive effect on learning; however, these investigations have provided

very little data of an explanatory nature. The types of students, texts and reading situations for which different types of overviews might be effective has not been clarified (Baker, 1977; Barron, 1971; Berget, 1977; Earle, 1969b, 1973; Estes, Mills, & Barron, 1969; Vacca, 1977; Walker, 1979).

Objectives. Those who endorse the use of behavioral objectives frequently argue that as teacher-directed prereading activities, behavioral objectives facilitate students' organization of their learning; this argument is based to some extent upon the assumption that if students know what they are expected to learn, they will tend to pursue their learning more systematically. R. Gagné (1965), for example, rationalizes the use of behavioral objectives by proposing that objectives aid students in organizing their learning, through the clarification of individual goals which permit not only more efficient study time but also a system for monitoring individual progress.

While common sense would suggest that providing students with objectives before they read to learn will enhance that learning (Levin & Pressley, in press), such a facilitative effect is far from certain. Duchastel and Merrill (1973) reviewed the effects of providing behavioral objectives on student achievement and found that few studies show a positive effect. Further, in a review of over forty research studies which were analyzed in terms of teaching strategies, task characteristics, and learner characteristics, Hartley and Davies (1976) concluded that ". . . behavioral objectives have an effect upon learning, but this [effect] is less clear cut than many of the advocates of behavioral objectives

usually claim" (p. 251). Hartley and Davies suggest that the facilitative effect of behavioral objectives depends upon the cognitive tasks, student ability, and text organization. They concluded that while behavioral objectives did not help students perform tasks at the lower levels of Bloom's Taxonomy, they could increase learning for middle-ability students performing tasks at higher levels of the taxonomy while reading loosely-structured text.

Before research can determine the effect of behavioral objectives upon reading to learn, researchers must concede that it is not sufficient to know that some objectives aid some students for some reading purposes in some text situations. Rather, they must be committed to a search for the specific conditions responsible for specific effects. Second, consistent with Hartley and Davies' criticism, a consensus as to what constitutes an objective is necessary if the effects of objectives upon learning are to be probed systematically and differentially. Certainly, this would entail defining objectives in terms of text, reader, and learning characteristics. Further, it demands going beyond behavioral definitions limited to overt behaviors, behaviors quantifiable in some sense, to research which probes under what conditions objectives, which tap metacognitive and self-monitoring responses, might facilitate learning from prose.

Pretests and prequestions. Two teacher-directed preinstructional strategies somewhat related to objectives are pretests and prequestions.

In the context of the classroom, both pretests and prequestions tend to be used most frequently for purposes of assessment. But as Pressey (1926) points out, questions asked prior to reading a text can serve a learning producing function as well. Specifically, Pressey (1926) has claimed that pretests increase a student's sensitivity to learning by alerting him or her to the nature of the task and its relevance, as well as providing a means to evaluate, categorize, or generalize.

The claim that pretests and prequestions have a beneficial effect upon learning continues to be empirically supported, although somewhat qualified. As Anderson and Biddle (1975), Hartley and Davies (1976), Levin and Pressley (in press), and Rickards (1976) suggest with respect to learning from prose, pretests (often in the form of adjunct prequestions) can have a facilitative effect if the material to be read is difficult to comprehend (Hartley & Davies, 1976; Levin & Pressley, in press), and if the goal of the pretest is to have students learn only the information from reading which is necessary to answer the pretest questions (Anderson & Biddle, 1975), and if the information tested on the pretest is among the most important in the text (Rickards, 1976). If, on the other hand, the goal is to improve general understanding and retention of a passage, pretests and prequestions tend to have a restricting effect on learning (Anderson & Biddle, 1975). One may suppose, therefore, that if students know something about the topic to be learned, if the material to be used is difficult for them to read, and if the teacher wants students to gain

specific learnings from reading, then either a pretest or prequestions which test in advance of reading will likely facilitate subsequent learning from that text.

Such a claim, however, falls short of addressing the issue of variability across texts, readers, and teachers in the following respects. First, whatever effects pretests may have, it is doubtful they can overcome the lack of prerequisite information necessary to process a text. Logically, a pretest can only be expected to facilitate activation of existing knowledge if a reader has such knowledge (Bransford, 1979). Second, pretests and prequestions interact with passages to produce differential effects (Richmond, 1976). The relationships which exist between questions and texts are obviously complex and cannot realistically be considered outside the purposes for which the questions are posed, as well as the purposes for which they are interpreted. Clearly, the relationship between questions, texts, and the reader's perception of a question's intent cannot be depicted by simple taxonomies for question types, nor can such taxonomies be used to generate questions. Unfortunately, most of the research dealing with the facilitative effects of questions have used taxonomies based upon such a pretense. Even recent attempts by Herber (1970, 1978) and Pearson and Johnson (1978) tend to be too global with regard to the relation between a text and a question and disregard intentionality arising from the relation between the purpose of a question, the question given, the text, and the student; the attempt by Sinclair and Coulthard (1975) to address intentionality tends to impose categories somewhat too subjectively.

Like research on advance organizers and objectives, research on prequestions and pretests awaits modification in light of the development of methods to assess the characteristics of these tasks as well as findings which will take into account and explore the effects of such variables as texts, teachers, and students.

Prequestions and student-centered/generated purposes. The three previous subsections have discussed prereading instructional strategies which tend to be teacher-directed in nature; for while they may address student-related issues, they are nonetheless generated and/or directed on behalf of students rather than by students. We wish to contrast this approach to activating students' background knowledge with that of student-centered prequestions, predictions, and discussion of purposes for reading. As is the case with most prereading activities, student-centered prequestions, predictions, and discussion are principally purpose setting in their effect. They differ, however, from teacher-directed preactivity in that their intended function is to encourage and make use of spontaneous student response in terms of directing both the focus of activity and its outcome. And, characteristically, these procedures result in some degree of student-teacher and/or peer interaction, as opposed to simple exchanges limited to one-way question-response sequences. In the main, student-centered prereading activities are based on the notion that such activity has the potential to activate problem-solving behavior--namely, inquisitiveness as well as the ability and desire to examine ideas and generate alternatives.

Most basal reading lessons and a number of reading educators advise teachers to begin with either selected questions or a discussion of the story topic designed to facilitate student-teacher and peer interaction in the context of the "reading lesson." Stauffer's (1969) Directed Reading-Thinking Activity (DR-TA) is one such procedure where purpose setting together with interaction are integral. As Stauffer has described the approach:

> . . . either the reader declares his own purposes or if he adopts the purposes of others, he makes certain how and why he is doing so. He also speculates about the nature and complexity of the answers he is seeking by using his fullest experience and knowledge relevant to circumstances. Then he reads to test his purposes and assumptions. (Stauffer, 1969, p. 40)

Another recommended strategy, Manzo's (1969) Request Procedure, uses a simple questioning format whereby students are given the opportunity to generate as well as respond to questions based upon a text selection or a portion of it. The procedure is typically done in pairs, student-teacher or individual students, and as sections from a text are read silently, each participant in turn poses a number of questions based upon their reading.

Research examining the efficacy of procedures similar to those described above provides some support for student-generated questions and discussion, but little mention is made with regard to either the type of text and student for which specific procedures are most appropriate, or the extent to which the rationale for each such procedure is justified.

For example, Manzo (1970) and Manzo and Legenza (1975) found general support for the use of the Request Procedure with kindergarten children and poor readers. Similarly, Bisken, Hoskisson, and Modlin (1976) reached the general conclusion from their study that first- and third-grade Title I children learned considerably more from passages taught by the DR-TA than from listening to the stories without discussion. Davidson (1970) and Petre (1970) found a similar advantage for the DR-TA over other directed reading lessons for fourth graders of different ability groups.

Outside the context of research based on selected strategies, there has been little support for the student-centered approach until recently. Using both immediate and delayed passage-dependent recall questions, Chodos, Gould, and Rusch (1977) found that having fourth graders generate four questions from a brief summary of a passage before they read the passage significantly improved the students' learning of that passage as well as their ability to maintain what they had learned. Using a paradigm suggested by Swaby (1977), Schachter (1978) used discussion to link "to be read text" with prior experience. Swaby (1977) had presented sixth graders, prior to their reading a passage, with a written statement designed to create a link to prior experience. The procedure did not facilitate comprehension, but Swaby speculated that a discussion of prior experiences may have had an effect--especially an effect on inferential comprehension. Schachter (1978) took Swaby's suggestion and examined the impact of linking with prior experience through discussion.

As predicted, Schachter's procedure yielded results which reflected an enhancement of inferential comprehension.

In general, research on student-centered prereading activity leaves us with two overriding concerns. First, despite the fact that informal prequestioning and discussion are widespread classroom practices, we could find little research which examined the tendency of teachers to use the greater opportunity for interaction afforded by informal prequestioning and the effect such practice might produce. Together with Durkin's (1978-79) and Guszak's (1967) research describing teacher questioning behavior, "the state of the art" relative to both teaching practice and research on informal questioning or discussion is far from encouraging. Second, the few studies we could find examined effects in terms of overall reading achievement rather than in terms of multiple measures established for purposes of examining the specific rationale by which classroom methodologies were originally justified. We again find ourselves faced with a body of research which has yet to address the differential efficacy of specific instructional strategies intended to focus attention or activate background knowledge, and at the same time account for the interaction among reader, text, and teacher variables.

Pictures, prefatory statements, and titles. To what extent do those text adjuncts described by Hartley and Davies (1976) as content clarifying improve a reader's ability to learn from text? While it is clear that pictures, titles, and prefatory statements can provide relevant contextual

information and thereby improve comprehension for ambiguous or unclear passages (Arnold & Brooks, 1976; Bransford & Johnson, 1972, 1973; Bransford & McCarrell, 1974), it is less clear whether they are effective aids when the adjunct reiterates information provided directly in the prose (Aulls, 1975). Certainly, no one argues that having students read titles, prefatory statements, or illustrations makes them better comprehenders in any general sense (Jenkins & Pany, in press), but there does exist evidence both to support and disclaim their facilitative effect when students are reading to learn from text.

With respect to pictures, Samuels concluded in 1970 that there was "almost unanimous agreement that pictures, when used as adjuncts to the printed text, do not facilitate comprehension" (p. 405). Since that time, Thomas (1978) investigated the effectiveness of pictorial illustrations as adjunct aids in science texts using fourth graders of three ability levels as subjects; he found the illustrations to have no facilitative effect. Marr's research in 1979 led her to a similar conclusion, namely, that it is often the case that pictures fail to have a facilitative effect on learning.

In contrast, a growing number of studies have found evidence to the contrary. Specifically, pictures have been shown to increase the prose learning of: (a) young children when their effect is measured in terms of responses to short-answer questions (Guttman, Levin, & Pressley, 1977; Lesgold, Levin, Shimron, & Guttmann, 1975; Levin, Bender, & Lesgold, 1976);

(b) fourth graders (Peeck, 1974); (c) sixth graders, as measured by main idea responses (Koenke & Otto, 1969); (d) undergraduates (Dwyer, 1968; Snowman & Cunningham, 1975); and (e) the retarded (Bender & Levin, 1978; Riding & Shore, 1974). These and other studies have led Ruch and Levin (1977) and Levin and Lesgold (1978) to argue strongly in support of the notion that pictures have a facilitative effect on children's learning from prose. This effect is said to be a special effect for pictures, over and above an effect due to mere repetition of ideas (Levin, Bender, & Lesgold, 1976).

The picture becomes murky when one considers that Rasco, Tennyson, and Boutwell (1975) found a facilitative effect for pictures to be confounded with subjects' use of strategies. Dwyer (1967, 1968, 1969, 1971, 1972) found that not only were some pictures more effective than others but that even when pictures were effective, they caused learners to slow down. Several of these studies have used listening rather than reading modes and assumed results were generalizable. When Readence and Moore (Note 3) meta-analyzed those studies where pictures were used when subjects read to learn (as opposed to listening to learn), they found the effect size for those studies to be generally positive but nonetheless quite small. Clearly, pictures do not have an equally facilitative effect for all subjects (Levin, Divine-Hawkins, Kerst, & Guttmann, 1974).

It is the differential effect of pictures which leads us to conclude again that certain students, when reading certain texts for certain purposes

with certain adjunct aids, are helped dramatically by those aids, but that such facilitative effects are significantly reduced when no regard is given to the likelihood of interaction. Indeed, this seems quite compatible with a conclusion Schallert (in press) recently reached following a review of the role of illustration in prose comprehension. She stated:

> . . . where research has found pictures to be helpful, the illustrations have seemed to be related to the text in certain ways. For example, pictures which represent spatial information or which are non-redundant with the text and portray information important to the total message are likely to help readers learn from written material. However, since not all pictures are facilitative and some even seem to hamper the reading process, it seems very important to determine the most effective use of illustration. (in press)

Accordingly, she suggests three issues need to be addressed: How might the information represented in pictures be measured? What kind of information should be represented in pictures? How do students read or learn to read pictures?

Research findings are in a similar state with respect to titles and prefatory statements. With children and adults as subjects, neither titles nor prefatory statements (Christensen & Stordahl, 1955; Cole, 1977; Landry, 1966) were found to have a facilitative effect on comprehension. In contrast, studies by Doctorow, Wittrock, and Marks (1978), as well as Memory (1979), suggest that the inclusion of titles and prefatory statements provide certain adolescent readers advantages in terms of their

ability to recall and answer selected questions. Unfortunately, in all but a few studies, we are given only sparse descriptions of the adjunct as well as the teacher, text, and reader variables. Rarely were multiple measures employed to address systematically the impact of the adjunct during and after reading.

Guiding Reader/Text Interactions During Reading to Learn

A variety of interventions have been used by teachers and researchers in an attempt to influence how readers process text in order to increase learning from reading. Among these interventions are those adjuncts and activities which accompany the presentation and processing of the to-be-learned text. Essentially such adjuncts and exercises appear to have a two-fold purpose: increasing the extent to which to-be-learned material is accessible to readers, and improving students' ability to comprehend to-be-learned text. We shall briefly address each of the following: inducing imagery, inserted questions, self-questioning, oral reading, lesson frameworks, and study guides.

Inducing Imagery

In an effort to guide reader/text interaction, some researchers have attempted to induce readers to image cognitively the objects and events described in a prose passage. While such a strategy does not appear to facilitate learning from text for very young children (Dunham & Levin, in press) or even adolescent EMR students (Bender & Levin, 1978), it may be

that these students cannot image on command or that they do not learn well from pictures (Levin, Divine-Hawkins, Kerst, & Guttmann, 1974). This seems quite likely, since a number of studies demonstrate that careful instructions and/or training to image can improve prose learning of third (Lesgold, McCormick, & Golinkoff, 1975; Pressley, 1976, 1977), fourth (Lesgold, McCormick, & Golinkoff, 1975; Levin, 1973), fifth, and sixth (Kulhavy & Swenson, 1975; Pressley, 1977) graders. Other studies have found a facilitative effect for readers imaging on reading to learn with twelfth graders (Anderson & Kulhavy, 1972) and college students (Steingart & Glock, 1979). While it must be noted that there are imagery-inducing strategies which do not help learning from text (Tirre, Manelis, & Leicht, 1979), that with longer passages it is difficult to get readers to maintain an imaging strategy (Anderson & Kulhavy, 1972), and that some students who do not learn well from pictures do not seem to benefit from imaging (Levin, Divine-Hawkins, Kerst, & Guttmann, 1974), it seems fair to conclude that inducing imagery is likely to increase learning from text for selected students in and above grade 3.

In 1971, Paivio expressed concern for the fact that imagery researchers could only speculate about the instructional effects of imagery. In 1980 there is sufficient data for educators to be optimistic that imaging is proving effective. However, given that most increases in learning from prose due to inducing imagery are slight, and given that some students apparently have difficulty imaging, more research needs to be

conducted in which the following apply: (a) effects are examined differentially and judiciously, and (b) care is taken to determine and describe how well imagery is induced. Of relevance to classroom implementation, research needs to examine whether the effectiveness of imaging can be extended to students reading different texts of varying length within the realm of school-related purposes.

Inserted Questions

Providing students with questions during reading is a common instructional practice. In an attempt to guide students' reading of a text selection, teachers frequently stop students who are in the process of reading to pose a number of text-related questions. These questions are often either retroactive in nature, requiring the reader to refer to something just read, or proactive, requiring the reader to read ahead in order to search out an answer or confirm a prediction.

Research seems to bear out teachers' intuitions concerning the facilitative effect of inserted questions. Hershberger's (1964) original study and Rothkopf's follow-up work (1966) have not only provided a great deal of research impetus in the area of questioning, but also have somewhat clarified the role of inserted questions in reading to learn. Hershberger's (1964) original investigation reported that students given self-evaluative review questions outperformed a control group on a posttest based on those same questions. This issue has since been examined by Rothkopf (1966, 1971, 1972a), who initiated a number of studies addressing the

direct influence of questions inserted in text. Rothkopf's line of research and methodology prompted a rash of investigations (Boyd, 1973; Frase, 1967, 1968; Frase, Patrick, & Schumer, 1970; McGaw & Grotelueschen, 1972; Rothkopf & Bisbicos, 1967; Rothkopf & Bloom, 1970; Snowman & Cunningham, 1975) which, with few exceptions, confirm that students responding to inserted factual questions perform better on those same questions given as a posttest than students who only read the text passage. Further, when the questions which are given involve applying information gleaned from text, students who respond to the questions both in the inserted and the posttest situations perform better on not only the application questions but others as well (Watts & Anderson, 1971).

Of interest to educators, however, is not just the fact that inserted questions have an effect. Since the strategy is used by a great many teachers on a day-to-day basis, it seems imperative that their use be examined more closely. The available research provides only partial information on the value of inserted questions across different texts and purposes for reading, especially if time on task is held constant (Carver, 1972). Only a limited number of studies have addressed the type of attention-focusing functions inserted questions prompt as well as the extent to which learning is tied to attention or vice versa (Britton, Westbrook, & Holdredge, 1978; Reynolds & Anderson, 1980; Reynolds, Standiford, & Anderson, 1979). Too few studies have examined the effectiveness of using questions within classroom settings--for example, their

value with repeated use, and the worth of questions tied to a rationale model of the text or reader, for example, sets of interrelated questions.

Self-Questioning

In an earlier section we addressed self-questioning and purpose-setting strategies as they occur in prereading situations. We shall now extend that discussion to include literature which deals with self-questioning during reading.

Research-based information on self-generated questions is not only conflicting but far from complete. Studies by Duell (1974) and Morse (1976) demonstrated that college students induced to self-question had no advantage over other students not induced to question, while André and Anderson (1978-79), Frase and Schwartz (1975), Schermerhorn, Goldschmid, and Shore (1975), and Weiner (Note 4) found reason to support their use. Indeed, results of selected studies are encouraging; however, there are a number of reasons why a more comprehensive and rigorous research program is needed to investigate further the effects of self-questioning as a prose learning strategy. First, very few studies to date have trained students to ask questions or given them the opportunity to practice that strategy. In those studies where training did take place, peer training procedures were most often used. Second, in some instances, the instructions which were given to students severely limited the types of questions students would tend to ask. This criticism would hold with respect to both the Frase and Schwartz (1975) study, where students were required to identify those lines from the text that contained answers to their questions, as

well as the Weiner (Note 4) study, where students were asked to generate a singular set of question types across different texts, with little regard for the idiosyncratic purposes for which the students might be reading. Third, and typical of reading comprehension instructional studies, very few self-questioning studies have used more than a single achievement measure to assess the effectiveness of a self-questioning strategy. And no study was found to use text analysis methodology for the purposes of indicating the different types of inferences students generated. Fourth, a majority of the studies failed to use a sufficient number of comparison groups to separate out the effects of having students generate questions. In summary, as Weiner (Note 4) has suggested in the conclusion of her paper, analyzing training programs, comparing various types of strategies, and using multiple comparison groups and different measures of effect across a variety of texts are essential if we are to make explicit what has only been implied about the strategy of self-questioning.

Oral Reading, Lesson Frameworks, and Study Guides

While questioning strategies are undoubtedly the most widespread approach to guiding student-text interactions during reading to learn, with imagery-inducing strategies being much less common, there are countless other adjunct devices and practices suggested in the literature. We will briefly comment upon three which are frequently recommended for classroom use: oral reading, lesson frameworks, and study guides.

Oral reading. When students find a textbook difficult to read, teachers often ask that those students read the textbook aloud. This is

not only an observed classroom practice, but one to which teachers readily admit. Research on oral reading as a strategy is sparse and equivocal, although there exists a slight edge in favor of oral reading over silent reading for purposes of comprehension. Poulton and Brown (1967) and Rogers (1937) found no differences between learning from text after oral reading as compared with silent reading, while Collins (1961), Elgart (1978), Graham (1979), and Rowell (1976), all found comprehension and retention to be superior after oral reading for students at several different age levels. There were no studies found which examined the differential effects oral reading might have had upon recall of explicit and likely-to-be-inferred information across texts read for different purposes by students of varying abilities. Nor were any found to address the long-term effects of oral versus silent reading in classrooms where boredom, inattention, and other factors might mediate the apparent superiority of oral reading.

Lesson frameworks. Lesson frameworks, including the Directed Reading Activity (Betts, 1946), the Directed Reading-Thinking Activity (Stauffer, 1969), and the Guided Reading Procedure (Manzo, 1975), are frequently recommended to reading and content teachers as strategies for aiding students in their efforts to learn from text. While they are designed to provide readers with a way to approach a text, they are as much an aid to teachers as to students. Unfortunately, there is a dearth of research based on these practices, little to either support or refute their use. In two experiments with seventh-grade poor readers in a geography class,

Bean and Pardi (1979) found better learning from text when the Guided Reading Procedure was used in combination with prereading assessment and structured discussion. As reported earlier, Biskin, Hoskisson, and Modlin (1976) found that first- and third-grade Title I students remembered story elements better after being taught a Directed Reading-Thinking Activity than after listening to the stories without discussion. Also, as reported earlier, Davidson (1970) and Petre (1970) examined student responses and found results which favored the Directed Reading-Thinking Activity over the Directed Reading Activity with fourth graders--especially higher-ability students. Given, however, the limited amount of research examining these strategies, there is little to prompt any general or differential suggestions regarding either the construction or implementation of these strategies.

Study guides. Study guides are widely advocated adjuncts to textbook material, particularly content area text. As described by Earle (1969c) and Herber (1970, 1978) study guides use various adjunct activities and questions to structure as well as guide students' reading of difficult subject-matter prose. It is the purpose of a study guide to facilitate readers' understanding of text content while improving their ability to deal with patterns of ideas (cause-effect; comparison and contrast; sequence or time-order; and simple listing) as well as levels of text presentation. While there is not an extensive body of research on the effectiveness of study guides at this time, several studies involving

some permutations of this methodology have produced encouraging but differential results. Namely, for some subjects on some variables with selected texts, study guides have proven effective (Berget, 1977; Carney, 1977; Estes, 1970, 1973; Maxon, 1979; Phelphs, 1979; Riley, 1979; Vacca, 1977). With the growth of interest in cataloging text characteristics, as well as describing readers' inferences with and without adjuncts, research should be forthcoming which will provide the differential information needed to examine those intuitions which prompted Herber's and Earle's original rationales for study guides. At the present, however, we are far from knowing how different types of guides might and should be developed to facilitate prescribed reading outcomes.

Teacher Interventions Following Reading to Learn

There undoubtedly exists as much variability among teacher interventions following reading (postreading activities) as between postreading activities and those which we have set apart from them, namely, prereading activities and interventions for guiding reader/text interactions during reading. This state of affairs seems reasonable, since postreading activities have come to imply anything from recall exercises tied exclusively to explicit information in the text, to long-term projects of an applied nature, which may be only tangentially related to what has been read. Under the assumption that such activities will provide for the retention, reinforcement, extension and/or application of previous learnings from text, teachers are frequently encouraged to consider

postreading activity an integral part of reading to learn. A perusal of most basal reading material, content area texts and lesson frameworks will confirm this. The notion of postreading activity raises the issue of whether intervention occurring after the fact has any influence upon student performance. Furthermore, do they do what they purport to do? We will attempt to pursue these issues as we address the effects of a select group of postreading strategies: postquestions, feedback, and discussion.

Postquestions

Anyone who has visited public school classrooms very much will recognize this scenario: Students are assigned to read a selection from a textbook, either in class or for "homework"; the teacher then asks a series of oral questions based on that selection which the students answer orally, generally with their books closed; at some later time the students take a test which includes questions based on that selection.

Experimental results addressing the effect of postquestions upon student learning is quite conditional, as one would suspect. As in the case of inserted questions, students responding to postquestions perform better on those same questions given as a test than students who only read the text passage. Similar instances of the facilitative effect of postquestions on "intentional learning" is reported by Anderson and Biddle (1975) to have occurred in 37 out of 40 such studies they examined.

Results in the context of "incidental" learning, however, are much more equivocal. While Anderson and Biddle (1975) reported that 26 out of 39 studies found a facilitative effect of postquestions on new questions appearing on a later test, they did demonstrate that the size of this effect was less than dramatic. In addition, others suggest that post-questions might under some circumstances have a restricted effect on incidental learning (Frase, 1975; Hiller, 1974; Rothkopf, 1972b; Sagaria & DiVesta, 1978).

Another factor related to the issue of postquestioning is that of question type. Rickards (1976) found that postquestions derived from information with high structural importance in a selection facilitated intentional learning from text; however, questions based on information of low structural importance did not. Watts and Anderson (1971) and Rickards and Hatcher (1977-78) suggest that application-type or meaningful learning questions facilitate intentional learning while rote learning questions do not. Friedman (1977) and Yost, Avila, and Vexler (1977) report that "higher-level" questions produce a greater learning effect than "lower-level" questions. Biskin, Hoskisson, and Modlin (1976) consider reflective questions, such as those used by the Great Books Foundation (1967), to enhance comprehension and retention of stories.

It is less clear what other factors might interact with the effect of postquestioning upon learning. Richmond (1976) found the effect differed across passages. Watts (1973) found the effect diminished as the

time increased between postquestioning and testing. Shavelson, Berliner, Ravitch, and Loeding (1974) found better readers gained much less than poorer readers from postquestioning.

Based on what evidence we do have, however, it seems reasonable to conclude that if teachers use text materials which students find challenging, if teachers know specifically what they want students to learn from that material, and if what teachers want students to learn is information which the author also deems important, it is likely that teachers can facilitate learning by asking application-type or inference questions based on such text-derived information, assuming such facilitation is measured by a test which asks the same questions and assuming little time elapses between postquestioning and testing. Of relevance to classrooms, however, very few studies have examined the value of sets of related questions tied to either the pedagogical assumptions inherent within published reading programs or the discourse flow within texts, for example, sets of questions related to the events within a story.

Feedback

When students answer questions or take posttests based on what they have read, teachers typically provide feedback, that is, let students know how well they have performed. In general, research supports this practice. E. Gagné (1978), Kulhavy (1977), and LaPorte and Voss (1975) all conclude that feedback which occurs subsequent to postquestions or posttests results in greater gains in learning than when feedback does not follow such

activity. The timing of such feedback, however, does not appear to be a significant factor (E. Gagne, 1978; Kulhavy, 1977). Rather, it is the quality of feedback which most often results in its differential effects. While this may seem contra-intuitive, Kulhavy (1977) notes that it is feedback following wrong answers which has the most dramatic effect on learning. In fact, LaPorte and Voss (1975) found that feedback did not increase students' learning for questions correctly answered, but did for those questions which were incorrectly answered. Further, Barringer and Gholson (1979) have shown verbal feedback to be consistently superior to tangible feedback with respect to conceptual learning, but as Kulhavy (1977) has pointed out, if students can cheat (obtain feedback before answering the questions) or if material is too difficult, feedback will matter little if at all. These findings as they stand are quite interesting. It would be useful, however, to extend this research to address the influence of feedback upon on-line processing of different texts including, for example, an examination of the influence of feedback upon students with different predispositions, varying degrees of certainty, alternative purposes and divergent on-line processing tendencies.

Group and Whole-Class Discussions

Beyond post-questioning and feedback, there are numerous other post reading strategies teachers use as a means of facilitating reading to learn. Discussion bears specific mention as it surfaces in some form or another during a great many of them. From the initiation of group projects

to the culmination of such individual pursuits as book reviews, teachers frequently either schedule group discussion of some preread text or assign projects which will necessitate interaction to some degree. Support for the use of discussion as a strategy to increase learning from text emerges, but quite indirectly, through research related to group discussion.

A study which examined the use of guide material and small group discussion with social studies text led Estes (1970, 1973) to suggest there were no direct benefits from small group discussions. In contrast, a study by Vacca (1977) which incorporated the use of group discussion, claimed that group discussion together with the specific text material and study guide upon which it was based was both productive and beneficial in terms of the student's acquisition of context. And Barron and Melnick (1973), in a longitudinal vocabulary study in the area of biology, alluded to the differential effectiveness of teacher-led full-class discussion and student-led small-group discussion. They suggested that both the full-class discussion and the small-group discussion were better than no discussion, but that whole-class discussion tended to be easier to operationalize given specific guidelines and a purpose for the discussion.

Intuitively it would seem that the effects of discussion, when it occurs as part of some larger post-activity, are confounded somewhat due to the likelihood that discussion facilitates some aspects of the activity and the activity in turn feeds into discussion. Further, the

effects of discussion as a postreading activity in and of itself have yet to be fully addressed. Researchers should, therefore, be encouraged to examine discussion's influence upon reading to learn, remaining cognizant of both the significance of discussion in light of other classroom strategies and the nature of reader-text-teacher interactions. This implies systematically measuring the impact of the text before, during, and after discussion as well as the characteristics of the group, for example, cohesiveness, composition, and goals.

General Comments on Increasing Learning from Text/Prose

A variety of interventions have been used by teachers and researchers in an attempt to influence how readers process text in order to increase learning from text. A number of studies have examined the influence upon student learning of a variety of orienting strategies, guided reading procedures and postreading activities. Attempts to synthesize the findings from these studies have tended to reach the same conclusion (Hartley & Davies, 1976; Levin & Pressley, in press). As stated by Levin and Pressley, "alerting students to exactly what it is they are to learn is generally more efficient than leaving them in the dark" (in press). Our synthesis would seem to suggest that teachers who do attempt to focus attention, build or activate students' existing knowledge before students read to learn; especially those teachers who take a student-centered approach to activation will probably experience more success than those who do not. Likewise, teacher interventions designed to guide reader/text interactions during reading as well as teacher-directed postreading

practices are usually better than no guidance or no postreading activities. Unfortunately, beyond these general guidelines the implications one can draw from the research to date suffers from being overly global when, to thoroughly understand practice, we need to examine it carefully and differentially. Suffice it to say that whatever positive effects practices or strategies tend to have, in general, their effects are likely to be fragile across such variables as texts, teachers, and students. The research thus far seems to grossly overgeneralize while underestimating the complexity of the teacher, text, and task variables involved. The means which have been used to develop, describe, and implement research on these practices are limited in terms of describing the relationship of the strategy or adjunct to different texts, readers, or teachers. Very few studies have systematically addressed permutations of strategies across a variety of text situations, readers, and teaching methodologies. In this regard, the complexity of the relationship between intervention and learning, especially classroom learning, either has not been addressed or has been oversimplified to the point of distortion. Further, most studies have restricted their measurement of effects to a single posttest measure. Long-term retention and on-line measures have gone virtually unexplored. It is this state of affairs, although disconcerting, which points to the problems incurred in doing research on reading comprehension instruction, but, at the same time, the most interesting research possibilities still to be explored.

INCREASING ABILITY TO LEARN FROM TEXT/PROSE

A principal question in research on learning from text/prose is, "What teacher interventions before, during, and/or after reading can increase what students learn from their reading beyond what they might learn when reading without such intervention?" A principal question in research on improving students' ability to comprehend what they read is, "What teacher interventions can increase students' ability to comprehend or learn from new passages (passages not taught to the students) beyond the increase which might occur when students read independently?" Clearly, the concern here is with transfer: Can students be taught knowledge, skills, or strategies which will transfer to their reading of passages not used in lessons with them?

In one sense, any study on reading can be viewed as a potential source for instructional implications, in which case the term "instructional research on reading" is synonomous with the term "research in reading." If, however, it is worthwhile to distinguish between the two, then instructional research must be characterized as that which tends toward more direct and obvious implications for reading instruction than those studies whose only link to instruction is that subjects read text. Certainly, it is important to know what the characteristics of good and poor readers are and what the characteristics of comprehensible texts are. Further, it is important to know how classrooms function during reading instruction and the nature of practices presently in use. It seems,

however, that such knowledge is only useful when it is examined in the context of what causes readers to comprehend better than they would under other circumstances.

You will recall that throughout our discussion of "Increasing Learning From Text/Prose," we consistently recommended that research address the various effects of treatments across reader, text, and teacher variables. This is both a call for a number of research replications and extensions in the case of those treatments which are already shown to have positive effects upon students' learning while reading, as well as a call for more instructionally sensitive designs. Unfortunately, a recommendation for replication is not yet possible with respect to treatments designed to improve reading comprehension ability for untaught passages, because a thorough search of the literature has revealed that, despite a few exceptions, in the words of Gertrude Stein, "there isn't any there there." We perceive this rather unsettling state of affairs to be the outcome of certain conditions. First, while it is the case that many studies have investigated differences between good and poor readers or between good and better readers, almost all such studies have been correlational in nature. As a result, these studies tend to focus on differences which themselves merely covary with the real causes for difference, or they focus on differences which are in actuality differences between readers and not differences in the effect a strategy may have upon readers' ability to comprehend. Second, while a handful of studies over the past

decade have investigated the effects of treatment on transfer passages, very few included a control group which read the treatment passages when passages were part of the treatment. Calling for such causal design research would not seem radical, since such designs have been employed in learning from text studies and word identification studies (Cunningham, 1975-76, 1979). And third, while it is also true that a host of studies have used one or two group designs to investigate the effect of reading programs on students' standardized test performance, it is impossible to determine if the instructional components of these programs were responsible for whatever differences were observed, due to the variability across programs with respect to materials, grouping patterns, inservice training for teachers, and parent involvement. Of course, if there existed a body of literature showing the efficacy of a particular practice while isolating the causal effects of that practice, then looking at studies evaluating programs which include that practice might add some additional support for it. However, in the absence of such causal research on instructional practices for improving comprehension ability, it can only be concluded that such program evaluation studies are worthless.

This situation has placed us in a dilemma: Do we examine instructional research in terms of how questions have traditionally been pursued, i.e., program evaluation research and good and poor reader paradigms? Or do we attempt to outline a few studies which meet our qualifications as a means of discussing how we perceive that instructional research in reading

ought to be conducted? In the name of a constructive approach, we have chosen the second course, and for this purpose, taken our direction from what has more recently been termed "process" research.

Some Directions for Research in Reading Comprehension Instruction

Over the past decade, text analysis research, schema theory research, and classroom observation/ethnographic studies have enabled us, as never before, to describe and explain how texts, readers and classrooms function. Although process research is rarely prescriptive, it does explicate existing conditions and in turn assists us in the development of research designs which reflect in a more realistic sense the array of variables at play in any instructional environment and thereby allow us to plan a reasonable agenda for carrying out instructional research. Consider the research efforts which have been and are being conducted in the area of metacomprehension and inference training as well as in the area of meeting the text-based needs of readers.

Metacomprehension and Inference Training[1]

The results from metacomprehension studies and studies of the inferential behavior of readers suggest that many readers, especially young or poor readers, often have an unclear concept about what reading is, do not know how to cope with some of the task demands of reading, and often have difficulty generating inferences for complex exposition, as well as integrating information and identifying main ideas. A study by Pace (1979)

suggested that lower elementary age children, when compared with their older peers, tend to be less aware of their own level of understanding and of the possible resources they might use. Paris (1975) found young children are less able to relate their own background experience in the process of inferencing. Tierney, Bridge, and Cera (1978-79) found that poor third-grade readers were less able to integrate information or generate connectors for logically related propositions than good third-grade readers. Studies by Brown and Smiley (1977), Otto, Barrett, and Koenke (1969), and Smiley, Oakley, Worthen, Campione, and Brown (1977) have suggested that main idea extraction is difficult for retarded children as well as young and poor readers. Markman (1977) has demonstrated that children in grades 1 through 3, when given incomplete directions, appear to be insensitive to their failure to comprehend. Kreutzer, Leonard, and Flavell (1975) have demonstrated that children have difficulty distinguishing between task demands; for example, gist and verbatim recall-type demands. More recently, Raphael, Winograd, and Pearson (1980) noted that the ability of good and poor readers to identify a strategy for answering a question was related to their performance in answering the questions.

From the point of view of the researcher interested in intervention, the emergence of metacomprehension and inference studies is potentially exciting, since these studies provide the basis for determining whether or not inferencing ability or metacomprehension can be improved. In turn,

this research raises the issue: Can students learn to learn? That is, can students be taught knowledge, skills, or strategies which will transfer to their reading of unfamiliar passages? In pursuit of these questions, a number of recent research efforts have attempted to examine the efficacy of interventions intended to improve such abilities. We will describe three such studies.

A study by Hansen (1979) examined the effectiveness of two intervention techniques intended to increase the inferential comprehension ability of second graders. Based upon the work of schema theorists (Anderson, Reynolds, Schallert, & Goetz, 1977; Neisser, 1976) and studies by Trabasso, Paris, Brown, and others (Brown, 1977; Paris & Lindauer, 1976; Riley & Trabasso, 1974; Omanson, Warren, & Trabasso, Note 5), Hansen set up three treatment groups. A strategy group focused on integrating text and background knowledge prior to reading. A question group received a "steady diet" of inferential questions. The control group received a mixture of literal and inferential questions. After 10 stories across a 40-day period, Hansen's treatments were tested on a variety of measures, including passages intended to assess the transfer value of the training. In general, the results she obtained reflected a rather localized effect due to the treatment conditions, and little effect as measured on transfer tasks. In an effort to rationalize these results, Hansen questioned whether or not it was reasonable to expect students to spontaneously apply the training strategies.

The second study, by Gordon (1979), looked into the effects of inference training upon the responses of 42 fifth graders. Specifically, Gordon compared the effects of two intervention strategies directed at improving the readers' ability to engage prior knowledge and utilize text cues. One treatment focused on building prior knowledge for instructional selections along with an awareness of text structures. The second treatment focused on providing students with strategies for inferring. A control group received a "language-related" curriculum. In general, the results Gordon obtained favored the inference strategy group, especially on the transfer tasks--that is, the delayed posttests. As Gordon rationalized, this treatment group "had the advantage through the use of a metacognitive strategy which showed them when and how to draw on relevant schemata" (p. 220).

A third study, completed by Day (1980) and reported by Brown, Campione, and Day (Note 6), studied the effectiveness of summarization training with and without explicit cuing. Specifically, college students were given either: (a) encouragement to summarize and capture main ideas; (b) instructions for modeling certain rules; (c) instructions for modeling certain rules and encouragement; or (d) instruction for modeling certain rules and rules for using these rules. Across pre- and posttest measures, Day found that providing students rules for summarizing influenced the students' abilities to summarize, detect main ideas and delete trivial information, but the influence of this training varied with the sophistication of the students. In other words, although all students profited

from the training conditions, less sophisticated students (students with writing problems) needed more explicit training (i.e., training in the rules and their application). As Brown, Campione, and Day reported:

> Training results in greater use of the rules, and improvement is effected with less explicit instruction with more advanced students. For those students with more severe learning problems, training results in less improvement and more explicit training is needed before we can get any effect of training. (p. 16)

In response to the question, "Can students be taught knowledge, skills or strategies which will transfer to their reading of passages not used in lessons with them?", the findings of all three studies suggest it can be done, provided a great deal of care and thought go into the questions to be addressed, the operationalization of treatments, and the measurement of effects. In other words, it is clear that integral to the success of such endeavors, researchers must specify questions sensitive to students' needs and abilities across a variety of different reading tasks, develop treatments which depict variations of a desired quality (such as, explicitness), and devise methods which measure potential effects. Treatments must in some sense reflect the researcher's specific goals, and assessment, while consistent with treatment objectives, must be capable of providing differential information and detecting transfer effects. The fact that all three studies reviewed in this subsection demonstrated some measure of success is a testimony to the potential payoffs of detailed planning, preparation, and implementation.

Meeting Text-Based Needs of Readers

That area of research which explores the relationship between text characteristics and reading comprehension promises to be equally as significant as that of inference and metacomprehension, for it leads us to address the complement of reader-based needs, namely, readers' text-based needs. Given that certain readers have difficulty dealing with certain text features, there has been a tendency for researchers to subscribe to one of two postures: either pursue instruction which will assist readers with these texts, or develop text in such a way as to avoid such difficulties. It is those studies adopting the former approach which are a potential source of instructional implications for improving the ability of readers to comprehend or learn from passages not taught. We will consider two sets of such studies.

The first set addresses the strategy of sentence combining/reduction. As Pearson stated in a recent paper entitled, Text Structure and Reading Comprehension,

> Perhaps the most obvious attempt to determine the influence of direct instruction in the microstructure of text upon comprehension has been in the tradition of sentence-combining research. (in press)

Disenchanted with the methodology associated with teaching writing via formal grammar, but nonetheless encouraged by the interrelationships shown to exist between syntax and reading, many have come to acclaim sentence-combining as a potential means for improving both writing and reading

comprehension (Combs, 1975; Mellon, 1969; O'Hare, 1973). In terms of improving reading comprehension, sentence-combining and its more recent counterpart, sentence reduction (Ney, 1976), is based upon the assumption that sensitizing students to the methods by which ideas are expressed and related in text will likely develop their ability to comprehend text structures. Unfortunately, attempts to validate these notions have produced what we would consider limited results, due to what we perceive to be a failure on the part of researchers to reflect upon those situations and measures which training in sentence-combining would most likely influence. A study by Straw (1979) is an appropriate example. Straw attempted to examine the influence of sentence-combining and sentence-reduction upon the reading comprehension of 124 fourth graders. After a five-week training period for one-half hour daily, Straw found his training to have positive effects upon cloze test results but no influence on the results of a standardized reading test. Howie (1979) conducted a similar study with ninth graders and obtained no impact upon cloze reading performance nor any significant gains on the Gray Oral Reading Test. Howie attempted to rationalize these results by questioning whether the influence of sentence-combining upon reading can be measured.

Unlike sentence combining/reduction research which has come out of a writing tradition, the second set of studies evolved from more recent developments in the area of text analysis; in particular, those text analysis procedures which attempt to provide a diagrammatic representation for the patterns of ideas represented within text. Four such thrusts,

Networking (Dansereau, 1979), Mapping (Anderson, 1978), Flowcharting (Geva, 1980), and Rhetorical Structures (Meyer, 1975), have been adapted for use as instructional tools. In this context, students use text cues to define the fundamental relationships as they manifest themselves in expository text. Flowcharting, networking, and mapping require students to diagram how the ideas and their relationships are represented within text; rhetorical structuring requires students to label these patterns as well as identify the hierarchy of ideas. Apart from these three approaches, a more common classroom strategy for schematically representing collected key ideas, their interrelationships, and subordinates is the structured overview (Barron, 1969; Earle, 1969a). Used as a prereading or postreading activity, the structured overview frequently serves as a device for presenting or organizing the key ideas from a textbook unit in a diagrammatic form.

There is little research to date which addresses the transfer value of strategies such as those we have just described. Studies examining mapping (Armbruster & Anderson, 1980) and the creation of structured overviews (Baker, 1977; Barron, 1971; Berget, 1977; Earle, 1969b, 1973; Estes, Mills, & Barron, 1969; Vacca, 1977; Walker, 1979) have yet to address whether such strategies have any transfer value to passages which are not mapped or overviewed. (A fuller discussion of research dealing with the utility of structured overviews is provided in the subsection, Advance organizers.) Nonetheless, studies by Bartlett (1978), Dansereau, Holley, and Collins (Note 7), and Geva (1980) have provided some data supporting the transfer value of training in such strategies.

Bartlett, for example, examined the effects of teaching ninth graders to recognize commonly found rhetorical structures on their ability to identify and use these structures in their own recall protocols and the amount of information they could remember. The instruction focused on how to identify and use four commonly found top-level structures in classroom text. Special aids for identifying the top-level structure were faded out over the week of instruction, while the passages studied became increasingly more complex. Students in the training group and control group read and recalled passages prior to training, one day after the training program, and three weeks after the completion of the program. The instruction resulted in significantly increased use and identification of the top-level structure as well as almost a doubling in the amount of information recalled by the training group on the posttest measures.

In response to the question, "What would it mean to find that text structure influences comprehension?", Pearson (in press) stated

> That text structure influences comprehension, . . . is not an issue; what is an issue is the precise way in which the influences are exerted, why the influences exist, and what the influences have to say about practical matters of teaching and writing instructional material. (in press)

At the present time, research which addresses the domain of meeting text-based needs of readers is in its infancy. While research has provided some clarification of those text characteristics which influence comprehension,

and results from training studies seem encouraging, we contend that scholars interested in the area of "text" have just begun to move into research which addresses the question:

> Can students be taught knowledge, skills, or strategies which will meet their text-based needs and transfer to their reading of unfamiliar passages?

This will entail identifying these text-based needs. Researchers will need to undertake concurrent analyses of: (a) the discourse features evident in the texts which students encounter; and (b) an examination of the type of situation within which these features either enhance or detract from learning. Thereupon it would seem that systematic research programs could begin on several fronts: engineering texts for purposes of improving their quality; providing students problem-solving strategies to monitor and debug comprehension problems; increasing the students' awarenesses of text features; including adjuncts intended to meet readers' text-based needs; and improving reader-based strategies to override text-based problems.

General Comments on Increasing Ability to Learn From Text/Prose

When asked to comment upon the general trend of research in reading and learning disabilities, Chall (1978) stated that "they [researchers] are describing, testing, correlating and predicting reading and learning disabilities. Only a fraction are studying what the best treatments are for children" (p. 34). Although we would concur with Chall's remark, we

are also encouraged somewhat by the fact that research has begun to appear from both the domains of "process" and "practice," research which willingly ventures into the classroom setting and attempts to deal with instructional issues as only the classroom can define them. In the area of increasing ability to learn from reading, even such a small beginning is welcome and promising.

HOW SHOULD RESEARCH IN TEACHING READING COMPREHENSION PROCEED?

This final section of our review attempts to take what research suggests in response to the question, "With whom, in what situations, and in what ways does teaching improve reading comprehension?", and apply it to the question, "How should research in teaching reading comprehension proceed?" We will initially pursue this latter question primarily in terms of methodological issues and thereafter generate a number of guidelines for future research.

Methodological Issues

Traditional methods studies in reading are objects of severe criticism and, in our estimation, rightfully so for a number of reasons. As a rule, designs have been built around a concatenation of variables, making it virtually impossible to attribute causation to any specific teaching practice. Treatments have frequently been too short in duration to provide any information regarding long-term effects. Subjects have seldom been screened sufficiently, resulting in data based upon subjects who were either

familiar with what the treatment was designed to teach, or were not ready to benefit from it. Posttests have all too frequently been global, rarely selected in terms of their compatibility with either a specific theoretical rationale, expected treatment outcomes, or the ability of subjects at the time of initial treatment. Moreover, treatments have not been operationally defined so as to rule out the possibility that practice in reading alone would effect the same gains as treatment.

At the risk of oversimplification, we suggest that these conditions have borne a serious shortcoming; namely, the inability of instructional research to offer us much advice relative to teaching. In the case of research on comprehension instruction, this is most certainly true, for there are few if any instances where improvement in reading comprehension ability for new passages can be attributed to a particular instructional strategy. Furthermore, we feel justified in proposing that a new era in instructional research is not only long overdue, but forthcoming.

We predict this new era will usher in a commitment to the study of classroom dynamics, prompted by a recognition that we lose rather than capture the essence of any instructional environment when we limit our descriptions to the status of individual variables; for the characteristics of this environment emerge only in the context of interaction. In all likelihood this era will sponsor just as rigorous a commitment to the development and application of a variety of research paradigms and their

ongoing refinement. This suggests, therefore, to researchers intent on classical experimental paradigms that they avoid the pitfalls of past studies and adopt procedures which are sensitive to the need for data which considers the influence of a variety of classroom variables. Similarly, it suggests to researchers intent on a more naturalistic inquiry that they endeavor to be rigorous with respect to reporting learning as it occurs "naturally" (Erickson, Note 8). Most importantly, it suggests that researchers should be encouraged to consider an integrative approach which assumes some of the advantages of both the classical and naturalistic paradigms. Beyond these rather global predictions, the following guidelines for conducting research seem integral to the actualization of this new era.

Apply a "Greatest Likelihood Principle" to Experimental Research

A very important question to answer initially is: Can we under any circumstances cause students to improve their ability to comprehend new passages? It is our position that those of us who are prone to explore this question through a classical experimental paradigm, must do so in the context of what is termed "a greatest likelihood principle." As we perceive the implementation of this principle, researchers pursuing the efficacy of a strategy or teaching practice select students, materials, and activities which are most likely to prove successful. This would be accomplished in part by adherence to the following practices: (a) Subjects would be screened prior to treatment on the basis of such potentially confounding

variables as background knowledge to insure that the sample includes only those who do not manifest the ability the treatment is intended to develop and would profit by such treatment. With respect to the classical experimental and quasi-experimental comparisons, subjects would be randomly assigned to at least two groups, a treatment group and a control group, wherein the subjects independently read treatment material. (b) Treatments would be designed to produce maximum benefits. This often entails simply being sure that a treatment represents what we know about instruction and the interests of students and is of sufficient duration to be effective. (c) Dependent variables would be derived for passages and from measures not included in the treatment. These measures would need to be valid as well as reliable and sensitive to the treatment in terms of task difficulty and type of outcome behavior. This might require that researchers consider anew the types of impacts their interventions are likely to have and devise methods for measuring such impacts. Further, this suggests not only the need for multiple dependent variables, including on-line processing measures, but the development of a new array of procedures for probing the readers' likely retention, appreciation, and understanding.

It is unfortunate that most research in teaching reading comprehension has resorted to the application of what might be aptly described as a "single shotgun approach" to research, coupled with the use of rather global treatment procedures and assessment measures. In accordance with implementing a "greatest likelihood principle," we feel that this pattern should be reversed

and in its place be initiated a program of research similar to that of Rothkopf (1966, 1971, 1972a) and Frase (1967, 1968), whereby research questions are shaped across several studies in light of ongoing replication, modification, and extension.

Design Studies Where the Complexities of Texts, Teaching and Context are Addressed and Can Reveal Their Impact

Throughout this paper we have suggested that very few studies have addressed the complexities of classroom learning. Tuinman (1979) alluded to this state of affairs when he noted that the "fact that reading researchers are in contact with readers only at the moment of data collection is far from trivial" (p. 9). And as Trabasso (in press) argued in reaction to reviews of research literature dealing with teaching reading comprehension:

> . . . persons doing research on reading should go back to the classroom. . . . This return to the real world would influence several aspects of research. What tasks and texts are chosen for reading as well as how an understanding of these tasks and texts is to be measured. (p. 14)

Assuming this criticism is a valid one, that indeed researchers have failed to recognize the subtleties of classroom operation as they exist in conjunction with student-teacher transactions, how might researchers begin to address the complexities of the classroom? Jenkins (1978) has suggested that researchers in the process of studying any learning situation consider and systematically examine at least four basic factors: (a) the nature of the materials to be learned; (b) the characteristics of the learner; (c) the learning activities or kinds of things that

learners do when presented with material; and (d) the criterial tasks. Jenkins' argument is that since any question about learning involves all four factors to some extent, researchers pursuing such questions must recognize these factors and account for their individual and collective contributions, lest erroneous conclusions be drawn from data. We would extend Jenkins' argument and alter it slightly to suggest the need for research dealing with learning from text or learning to learn from text which examines systematically, separately, and concurrently the occurrence of interactions involving text-treatment, aptitude-treatment, teacher-treatment, context-treatment, learning-treatment, text-aptitude-treatment, text-aptitude-teaching-treatment, and so on. Such examinations might be a priori for purposes of studying variations across texts, teaching, learning, and context within causal designs; minimally, researchers should be held accountable for delineating text features, learner variables, teacher and teaching variables, and contextual features which might be of relevance to the ecological validity and generalizability of any findings. Consider the ramifications of text-treatment, teacher-treatment, and context-treatment interactions.

Text-treatment interactions. Obviously, the results of any study that investigates learning from text or learning as measured by some text-related assessment task will be influenced, in part, by the text used or under study. Research on the characteristics of text features has suggested among other

things that: (a) certain aspects of text influence the amount and type of information recalled; (b) predictions can be made, based upon text features, as to where distortions, omissions, and additions will occur; (c) text characteristics have a differential influence upon children compared with adults and good readers compared with poor readers; and (d) the influence of text features will vary with a reader's background of experience or predisposition. It seems, therefore, not only naive but misleading to disregard the potential for an interaction effect likely to occur across different types of text, different treatment conditions, and readers. Nor does it seem legitimate to select text randomly or according to the global categories of narrative and exposition. In any study, text should be selected, described, and analyzed in such a way that either reasonable generalizations to other specific texts can be made or the stability of results across texts can clearly be established.

Teacher-treatment interactions. In various syntheses of research pertaining to the teacher variable Rosenshine and others (Rosenshine, 1976; Rosenshine & Furst, 1971; Rosenshine & Stevens, in press; Rosenshine, Note 9) have argued that research involving teaching must consider an array of variables ranging from the clarity of teacher communications to the student's engaged time on task. Furthermore, they have suggested that a fairly consistent pattern emerges with regard to those factors which distinguish successful from

unsuccessful teaching: namely, student-engaged time on task and a framework for teaching involving demonstrate-prompt-practice-pacing and monitoring-feedback. Recently, the training studies of Brown and her colleagues (Brown, in press, a and b; Brown, Campione, & Day, Note 6) have called attention to what might be considered two teaching principles for improving a learner's strategies for learning. We will refer to them as the explicitness hypothesis and the relevancy hypothesis. The explicitness hypothesis suggests that the effectiveness of direct instruction related to strategy training varies in accordance with the ability of students and the explicitness with which teachers present rules for learning; the relevancy hypothesis relates to the notion that students acquire strategies more readily when they know the nature of the task at hand and that task is perceived by them to be relevant. The implication of these notions is that research on reading comprehension, especially helping students learn to learn from text, must consider the teaching framework within which a treatment is administered. This should not be foreign to reading researchers, as it coincides with the age-old concern that the teacher variable often has a confounding effect in reading methods studies. The ramifications of considering the teacher as a variable entail either controlling or systematically examining teacher variation. Researchers might pursue the possibility of a teacher-treatment interaction or as several research studies have suggested a teacher-treatment-aptitude interaction (Brown, Campione, & Day, Note 6; McDermott, 1976). In terms of controlling for the teacher

variable, researchers should not assume randomization of teachers will suffice for matching. Minimally, they should report the teaching framework within which treatments are operationalized, for example, including information relative to student engagement, and teaching sequence, style, clarity, monitoring, feedback, and so on. Ideally, researchers should systematically consider varying these features and the teaching framework.

Context-treatment interactions. Of relevance to the teaching framework within which instruction proceeds, researchers must be sensitive to the larger context within which reading comprehension instruction occurs, in particular, the extent to which an experimenter's intrusions have pushed or changed this environment. (For our purpose, we are defining context as the dynamics occurring in the regular classroom learning environment; context-treatment interactions pertain to any intrusion by the researcher which disrupts the classroom dynamics beyond that which was intended.) The issue of context-treatment interaction relates to whether the researcher's intrusions had an influence upon the classroom environment which in turn may have influenced learning to read from text or learning to learn from text. In the classical research tradition, the possibility of a context-treatment interaction was often supposedly controlled with the use of a placebo--a treatment group with all of the attributes of other treatment groups except on the variable for which effects were being examined. Unfortunately, the use of randomization or a placebo does not ensure against the context-treatment interaction. Especially in classroom settings, a single feature

of a single treatment condition might uniquely and separately prompt a context-treatment interaction; features of any treatment group, even placebo, have the potential to alter the dynamics of a classroom. How might researchers address these possibilities? They might observe the verbal and nonverbal social exchanges within the classroom community before, during, and after intrusion. As Bronfenbrenner suggests, researchers might assess each subject's "definition of the situation, how he or she perceives the setting and its various elements" (1976, p. 8). In the classical experimental tradition, researchers might examine the effect of systematically changing context--especially if they suspect a context-treatment interaction occurs and is likely either to detract from or to enhance learning. Otherwise, researchers should at least be held accountable for systematically describing and reporting what occurred in the context of the classroom. With the development of ethnographic techniques and technology, these methods should be within the grasp of most researchers and integral to reporting any classroom research endeavor.

Design Studies Where the Complexities of Classroom Learning Can be Addressed

If we were to enumerate those paradigms used within the past two decades to address issues related to teaching reading comprehension, we would be impressed with the predominance of quasi-experimental and

experimental studies which are tied to an analysis-of-variance model, based upon pre- and posttest measures. For treatment groups, treatment success is usually determined at least in part by a standardized reading test. It is our general argument that to a large extent, research within the context of these paradigms has been insensitive to certain key issues related to learning.

First, research on reading comprehension has failed to address whether or not students have acquired the prerequisite skills or strategies intended to increase learning from text or learning to learn from text. More specifically, within treatment groups some subjects may or may not have reached a satisfactory level of proficiency with a strategy; or for some subjects learning may not have stabilized. When researchers fail to systematically examine whether some students have acquired certain types of learning, it is not surprising that within-group differences often exceed between-group differences. Further, when researchers limit their measurement of effects due to learning to single rather than repeated measures prior to, during, and after training, it is difficult to know whether learning has stabilized.

A second major shortcoming is the measurement of learning outcomes. A single measure of reading comprehension, as has been typically the case in most instructional research studies, cannot capture the various

and subtle effects due to learning researchers should be seeking. Likewise, the use of global recall scores generated either from oral or written retellings do not capture the extent to which readers transform, integrate, or summarize the information represented within the text. Alternatively, in those situations where researchers have had cause to examine a number of different effect measures, they often fail to extend their analyses to address interdependencies between variables--that is, the synergistic nature of learning.

For these reasons, we posit that although one cannot deny that the notion of a learning-treatment interaction is quite complex, it is essential that research on reading comprehension begin to address its personality. This entails the following.

First, if researchers are intent on examining the effectiveness of training to predetermined levels of proficiency, they have essentially two choices. Researchers can determine a priori to have students reach a criteria relative to strategy or skill utilization prior to measuring effects; alternatively, they can plan to examine the relationship between effect size and level or skill or strategy acquisition in their data analysis. Second, if researchers are to address the stability of learning, they might consider: (a) obtaining multiple measures of the same variables prior to and after the administration of treatments; (b) adopting a time-series

approach (in conjunction with multiple measures) to examine the relationship of learning to treatment conditions across time; or (c) adopting a single-subject research paradigm (involving baseline measures, measurements during treatment conditions, and variations thereof) as either a subset of a research study involving groups or as a means of generating hypotheses for pursuit within the context of an experimental paradigm involving groups (see Birnbrauer, Peterson, & Solnick, 1974; Kratochwill, 1978). In so doing, researchers can establish the extent to which learning prior to, during, and after learning has stabilized and is reliable. Third, to address the possibility that subjects acquired certain types of learning and not others, we would argue that researchers need to give thought to what reading comprehension and learning are, as well as what are valid ways to measure their various facets. With the advent of text analysis procedures, researchers have available detailed procedures for examining qualitative differences in readers' recalls which can be related to theoretical notions of reading comprehension. With the gradual refinement of theoretic notions of comprehension--for example, schema-theoretic notions--researchers should be prompted to include measures which address aspects of comprehension and learning including schema selection, schema maintenance, schema transfer, and schema specialization and generalization. These advances in technology and thinking about reading

comprehension should displace single and global measures of reading comprehension which have done little to capture the idiosyncratic and qualitative differences due to increasing learning from text and ability to learn from text. Fourth, with the examination of learning from a variety of vantage points comes the need for researchers to examine effects due to treatment both independently and interdependently. We therefore urge the employment of statistical examinations of data which provide information relative to the amount of variance accounted for by variables uniquely, separately, and together. This demands that researchers go beyond univariate analyses of variance to multivariate models.

In summary, then, it is our argument in suggesting these guidelines that it is far from legitimate to arbitrarily select and administer treatments and dependent measures in a simple pre- and posttest design and thereafter assume the privileges of generalization and causation. For clearly, notions of applying the "greatest likelihood principle" and the notion of generalizability via representativeness are valid for classroom research on reading comprehension only within the context of a consideration of text-treatment, teaching-treatment, and context-treatment interactions. While some may argue

that blind research is better than no research, we certainly run the risk of obtaining misleading results when our research questions tend to be "stabs in the dark" rather than informed probes. Whether our questions take on the characteristic of an informed probe may depend upon the willingness of researchers not only to address the complexities of such interactions, but also to agree that these factors are worth examining systematically as they exist in relation to one another.

Design and Implement Research Which Can be Coherently Interpreted in Light of the Literature from all the Relevant Disciplines

All research on reading comprehension instruction requires, at some point, curriculum (knowledge, skills, or strategies), instruction (means for transmitting knowledge, skills, or strategies to students), teacher(s) (whoever is employing those means during the research), student(s), text(s), context (the dynamics occurring in the learning environment), and data collection/analysis. All these aspects enter into making a piece of instructional research "interpretable." Unfortunately, a research study in reading comprehension instruction can fall prey to naiveté with regard to any of these seven aspects.

Our fourth guideline, then, deals with the necessity of interdisciplinary research in reading. As Goodman (1979) has stated,

> What is still needed is a wider range of reading research methodology and cross-disciplinary interaction . . . That goal is difficult to achieve if psychologists feel constrained to do "psychology," linguists to do "linguistics" and ethnographers to do "ethnography" . . . we need interdisciplinary research not multidisciplinary. (pp. 144-145)

No one researcher can expect to avoid naiveté in all seven aspects of a study on reading comprehension instruction, and yet, no criticism of a piece of research can be more damaging than when knowledgeable persons in a relevant discipline describe it as "uninterpretable." We recommend that this guideline be achieved by asking questions of the literature and/or of knowledgeable persons in relevant disciplines before embarking upon a piece of reading comprehension instructional research. Some of these questions are presented in the remaining paragraphs of this section.

Curriculum. In any instructional study, there is some attempt to transmit knowledge, skills, or strategies to students. This "content" of the instruction to be investigated should come under scrutiny before the study is undertaken.

Source	Question
Linguists Psychologists Psycholinguists	Do the knowledge, skills, or strategies to be taught represent conceivable and important psychological constructs for the comprehension of the kinds of language under study?

Source	Question
Teachers Reading Educators	Do you think it's important to teach this knowledge, these skills, or these strategies to students of the kind under study?
Students	Do you think it's important to know this knowledge, these skills, or these strategies?
Psychometricians Reading Educators	Can students be validly and reliably assessed as to this knowledge, these skills, or these strategies?

Instruction

Source	Question
Educational Psychologists Instructional Designers Reading Educators Teachers	Do the means to be employed for transmitting the content under study to the kinds of students under study employ sound instructional principles?
Teachers Reading Educators	Do you believe the instruction to be investigated is "do-able" in classrooms and if so, under what conditions?
Students	What would your reaction be if you were taught in this manner?

Source	Question
Administrators/Supervisors Ethnographers Reading Educators Teachers	What means can be developed to ensure/ determine the degree of implementation of the instruction? Was the instruction actually carried out?

Teacher(s). Because any teacher has a personality, manifest both verbally and nonverbally, it is impossible to speak of instruction divorced from the verbal and nonverbal communicative channels used to implement it. To some extent, of course, each teacher has unique behavior, so there will always be a teacher-treatment interaction. Generalizability of results of reading comprehension instructional research will be enhanced, however, by defining the instruction (discussed above) under study as broadly as possible to include the type of verbal and nonverbal communication to be used. These questions, then, should be helpful:

Source	Question
Educational Psychologists Instructional Designers Reading Educators Teachers Students	What are some different ways effective teachers might go about conducting the(se) lesson(s)?
Evaluators Ethnographers Psychometricians	How can one assess the amount of idiosyncratic behavior in the lessons a teacher teaches?

Source	Question
Research Designers Ethnographers	How can one assess the impact of the teacher's idiosyncratic behavior in the lessons taught?
Teachers Students	Now that the instruction is completed, how do you think that instruction might have been better?

Student(s)

Source	Question
Teachers Reading Educators Educational Psychologists Students	What knowledge, skills, or strategies are prerequisite to learning the knowledge, skills, or strategies under study as taught by the instruction under study?
Psychometricians Reading Educators	Can students validly and reliably be assessed as to the prerequisite knowledge, skills, or strategies?

Text(s)

Source	Question
Teachers Reading Educators	Are texts relevant to students' needs and schools' goals?
Linguists Psycholinguists	Do the texts employed present avoidable obstacles to understanding?

Source	Question
Teachers Reading Educators Linguists	Are the texts to be used representative of the kinds of text(s) under study?
Teachers Reading Educators Students Linguists Psycholinguists	Are texts to be used appropriate for the students to be used in terms of difficulty, style, format, appeal, and conceptual load?

Context. A classroom can be described as learners, language-users, a community, or a teacher with an audience, depending on whether one takes the viewpoint of a psychologist, a linguist, a sociologist, or a supervisor. Actually, a classroom is simultaneously all of these things and more. Classrooms can be examined from the vantage of verbal and nonverbal interaction, classroom and school organization, or social community.

Source	Question
Ethnographers Administrators/Supervisors Teachers Students	How similar is the total instructional environment of the study (including instruction, teacher(s), student(s), and text(s)) to the kinds of instructional environments under study? Does the total instructional environment of the study have the "feel" or "rhythm" of a natural learning environment?

Source	Question
Ethnographers Teachers Students	What are some different ways students might be effectively grouped to receive the instruction under study?

Data Collection/Analysis

Source	Question
Ethnographers Teachers Students	How will the data collection/analysis procedures themselves effect the data being collected? What will be the impact on the teacher(s) and student(s) that data is being collected the way it is?
Research Designers	What designs could be used to determine the individual and interactive contributions of the independent variables under study?
Statisticians	What data analysis procedures are appropriate for making inferences based on the data to be collected?
Teachers Reading Educators	How much and what kind of a difference must result from the instruction under study before you would consider it an important difference?

The interdisciplinary research on reading comprehension instruction which would result from seeking answers to these questions from the literature or from knowledgeable persons in the relevant disciplines should be relatively free of the several types of naiveté to which such studies are prone. Of course, these procedures will not ensure that a research study will turn out as expected, but they will enhance the likelihood that whatever occurs can be interpreted. As a result, reading comprehension instruction research can be conducted which is psychologically, linguistically, sociologically, statistically, and educationally significant.

A Call for Action

It may seem that the four guidelines we have proposed for conducting reading comprehension instructional research are unreasonably demanding. Currently, it seems that instructional research is at once more difficult and expensive and less politically rewarding for the researcher to carry out. Many will see the "lie of the land" of this situation and decide that only the less than intelligent would dare to become involved in such research. So be it.

However, there may be some researchers who are willing to take risks, who believe it is time to move into a new period in reading research and who believe that, in the long run, benefits of rigorous-quality reading comprehension instructional research will outweigh immediate costs. It is this latter group that we call to action.

The relatively brief and recent history of investigations into the psychology and physiology of reading, approximately a century in length, may be informally characterized as the "reading epoch." This epoch is ongoing and is primarily distinctive by the sheer amount of investigation thus far. Alfred North Whitehead (1925/1967) has written:

> When you are criticizing the philosophy of an epoch, do not chiefly direct your attention to those intellectual positions which its exponents feel it necessary explicitly to defend. There will be some fundamental assumptions which adherence of all the variant systems within the epoch unconsciously presuppose. Such assumptions appear so obvious that people do not know what they are assuming because no other way of putting things has ever occurred to them. (p. 48)

Are there basic assumptions which "adherence of all the variant systems" within the reading epoch presuppose? It would seem so. The major assumption appears to have been that knowledge about readers, texts, or classrooms, once discovered, would be automatically applicable to improving reading instruction. The new epoch we are calling upon demands an examination of such assumptions. Further, our call for action should not deny the theorist, researcher, or practitioner. Indeed, our call for action should not deny pursuing research which is less theory-laden and has its roots in both the pedagogical traditions and intuitions

of reading education. For example, there are numerous reading instructional practices and paradigms advocated and followed by teachers for which we lack any substantial data base or theoretical explanation. We would be amiss not to encourage reading educators to pursue a rigorous program of research which will detail in what situations with what students and in what ways their present practices effect learning and learning to learn? We would request linguists, psycholinguists, psychologists, ethnographers, psychometricians, and others to encourage reading teachers and teacher educators to delineate reasonable research probes to these ends and challenge them to address the implications any findings have for both theory development as well as subsequent research and practice. Further, we believe that despite their apparent simplicity there are many intuitions (sometimes tacit) held by teachers about classroom comprehension and learning which should be articulated and probed. For example, implicit within most teaching situations there appears to be a level-of-activation hypothesis compatible with the notion of student-engaged time on task. Our point is that teachers and teacher educators should reflect upon their intuitions and invite interdisciplinary advice on seeking a data base and its interpretation. We have a sense that a major stumbling block to progress in research on reading comprehension instruction has been our unwillingness to subject intuitions to research probes.

A FINAL WORD

It has been our intent to address what we initially perceived to be a formidable task, namely a review of the literature on teaching reading comprehension in terms of two questions: With whom, in what situations, and in what ways does teaching improve reading comprehension? How should research in teaching reading comprehension proceed? We were not mistaken; the task was most formidable, and to address it satisfactorily, we were forced to create what may be perceived as an artificial means of organization and an abstraction of studies which may have more than slightly influenced the direction of our discussion. We come away from this effort recognizing that in the process of pursuing the "power to prescribe," researchers exploring issues related to teaching reading comprehension have characteristically confined themselves to the use of a rather limited number of research paradigms, which on the whole do not lend themselves to a collection of contextualized data; and in addition, their efforts have tended to minimize the significance of replication and extension. However, one cannot be anything but encouraged by the growing tendency for researchers to conjoin the "wisdom of the classroom" with their own research-based intuitions in a cross disciplinary fashion; resulting in possibly their greatest find, that, indeed, the classroom has much it can teach the researcher about his own expertise. Certainly the byword of what we predict to be a new era in instructional research will be cooperation--between classroom and researcher, between theory and practice.

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Footnote

[1]Metacomprehension deals with a person's knowledge of oneself--that is, knowledge of one's characteristics, knowledge of the characteristics of tasks, and knowledge of potentially employable strategies to cope with these tasks. As Brown (in press) has suggested, metacomprehension includes the nature as well as the role of subconscious and deliberate monitoring of understanding, task demands, strategies, and the interactions among them. With respect to reading, it relates to a reader's awareness of reading, reading strategies, task demands, and his or her own understanding. This would include monitoring (prior to, during, and after reading) one's efficiency as a reader.

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