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ABSTRACT

This paper reviews recent research to determine why children encounter problems understanding what they read. Four points are discussed as especially relevant to children's problems in reading comprehension: (1) reading differs from early language experiences, and an analysis of these differences can indicate likely sources of reading difficulty; (2) reading is a process that involves constructing hypotheses based on prior knowledge, while a lack of such knowledge can lead to incorrect hypotheses; (3) the emphases on decoding skills in early grades often engages children in essentially meaningless reading activities, giving the impression that reading has no purpose; and (4) an entirely new set of strategic skills is needed for functional reading tasks such as reading textbooks or following instructions, tasks for which no foundation has been laid. Implications for testing are discussed, including the use of an individualized approach that embeds testing in the ongoing reading and writing activities in which the student is engaged. (DF)

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Reading Education Report No. 8

CHILDREN'S READING PROBLEMS

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The writing of this paper was supported by the National Institute of Education under Contract No. US-NIE-C-400-76-0116. The paper attempts to integrate the thinking of a large number of people associated with the Center for the Study of Reading. In particular, there are ideas included from, among others, Richard C. Anderson, Thomas Anderson, Ann Brown, John Seely Brown, Bertram Bruce, John Frederiksen, Jean Osborn, Rand Spiro, and Andee Rubin.

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The question we address in this paper is the issue of why children have problems understanding what they read. At this point, we cannot provide answers that are complete, or even startlingly new, but we can summarize some of the work at the Center for the Study of Reading which we feel is slowly bringing us closer to such answers. Our account of this work will place special emphasis on those aspects that have implications for general educational policy and, more specifically, for testing.

In this paper, we will take up and develop four points which we feel are especially relevant to children's problems in reading comprehension. The first is that reading differs from children's early language experiences on a number of different dimensions. We believe that by analyzing these differences we can get some preliminary notions about where children's reading difficulties are likely to occur. The second point is that reading is a process which involves constructing hypotheses based on prior knowledge. Children often develop incorrect hypotheses because they lack some necessary piece of prior knowledge. The third point is that our school system, with its emphasis on decoding skills in the early grades, often engages children in a variety of reading activities that are essentially meaningless. Some children may therefore think that there is no purpose to reading. The fourth point is that, once children have learned decoding skills, they are then suddenly faced with functional reading tasks such as reading textbooks or following instructions. An entirely new set of strategic skills is needed for these tasks and no foundation has been laid for them. These four points represent four different areas in which problems in reading comprehension can arise.

Problems Arising from Different Language Experiences

Whether children have problems in reading depends partly on the language experiences they have before they learn to read. Most children are primarily familiar with conversation, but reading, especially the reading of stories, is quite different from conversation. Work by Rubin (in press) makes these differences clear. Rubin has isolated a number of dimensions along which language experiences can vary. The dimensions that are particularly relevant to this paper are described as medium dimensions, dimensions that have to do with how a message is communicated. These dimensions and their values for face to face conversation and reading a story are shown in Table 1. For ease of exposition, we call speakers and writers senders and listeners and readers receivers.

These eight dimensions define a space as in Figure 1 where different language experiences, such as having a conversation, watching a play, or reading a story, can be represented as points. It is clear that conversation and reading a story are maximally different. In contrast to reading a story, conversations are spoken, the receiver and sender are temporally contiguous and regularly switch roles, and utterances are designed specifically for the participants. Unless the conversation is over a telephone, the participants share the same spatial and temporal context and can also communicate via extra-linguistic means. In most children's conversations, with adults and with other children, the things talked about tend to be concrete and visible (Nelson, 1974). Finally, the contribution of each participant is clearly marked as to its source, and the physical presence of the conversants provides easy identification for different points of view.

We can illustrate a few specific problems that arise out of these differences. In text, punctuation indicates the higher-level syntactic information that features such as intonation and stress indicate in conversation. Thus, a question mark in text corresponds to a rising intonation in speech. A period corresponds to falling intonation, and commas

Table 1

Dimensions on Which Language Experiences Differ

(Conversation is labelled c and reading a story r.)

Modality:

Spoken (c)

Written (r)

Interaction:

Receiver can become sender (c)

(e.g. by asking a question)

Receiver cannot become sender (r)

Specificity of Audience:

Message designed for particular receiver (c)

Message designed for generalized receiver (r)

Spatial Commonality:

Sender and receiver in the same spatial context (c)

Sender and receiver in different spatial contexts (r)

Temporal Commonality:

Sender and receiver in the same temporal context (c)

Sender and receiver in different temporal contexts (r)

Extra-linguistic Communication:

Gestures and facial expressions possible (c)

Gestures and facial expressions not possible (r)

Concreteness of Referents:

Referents usually visible to receiver (c)

Referents not visible to receiver (r)

Separability of Characters:

Statements easily assigned to the person who produced them (c)

Statements not easily assigned to the person who produced them (r)

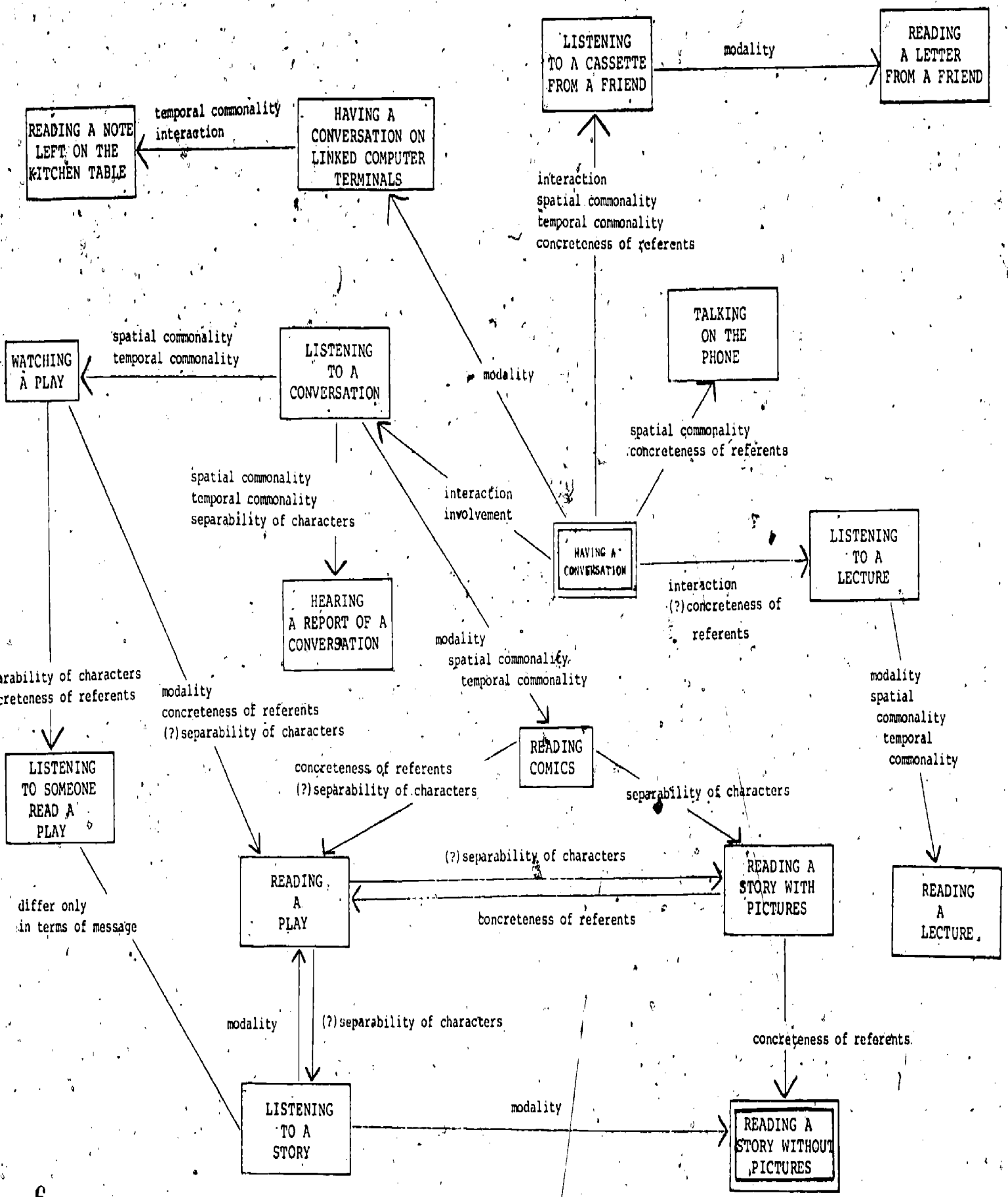

Figure 1. Differences among language experiences as communicative media. The arrows are labelled with the dimensions separating each language experience (from Rubin, in press).

correspond to pauses. However, these correspondences are by no means exact. For one thing, the same punctuation mark can be used for a variety of different purposes, some of them having no analogy in spoken language. For example, quotation marks are primarily used to set off quoted material or to indicate a verbatim utterance, but quotation marks can also be used to indicate that the writer is talking about a word or phrase rather than using it, as in the phrase " 'quotation' begins with a q". They can also be used to "hedge" the use of a word or phrase. These uses of quotation marks are peculiar to written language. Since the mapping from punctuation to intonation features is not exact and since there are syntactic features present in written language that are not present in spoken language, a beginning reader must learn a complex set of new syntactic skills. It is clear from work with children (c.f. Adams, in press) that they have difficulty doing so.

Another problem has to do with the separability of characters. In written stories, the utterances of different characters are set off by quotation marks, and by phrases such as "Joe said ...," But often in children's stories (e.g. Winnie the Pooh, How to Eat Fried Worms) such phrases are dropped after the first few turns. As a result, it is easy to lose track of who said what. Not surprisingly, this often leads to problems in understanding.

Lack of spatial and temporal commonality between the writer and reader also leads to problems, especially with respect to relative terms such as "here" and "now". In a conversation where there is a shared spatio-temporal context, what is "here" for the sender is usually "here" for the receiver and, certainly, what is "now" for the sender is "now" for the receiver. Furthermore, words like "this" and "that" are usually accompanied by gestures indicating exactly what "this" and "that" refer to. In stories, however, such words become particularly problematic. "Here" no longer has anything to do with the receiver's spatial location. Usually "here" refers to some location

within the world created by the story, a location that may not even actually exist. Furthermore, there are differences in meaning depending on how the word is used. When "here" is used by a character, it refers to the character's location. However, when "here" is used as part of the narration, it refers to the location in the story currently being talked about or described. Similar sorts of complexity attend the interpretation of other words such as "now", "this", "that", and even "yesterday", and "tomorrow".

In Rubin's (in press) dimensional analysis there is maximal separation between conversation, the kind of language experience a child is most familiar with, and reading a story. They have different values on every dimension. Unless children are also familiar with other language experiences that lie along a path between conversations and reading of stories (such as hearing stories or writing and passing notes), they are likely to find reading stories a difficult and unfamiliar experience. Reading stories is difficult not just because of the difficulties inherent in learning how to decode written messages, but also because of the difficulties inherent in the change on seven other dimensions as well. Children from cultures in which there is a strong oral, as opposed to written, tradition may lack the necessary familiarity with different kinds of language experiences and may find the reading of stories particularly foreign and, perhaps, inexplicable. The problem is, of course, not simply due to strangeness or unfamiliarity. The problem lies in the fact that all these differences require different processing strategies, strategies which some children may not have available.

Problems Arising From Lack of Prior Knowledge

Reading involves constructing an interpretation of a set of actions or events in a text based on one's prior knowledge. We can illustrate just how important that prior knowledge is with Schank & Abelson's (1975) example of the knowledge we have about eating at a restaurant. This knowledge is represented in what Schank & Abelson call a script. Most middle class Americans have a restaurant script that allows for considerable variation.

Consider the differences between eating at a fancy restaurant, and eating at McDonald's. When eating at a fancy restaurant, you wait for a hostess to seat you at a table; you are brought a menu at your table; you have several courses which are served by a waiter; etc. None of these events occur at McDonald's. Therefore reading about them may not make a great deal of sense to children whose restaurant experience is limited to eating at McDonald's. Thus, a story about eating at a place like MacDonald's will be easier for them to understand than a story about eating at a fancy restaurant. This kind of disparity between the settings in children's stories and the background of individual children must be very common indeed.

Recently there have been a large number of psychological studies (Anderson, et al. 1978, Bransford & Johnson, 1973) demonstrating that much of what people construct as an interpretation of what they read depends on some critical piece of information. For example, the sentence, "The notes were sour because the seams were split," makes no sense, unless you know about bagpipes. In a similar way children often cannot construct a sensible interpretation, or may construct a wrong interpretation, because they lack a necessary piece of information.

Not only does the interpretation of a text depend on prior experience of such things as restaurants and bagpipes, it also depends on knowledge of the plans and motivations of other people. For example, in stories and fables, the characters often talk about one plan, while covertly trying to carry out another (Bruce & Newman, 1978). In one fable about a fox and a rooster, the fox tries to lure the rooster out of a tree by inviting him to breakfast. The rooster accepts on the condition that he can bring along his friend who is in the tree trunk. The fox, thinking he'll have two roosters to eat, invites the friend. Unfortunately for the fox, this friend happens to be a dog rather than another rooster, and the fox is bitten for his trouble. Adults universally interpret this tale as a clever ploy by the rooster to outwit the fox, but usually children do not consider the rooster to be so clever, just

lucky (Bruce, 1978). In fact, roosters in real life are not so clever, but we as adults have come to expect this type of sophistication of roosters in fables. Here we see how correct understanding of a text can depend on a critical piece of knowledge about a character's motivations.

There are at least two practical implications of this work. One pertains to children from cultures different from that of the author. To the degree that texts used with children assume familiarity with middle-class situations or motivations, children without middle-class backgrounds will have problems making sense of them. Such children simply won't have the necessary prior information. Any other problems they may have with reading, such as decoding of words, will only be compounded.

Another implication of this work is that reading tests often measure background knowledge and not reading skill. It is certainly true that, without decoding skills, a child cannot understand a text no matter how familiar the ideas may be. However, testing of reading skills is only unbiased to the degree that the background knowledge of the children being tested is equally appropriate to the texts used.

Furthermore, higher-level reading skills are so tightly interwoven with background knowledge that tests must be extremely carefully constructed to separate the two. These higher-level skills include the ability to understand the conventions of punctuation and paragraphing, the ability to find specific information in a text, the ability to recognize and recover from wrong hypotheses about the text, and the ability to recognize and use high-level text structure. In current tests these reading skills are completely confounded with background knowledge, but there are several ways in which it is possible to unconfound them. One is to design tests around experiences and motivations that are common to all children taking the test. This least common denominator approach depends on finding such commonalities for its viability, which seems unlikely. A second approach would be to use tests that are individually tailored to each child. This could be done by first

identifying what the child's interests are or what the child's prior knowledge is. Test items could then be selected to match the child's interest or background. If we want to have truly diagnostic tests, this tailored testing approach is the one we will most likely have to take, but it is only possible with computer-based testing.

There is another way that background knowledge can lead to test bias. Spiro et al. (1978) have investigated the two different strategies that children use for dealing with problems in decoding. One strategy is to try to sound out difficult words in order to identify them. Unfortunately, this technique is slow and can lead to a failure to integrate ideas, because all the effort goes into the processing of individual words. The other strategy is to use the first letter or two to guess at difficult words on the basis of what one thinks they might be from prior knowledge and context. This strategy often culminates in wrong guesses and an inability to recover from incorrect hypotheses about the meaning of a text. Some reading tests make use of cloze procedures in which the child has to fill in missing words in the text. Such a procedure is obviously biased in favor of those students who use the latter strategy, even though the former strategy may be better in the long run. A fruitful direction for test design may be to attempt to distinguish these two classes of children.

Problems Arising from the Way Reading is Taught

In our opinion several aspects of the way schools teach reading may cause problems for children. These problems derive from too much stress on the decoding of words and in particular from the currently popular component-skills approach to reading. While we cannot document these problems, they seem apparent in some of the children we have observed.

In the early grades of school, children are faced with a variety of activities that are designed to teach component skills in reading, for example, tasks such as circling pictures whose words begin with b. For the most part these activities are tedious, and they are such fractionated

language experiences that they seem pointless to the children engaged in them. They are one of the ways we inadvertently teach children that reading is not inherently pleasurable, but something done to please the teacher. Students who don't care about pleasing the teacher will not care about doing these tasks.

In contrast to this fractionated approach, it is possible to engage children in language activities that are meaningful and also stress various component skills. Many such activities are suggested by the Rubin taxonomy described above. If a child is having difficulty with one or another dimension of reading, he or she can be given an activity that is like reading on that dimension, but more like conversation on other dimensions. For example, having stories read aloud to a child teaches notions about text structure while eliminating the decoding problem. Having children send notes and messages back and forth to each other teaches reading and writing skills while maintaining most of the aspects of conversation. Such an activity eliminates problems stemming from differences in spatial or temporal context. There are also a variety of computer-based activities involving reading that teach decoding skills and the following of instructions in an interactive and personalized way. One such activity is a Treasure Hunt game where the player moves around in a large set of caves looking for treasure and warding off elves and dragons. Such activities will soon be available on small computers that will be widely distributed in homes and schools. The above are examples of reading activities that are highly motivating and that stress component skills while still maintaining the communicative function of language.

Problems Arising from the Transition to Functional Reading

Comprehension difficulties often arise in the third or fourth grade because children move from reading texts designed to teach basic reading skills to reading texts designed to convey information. Story books for children use vocabulary and situations that are reasonably familiar to most children, but the informative texts involve new ideas and new vocabulary.

Their content is further removed from children's prior experiences. As the task of reading changes from acquiring decoding skills to acquiring new information, a new set of strategies becomes relevant. Among them are how to deal with failures to understand different words and phrases, how to revise misinterpretations, and how to select important points for whatever purpose is at hand (such as doing a task if given instructions, or remembering later if given expository material). These strategies represent a set of skills that children have not needed before and for which they usually have received little preparation in the earlier grades.

To some extent the same problems arise in conversation, but the appropriate strategies for dealing with such problems are quite different from those needed in reading. When you don't understand something in a conversation, you can look puzzled or say "what?" Such techniques do not work in reading. Hence, children do not have available strategies for dealing with such problems, and for the most part, they are never explicitly taught such strategies. In such situations, the brighter children develop their own strategies and the less bright children lose interest.

We can illustrate the new problems children face with three examples:

1) What to do when you don't understand.

2) How to read to remember later.

3) How to recover from wrong hypotheses.

Our preliminary work (Collins, Brown, Morgan & Brewer 1977; Collins, Brown & Larkin, in press) indicates that skilled readers acquire a variety of tacit strategies for what to do when they don't understand a text. In such cases they appear to carry along a set of questions as they read. If the structure of the text suggests these questions will be answered later, skilled readers will continue to read. If, however, too many questions collect, they will often jump back to the sentences that led to the questions. These they reread in order to form hypotheses which allow them to cut down the number of open questions. Learning when to keep reading, and when and where to jump

back and reread, are skills that are crucial for reading difficult material.

Reading for memory is another skill that only arises in later grades when teachers begin to expect children to acquire information on their own. It involves several subskills that students need to acquire, such as picking out main points, saving them in some form by underlining or rehearsing, and skimming the same text later. Brown & Smiley (1977) have extensive data that show that children do not know how to pick out the main points in a text. Because they haven't learned this skill they don't know what to focus their efforts on, and hence their studying is not as fruitful as that of those adults who are skilled studiers.

From tutoring children in reading we have discovered that they tend to hold onto wrong hypotheses even when they encounter contrary evidence. This is an old finding in the psychological literature (Bruner & Potter, 1964). Nevertheless, giving up wrong hypotheses is an important skill that good readers must acquire. The appropriate strategy is to go back and reread looking for a new interpretation, rather than to cling steadfastly to hypotheses which no longer make sense.

These three comprehension skills are examples of reading skills that are necessary for survival in school but that are not usually taught in school. These are all skills that are specific to reading, so they do not arise out of earlier language experiences. Where children lack any of these high-level strategic skills we should attempt to teach them directly.

The Relation Between Teaching and Testing

In an ideal world, the function of testing would be to identify the problems a student is having. Such testing would then determine what is taught to the student. This is a highly individualized notion of testing and teaching, one in which the testing provides feedback to guide the teaching. If we can develop well-articulated theories of how the reading process can go wrong, as Brown & Burton (1978) have done for arithmetic, then we can develop significantly better reading tests. This is one of the Reading Center's major goals.

Our vision is that such testing can be embedded in the ongoing reading and writing activities the child engages in. For example, in the Treasure Hunt game described earlier, messages can be constructed to be difficult to comprehend in different ways (e.g. vocabulary, syntax, pragmatic meaning, etc.). If the computer keeps track of what types of messages a child has trouble understanding (either because he asks for help or because he makes an impossible move), the computer can begin to build up a diagnostic profile of each child. Then the computer can direct the child toward activities that stress the particular skills the child needs to develop. In this way diagnosis can be tightly coupled to the individual training of the child. The minicomputer revolution will soon allow us to make many of these activities computer-based.

In summary, we believe it is possible to diagnose specific problems that children have in reading. Such diagnostic tests must then be tied to educational activities aimed at remedying the specific reading problem a child has.

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