

A THEORETICAL OVERVIEW OF THE READING PROCESS: FACTORS WHICH INFLUENCE PERFORMANCE AND IMPLICATIONS FOR INSTRUCTION

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Of universal concern to early years teachers is ensuring that their students become fluent readers. When children are learning to read they often sound out words letter by letter, make innumerable hesitations, add words not on the page, omit words altogether, or are overly dependent upon pictures as an aid to word recognition. Readers may mispronounce words and stop both to repeat words or to go back and self-correct, all in efforts to make sense of or comprehend the text. For numerous students, oral reading is laboured with both improper phrasing and repetition. Punctuation may be ignored altogether. Some pupils may even exhibit reluctance to read aloud orally, while others are overwhelmed by the task of reading a whole page of text silently. For many, learning to read is thus an extremely difficult task, to which this lack of fluency attests.

Our contention is that the reading difficulties described above are indicative of normal reading development and distinguish beginning readers from readers who are more fluent and skilled. Reading is an involved and complex process and many factors interact to inhibit and prevent reading success. It is, however, through increased understanding not only of the factors that influence reading development but also what is involved in the process of reading that the reading behaviours noted in the foregoing are placed in proper perspective.

This monograph therefore discusses both the difficulties faced by beginning readers as they acquire fluency and the complexity of the reading task. Discussion begins with an overview of past and prevailing models of the reading process and the introduction of an interactive model of reading. Subsequently, within the framework of the interactive model, factors which influence and affect reading acquisition including the orthographical, lexical and syntactical demands of text in relation to either the cultural experiences or semantic knowledge of students will be discussed, together with implications for reading instruction.

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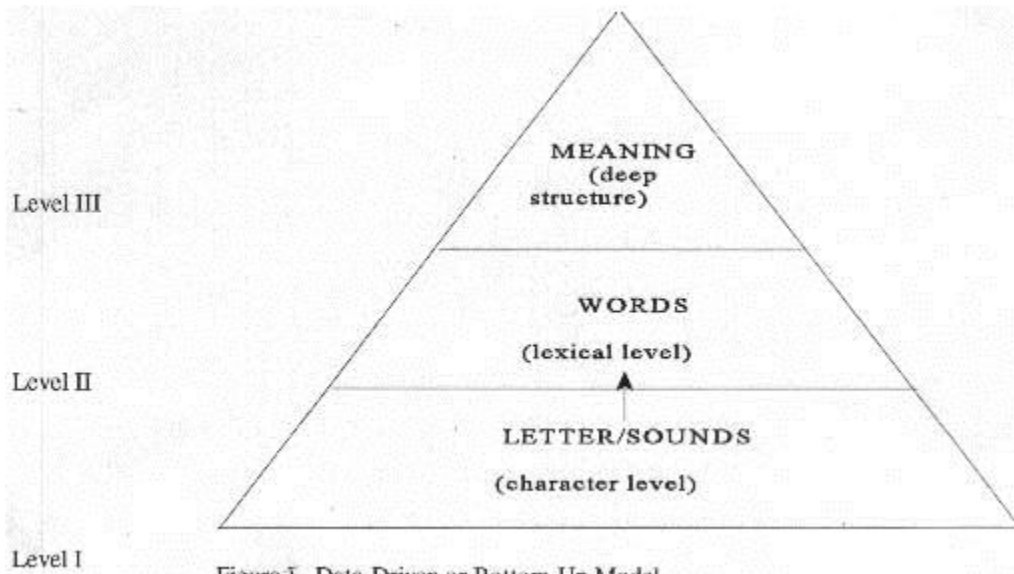
Reading Models: Bottom-Up and Top-Down

There has been extended controversy among reading authorities about the approach to use in teaching beginning reading, an either/or kind of controversy, the essence of which centres upon whether the first emphasis in word recognition instruction should be phonics- or meaning-based. In the one view of reading, learners are perceived as being almost passive decoders of visual stimuli, while in the other, learners are viewed as active participants who construct their own encodings.

It is useful to think of these two views of teaching reading as a dichotomy, as falling into two main camps. One camp consists of authorities who contend that the process of reading begins with letters and their sounds (phonics). These experts support what is termed a code-emphasis, text-driven or "bottom-up" model to explain the reading process. The other camp, in opposition, consists of those authorities who perceive reading as chiefly "externally guided", who subscribe to a hypothesis-test, or "top-down" model of the reading process. In the media, the implications of these two opposing views are often polarized in terms of what they mean for instruction, represented by: (1) those who advocate a phonics approach to teaching beginning reading and (2) those who would prefer meaning as the base, often critics maintain, fostering a "look-say" approach.

To elaborate, Gough (1972) proposes what may be classified as a phonics-based or "bottom-up" model of the reading process which portrays processing in reading as proceeding in serial fashion, from letters to sounds, to words, to meaning, in the progression suggested in the accompanying figure.

Taken from this perspective, the implications for reading instruction are that students need to begin reading by learning the letter names, associating the letter names with their sounds, and then be shown how to blend these sounds together into words. Stated in Gough's more technical terms the reading system, from a "bottom-up" perspective, functions in sequence as follows. First, the graphemic information enters through the visual system and is transformed at the first level from a letter character to a sound, that is from a graphemic representation to a phonemic representation. Second, the phonemic representation is converted, at level two, into a word. The meaning units or words then pass on to the third level - TPWSGWTAU (the place where sentences go when they are understood) and meaning is assimilated into the knowledge system. Input is thus transformed from low-level sensory information to meaning through a series of successively higher-level encodings, with information flow that is entirely "bottom-up", no higher level processing having influence on any lower level processing (Rummelhart, 1977). This process is also referred to as "data-driven" (Bobrow and Norman, 1975).

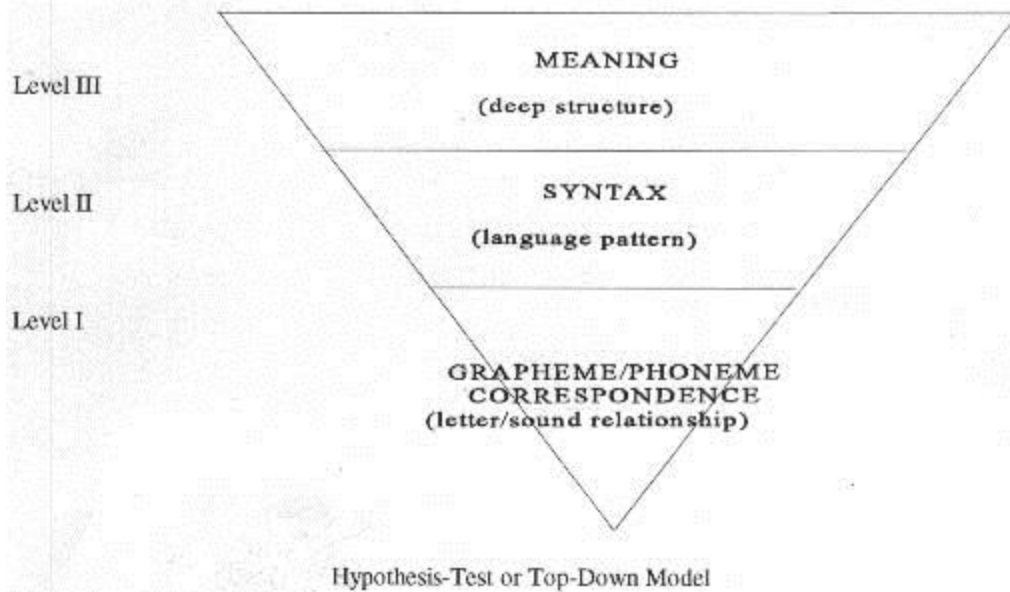


But other theorists disagree. For them, efficient reading does not result from the precise perception and identification of all the elements in a word, but from skill in selecting the fewest, most productive cues necessary (Goodman, 1970). These authorities contend that readers have a prior sense of what could be meaningful in the text, based upon their previous experiences and their knowledge about language. Readers are not, in their view, confined only to one source of information - the letters before their eyes, but have at their disposal two other important kinds of information which are available at the same time: semantic cues (meaning), and syntactic cues (grammatical or sentence sense).

Thus according to theorists in this camp, what readers bring to the text separately in terms of both their prior knowledge of the topic and their knowledge about language, assists them in predicting what the upcoming words will be. Readers sample the print, assign a tentative hypothesis about the identity of the upcoming word and use meaning to confirm their prediction. If meaning is not constructed, the reader resamples the text and forms a new hypothesis. Thus readers need only briefly sample the "flutters" on the page in order to confirm word identity.

In this model it is evident that the flow of information proceeds from the top downward so that the process of word identification is dependent upon meaning first. Thus the higher level processes embodied in past experience (semantics) and the reader's knowledge of the language pattern (syntax) interact with and direct the flow of information (Stanovich, 1980), just as listeners may anticipate what the upcoming words of speakers might be. The figure depicts fluent readers as actively engaged in predicting or hypothesis-testing when progressing through text. This view identifies reading as a kind of "psycholinguistic guessing game" (Goodman, 1970).

A representation of the "top-down" process is depicted in the following figure.



Summary

In general, it may be said that there are two opposing theories regarding what is involved in the reading process. One theory envisions reading as a data-driven process ("Bottom-up") in which: (1) letters are transformed into phonemic representations; (2) phonemic representations are then transformed into word representations; (3) words are next assigned meaning; (4) words are combined into meaning-bearing sentences; (5) meaningful associations are formed, and (6) information is finally stored. The contrasting theory views reading as a "top-down" process in which higher level conceptual processes direct word recognition and the reader: (1) samples the print; (2) makes predictions as to what the word might be based upon prior knowledge of the topic and sentence sense; (3) reads to confirm the hypothesis; (4) constructs meaning; and (5) assimilates new knowledge.

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Critique of the Reading Models

"Bottom-Up" Model

Rummelhart (1977) sees an essential flaw in the "bottom-up" model because processing is seen as proceeding only in one direction which implies that no higher level information ever modifies or changes lower level analysis. The following illustration refutes the idea that readers rely only on "bottom-up" processing. In this case readers are able to identify the word "read" correctly only by employing higher level semantic and syntactic processing.

- I read that story yesterday

- Today, I am going to read a new story.

From this example, it is evident that to pronounce the word "read" correctly in each case, the reader draws upon world knowledge and meaning as well as grammatical sense to facilitate word identification. Hence it is obvious that cognitive processing at higher levels influences lower or surface level processing. Reading thus seems to be an interactive, rather than a linear process based only on letter perception.

Other support for this position (Rummelhart, 1977) that reading is not entirely "bottom-up" has been demonstrated in a number of psychological studies in which: (1) subjects are cognizant of more letters when a word is presented than when a string of unrelated words is presented (Huey, 1908/1968); (2) letter strings are perceived as the original word even when a letter is deleted or replaced by one or two letters (Pillsbury, 1897); and (3) a letter is perceived more accurately when it is part of a word than when it is among a set of unrelated letters (Reicher, 1969). Not only that, but McClelland and Johnston, as cited in Rummelhart (1977), demonstrate that letters are more accurately perceived when they are embedded in orthographically regular rather than orthographically irregular strings, suggesting that the perception of letters depends upon the surrounding letters. Rather than being perceived singly then, letters are often perceived in clusters.

Other relevant research reported by Rummelhart indicating how semantic processing directs lower level processing includes a series of experiments in which the time required to identify such word pairs as BREAD-BUTTER, DOCTOR-NURSE as opposed to such pairs as BREAD-DOCTOR, NURSE-BUTTER is shorter when the words are semantically related. This adds further support to the thesis that word perception is influenced by meaning. As Stanovich (1980) contends, serial stage models of reading run into difficulty because no mechanism is afforded whereby high-level processes can influence lower levels.

"Top-Down" Model

The "top-down" model of the reading process in which higher level cognitive processing is believed to be primary in facilitating word recognition is also challenged. The opposing argument centres upon the assumption that good readers bypass the letter sound correspondence when they read because they read so quickly. That is, because good readers read at a faster pace, they do not depend upon the phonemic code. Recent evidence presented by Stanovich (1980) however, discredits this assumption. Mitchell and Green (1978) found that while reading speed was faster for text containing more frequently occurring words and words with fewer letters, readers showed no tendency to increase rate as they progressed through textual material and paused visibly on the final frame. This caused the investigators to contest the idea that speed in reading is a simple function of word predictability. Mitchell and Green argue instead that reading speed is determined largely by both word recognition rate and access to word meaning. Their research suggests that instead of depending on meaning only, good readers may well markedly attend to graphic information, especially when they are uncertain about a word.

Stanovich (1980) also refers to studies in which: (1) good first-grade readers were more mindful of graphic information than poor first-grade readers (Weber, 1970); (2) skilled readers did not prove to be more reliant on contextual information than unskilled readers (Perfetti and Roth, 1981); and (3) good readers were predominantly text-driven (Juel, 1980). This reinforces the contention that, contrary to the view of the "top-down" theorists, good readers do rely on graphic information, which may be more efficient than endeavouring to "predict" words based only upon context and language structure. Moreover, the fact that good readers make better use of contextual clues than poor readers is not evidence that they actually do so in reading. Good readers use context only when orthographic and phonemic cues are minimal. Despite the view of "top-down" theorists then, it would appear that even as readers become more accomplished they still employ data-driven strategies to unlock words.

A further critique of the "top-down" reading model emphasizing a logical point of view is presented by Wildman and King (1979). These authors suggest that although the "top-down" model may be useful in accounting for the fact that readers are often oblivious to insignificant errors in type, there are a number of presuppositions regarding the model that are open to question. They suggest that the implementation of the hypothesis-test strategy as an approach to word identification impedes rather than enhances reading speed. The amount of time required to generate a prediction by the top-down procedure simply does not account for the high speed word responses of fluent readers (Samuels, Begy, and Chen, 1976). It seems just as efficient, if not more so, to consider the letter/sound cues when decoding.

There is also the question of accuracy. Readers depending only marginally on graphic cues must not only anticipate virtually everything, but also be competent enough to come up with consistent correct guesses. There are a number of qualities inherent in the text which mitigate against the probability of uniformly accurate guesses. One serious factor pertains to meaning, defined as the reader's prior knowledge of the subject matter and the predictability of the story line. Another factor pertains to language, defined as the familiarity and regularity of the syntax or grammatical construction. The reader who relies solely on the hypothesis-test procedure for word identification must be nimble indeed to handle indiscriminate "curves" which may be thrown by the author in terms of either unexpected twists in the story plot or the use of unusual

sentence constructions. The following example (Perfetti & Roth, p.278) illustrates the difficulty. Predict what word should go in each blank.

1. The garbage men had loaded as much as they could onto the truck. They would have to drop off a load at the garbage _____.
2. Albert didn't have the money he needed to buy the part to fix his car. Luckily, he found the part he needed at the _____.
3. Phil couldn't decide whether to go to the movies or to the party. Both sounded like lots of fun, but he finally decided to go to the _____.

In every case the correct word is "dump". This is easy to predict in the first sentence because of the constraints imposed by meaning. In the second and third sentences, however, the situation is unconstrained. Without attending to the surface level cues, the reader might guess that the correct word(s) is/are auto wreckers, or neighbours, perhaps. In the third sentence, the writer throws a curve at the reader because s/he sets up an either/or situation. It is surprising to read the word "dump" because we expect the word to be either "movies" or "party". But anyone who goes to the wilderness to a cottage or a camp knows that the cars are literally lined up at the garbage dump on Saturday night. People are watching the bears forage for food.

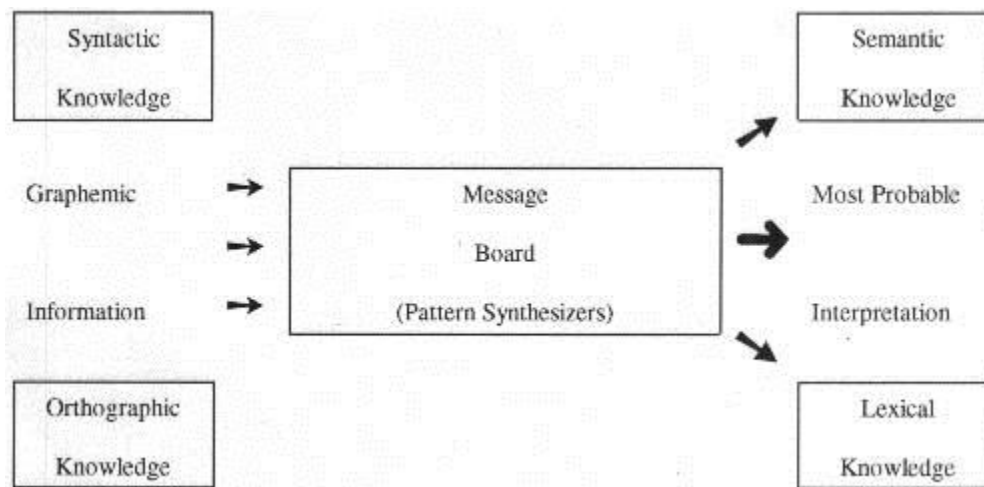
Wildman and King (1980) realistically suggest that most of our reading material is in fact neither sufficiently redundant nor adequately predictive for the hypothesis-test "top-down" model to operate effectively in isolation as the sole means of word identification. Common sense, then, would sustain a balanced view of the reading process. The interactive model described as follows is such a theory.

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AN INTERACTIVE MODEL OF THE READING PROCESS

Since neither the "bottom-up nor the "top-down" model of the reading process totally accounts for what occurs during the reading process, Rumelhart (1977) proposes an interactive model in which both letter features or data-driven sensory information and nonsensory information come together at one place. Using a computer analogy, Rumelhart labels this place a "message-board". In this model reading is not viewed simply as either a "bottom-up" or a "top-down" process, but instead as a synthesizing of patterns, calling for the application or integration of all of the previously identified knowledge sources, as shown in the accompanying figure.

Here in the message board, or pattern synthesizer, as suggested in the accompanying diagram orthographic knowledge or knowledge of letters and their associated sounds, lexical knowledge or knowledge both about how words form and what words mean, and syntactic and semantic knowledge come together simultaneously to facilitate word identification. It is theorized that the message centre keeps a running list of hypotheses about the nature of the input string, scans the message board for the appearance of hypotheses relevant to its own sphere of knowledge, and then evaluates that hypothesis, which is either confirmed or disconfirmed. Reading, according to Rumelhart, is thus neither a "bottom-up" nor a "top-down" process, but a synthesis of the two.



Adapted from Rumelhart, 1977

Summary and Implications

In regard to instructional implications, contrary to what many authorities contend, accomplished or good readers, may pay more attention to the graphic information than previously believed, while poor readers are poor readers because they concentrate solely on context for accuracy (Stanovich, 1980). The need is evident, therefore, in order to improve the performance of poor readers to teach orthographic patterns within the context of real reading to ensure that all knowledge systems are activated. The use of semantics and language sense is beneficial, especially when the text is highly predictable and redundant so that higher level processing may compensate for deficiencies in lower level processing. In sum, as Spiro (1980) implies

Reading is a multilevel interactive process, that is text must be analyzed at various levels, with units of analysis going from letter to the text as a whole. In addition to processing the explicit features of text, the reader must bring considerable preexisting knowledge to the reading comprehension process. The interaction of text-based and knowledge-based processes and of levels within each is essential... .

Having introduced a theoretical model which explains reading as an interactive process, discussion now proceeds to consideration of each identified component, beginning first with orthographic knowledge, followed by lexical knowledge, semantic knowledge and syntactic knowledge as related to both word identification and reading comprehension. The goal is to help the reader gain insight into factors which influence and constrain reading acquisition. It is through an understanding of the causes of reading difficulties that support for current practices or instructional change and modification will come about, bearing in mind that reading is an interactive process. Each knowledge component will therefore be examined in more depth.

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Orthographic Knowledge

One of the most significant facts about language is that it is structured: orthographic symbols are arranged according to a fixed set of rules and cannot be put together in simply any arbitrary form. At the graphemic level there are rules for permissible and non-permissible graphemic sequences. For example it is appropriate to string together the letters /s/, /t/, and /r/ to form the sequence /str/, but inappropriate, in English, to combine them to form the sequence /tsr/. Eleanor Gibson (1973) states that of the more than 150 consonant clusters in frequent use, all but three are constrained to initial or final position. This feature of English spelling therefore provides a source of enormous redundancy which is useful to beginning readers in that there is more than one source of information beyond the single letter to suggest what a word might be. The fact that letters cluster in repetitive patterns thus serves as a generalization that can be applied to decipher new words.

All native speakers, with experience, acquire this orthographic knowledge. Where the difficulty in learning letters originates for some children however, is in developing the ability to select from among the many different letter features. DeStafano (1978) identifies the smallest possible perceptual features which contrast letters as:

1. straight lines as opposed to curved lines as in "l" and "c";
2. horizontal elements as opposed to vertical or diagonal elements as in "t", "h", and "z";
and
3. open formations in contrast to closed formations as in "c" and "o".

There are other problems which arise in distinguishing between letters. Gibson and Levin (1975) describe the letter characteristics of redundancy as in "w", and discontinuity as in "l" for example. Discriminating among these features is a source of disorientation for some children. Such letter features confuse the eye. While most objects remain the same no matter from which angle we view them, if we turn M upside down, it becomes W. Children must also learn two forms for each letter, upper and lower case.

Another important skill is transforming the graphic strings into phonemic representation. In English generally, one letter or group of letters represents one sound, but this relationship does not hold true one hundred percent of the time, when gh has the f sound for instance. This may be a source of confusion for some students. Others may have trouble or be unaware that segmenting long or complex words into their more manageable parts or syllables and then imposing their phonetic knowledge, facilitates word identification.

In addition, there may be differences in idiolect or dialect which confound the perception of discrete sounds especially where the vowel system is involved. For example the word "pin" may be pronounced as both "pin" and "pen" in some jurisdictions. Children know the difference in meaning, but may be confused when efforts are made to teach them distinctions they themselves do not make, nor perceive.

Other examples cited (Savin, 1972) are that some pupils are able to tell that the sound of "cat" is different from the sound of "dog", but may not perceive that "cat" differs from "rat" nor that

"cat" and "cow" begin with the same sound. These same children do not exhibit flexibility in manipulating sounds and are not competent in games involving language play. This suggests that in addition to the issue of dialect, there may also be a developmental component in the cognitive sense which interferes with the understanding of how letters are transformed into phonemic representations. Lack of experience in listening to rhymes and stories as a preschooler may also be a factor.

Dialect

Certain words may also be differently pronounced by dialect speakers. For example the idiomatic form "ness" may be substituted for "nest", "ress" may be substituted for "rest", and "han" for "hand". Similarly, as reported by Hall and Guthrie (1980), "test" may be pronounced "tess", "mend" as "men", "walked" as "walk", "cold" as "coal" and "find" as "fine". These differences could interfere with word identification in a phonics approach to reading instruction and in total, frustrate children forced to pronounce sounds and words in isolation. In teaching, it would appear more useful to concentrate on associating sounds with longer orthographic strings which serve as visual stimuli, rather than on pronunciation and sound alone. It should not be inferred, however, that a whole word approach to phonic instruction should be ruled out, instead an analytic approach using whole words as models in building new words is still viable. Letters simply need to be embedded in orthographically regular strings such as syllable units that can be viewed as gestalts.

One of the main assumptions in this discussion of orthographic knowledge is that dialect variations may cause reading obstacles over and above typical problems of discriminating between letter symbols and transforming letter symbols into their respective phonemic representations. As Hall and Guthrie (1980) point out, it is obvious that phonological differences exist, but whether or not they actually interfere with a child's learning to read has not been demonstrated.

Hall and Guthrie review a number of studies on the effect of phonological interference to support their belief that dialect differences may not cause reading problems. One was a study by Melmed (1971) which compared the reading ability of third grade students who used vernacular Black English to that of third grade students who spoke Standard English. Vernacular Black English was characterized by vowel variations, weakening of final consonants, "r-less" and "l-less" speech, together with consonant cluster simplification. It was found that even though the third graders who used idiomatic speech often obtained low scores on isolated auditory discrimination tasks, and the production of selected phonological features, there was no difference in their ability to comprehend in reading. Similarly, Hall and Guthrie review research conducted by Rystrom (1970) which measured the effect of phonological interference on reading acquisition. Rystrom found that training in Standard English did not result in significant differences in reading achievement compared to a control group receiving the regular language arts program. Still another investigation using Appalachian dialect speakers as subjects (Rentel and Kennedy, 1971) studied the effects of pattern drill in Standard English on reading achievement, discovering no differences in reading scores between experimental and control groups.

Contrary evidence regarding the issue of phonological interference, however, is presented in research by Osterberg (1961) carried out in a dialect area of Sweden. In the first ten weeks of school, children were instructed in special materials which conformed to the phonological features of the dialect area in which they lived, while a control group received regular materials. Those children instructed in the special materials did acquire higher reading achievement performance both at the end of ten weeks and at the end of one year.

Numerous methodological flaws (Hall & Guthrie, 1980) are inherent in research of this type. One fault in the American studies relates to the question of school setting. Hall and Guthrie suggest that in the school setting children may in fact not be using vernacular or idiomatic speech, but employing the school register in Bernstein's sense of the term. This would account for lack of phonological interference. The conflicting findings of the investigations summarized suggest that the question of phonological interference having an inhibiting effect on reading skill acquisition has no definitive answer as yet.

Summary

In terms of orthographic features of text, there is a degree of regularity in English graphemic structure which provides helpful redundant information to aid word recognition. Some children encounter difficulty, however, in either discriminating letter features, separating the sound components, or matching sounds to letters. Other children demonstrate insufficient flexibility simply in manipulating sounds. They lack language facility. Regarding the role of dialect and phonological interference in reading acquisition, research into the question suffers from methodological constraints. As yet there is no conclusive answer as to whether or not idiosyncratic speech interferes with reading progress. Over-reliance on letters and their sounds and on materials outside the realm of the child's experience which prevents the application of meaning to assist decoding are factors that inhibit word identification.

Implications for Instruction

Broadly speaking, the interactive model of reading suggests that orthographic knowledge has as important a role to play in reading acquisition as lexical, syntactic and semantic knowledge. Many experiences with oral language in the very early years which focus on language flexibility appear to be basic to reading acquisition. In the beginning school years a continued emphasis on teaching the visual regularity of orthographic strings, called the mechanics of reading, is essential, as is tailoring the text to the actual experiences of children. Adding a [writing](#) component to beginning reading instruction also helps children internalize the code.

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Lexical Knowledge

There are two aspects of lexical knowledge or vocabulary and its interaction with reading processes: lexical knowledge contributes to word identification on the one hand by helping to confirm the incoming orthographic information; and on the other, lexical knowledge also relates to understanding word meanings and to reading comprehension. These two features will be dealt with separately.

Word Identification

As indicated in the foregoing discussion on orthographic knowledge, beginning readers are confronted with the initially demanding task of learning to decipher print. But as Adams (1980) points out, beginning readers have a wealth of oral language experience plus real world knowledge upon which to draw to facilitate learning to read. They have already acquired a substantial vocabulary and possess, as well, basic syntactic competence. Some may even have an understanding that we read both for enjoyment and to learn. Nonetheless, the intensity of the demand to make fine visual discriminations in regard to letters and letter strings is one reason why many authorities advocate a whole word approach to teaching beginning reading. They believe, quite rightly, that words that have high potency in terms of meaning are easier to remember. Through the application of meaning, one can build a store of words that are remembered instantly at sight. Given the interactive model of the reading process, the consensus is, however, that even if whole words are initially easier to learn, in the long run children who have been taught to read without due emphasis on the mechanics of decoding are at a disadvantage (Barr, 1975; Chall, 1967). In order to foster lexical knowledge or skill in word recognition, therefore, even if a whole word approach is instituted, it is still necessary to emphasize the patterns which occur among words. Venesky and Massaro (1967), as quoted in Adams (1980), argue that the most important component of letter to sound instruction is the direction of the child's attention to frequent spelling patterns. Since orthographic regularity has a strong influence on the ease with which skilled readers are able to encode a series of letters, it seems appropriate consistently to stress syllable units or orthographic strings. This is no small task as Gibson (1973) points out: sensitivity to orthographic regularity develops only gradually through experience. Direct instruction in the correspondence between letters and their sounds and in word building is particularly important for less skilled readers since it provides a means for identifying words already in student's listening vocabularies that have not been encountered in printed form before (Adams, 1980).

Adams reminds us, as teachers, just what does occur when a visually unfamiliar word is encountered by a beginning reader. The first hurdle is to divide the letter strings into sets of one or more letters corresponding to appropriate sound units. Thus phonemic segmentation ability (expertise in being able to break words into their component parts) is important. But confusion may exist in dividing words such as "nowhere" (now here, no where) for example. The reader must also be on the lookout for certain markers, such as final "e" which affects the quality of the vowel sounds. First the reader must match the sounds to the letter sets. Even at that, there may still be a certain amount of trial and error, since "ough" in "bough" is pronounced differently than "ough" in "cough", for example. Then the sound combination must be blended together to form a word. Lastly, readers need to check to confirm that the word generated makes sense in the

particular context. If not, the process must be repeated. As described, this final step in word identification involves a process of validation to ratify the word generated. It may be that the final cue which solves and acts as a check on word identity derives from meaning. Thus higher level processing serves to complement data-driven processing, indicating that with maturity, accomplished readers cope with unfamiliar words through a combination of both "bottom-up" and "top-down" processing.

Wittock, Marks and Doctorow (1975) have demonstrated that children are capable of processing unfamiliar words when the words are embedded in a story familiar to them. Perfetti and Hogaboam (1975) have shown children's ability to decode is facilitated almost as much when they have heard the word before as when they have both heard and seen the word before. As explained,

...written information can flow almost automatically from sensation to meaning. As the letters of the text are identified, they simultaneously prime or set up expectations about the identities of the words to which they belong. As the words are identified, they prime the most probably syntactic and semantic structures.
(Marilyn Jager Adams, 1980)

Reading thus is an interactive process: the skilled or accomplished reader making optimal use of the information on the page, the contextual information, and the redundancy of the language, with minimal effort.

Summary and Instructional Implications

Although the implementation of a whole word approach to teaching reading may be defended on the basis of potency and meaning, children will have an advantage in terms of word recognition skill when during instruction in word identification their attention has been directed to the systematicity and regularity of the orthographic features. On the other hand, accomplished readers are those who contend with word identification through the use of all knowledge systems, merging the information from the letter strings with information from their meaning lexicon or word store. In terms of instruction, the implication is that children need to be given the opportunity to employ all of these strategies, applying cues from the visual similarity between words, plus cues from the meanings of words, combining information so that reliance is not on one source of information at the expense of the other. An eclectic approach to word identification is intimated, one which stresses not only letter string regularity, but also the use of meaning to confirm predictions. The instructional goal is to ensure that all systems function and interact. To accomplish this, we need to provide lots of reading for practice and for some students, model our own thought processes as we apply strategies to unlock new words (using our sense of language and meaning in concert with letter/sound cues).

Word Meaning

Understanding the meanings of words is basic to comprehension. As Anderson and Shiffrin (1980) indicate, however, words have a number of potential rather than one fixed meaning. Try figuring out a synonym for the clue "bar" when working out a crossword puzzle, for example. Depending upon the number of spaces and the constraints imposed by the previously guessed surrounding words, the correct answer could be: "hamper", "impede", "restrain", "stop", "thwart", "rod", "saloon", or "beer parlour". Dechant (1982) advises that the word "run", for example, has 109 distinct meanings, the word "take" has 76, and the word "round", 83. Thus a word considered without context permits many interpretations. Johnson and Pearson (1978) suggest words may possess both denotative and connotative meaning. Since the same word may have so many diffuse meanings, it is appropriate to conclude that words are defined only when they are combined and interrelated with one another.

Another important aspect of word meaning is advanced by Clark (1973) who proposes that the meaning a young child has for a word is likely to be more global, and less differentiated than that of an older person. With increasing age and experience children are able to make more and more distinctions and differentiations among word meanings. Nelson (1974, 1977) hypothesizes that young children acquire understanding of words as they experience them in meaningful context. Further understanding of the denotation of the word will be tied to the particular circumstances or the episode in which the word was acquired. As children mature and gain more knowledge of the word, either directly through first hand experience or indirectly through reading, they will eventually use and understand many meanings of words without as much contextual support.

Still another aspect of word meaning to consider as it relates to schooling is pointed out by DeStefano (1978), who suggests that the language of instruction may prove to be a source of confusion for some children since the style of discourse in the classroom tends to be more formal and polite. To illustrate she refers to the language employed in beginning readers which invariably allude to Daddy as Father and Mommie as Mother. DeStefano labels this type of language "Basalese" (derived from the use of basal reading series or basic published material for reading instruction). The unnatural vocabulary employed in some textual material may thus interfere with reading acquisition.

Summary and Instructional Implications

Words have multiple meanings and require context for definition. There is also a developmental aspect to understanding word connotations. As the experiences of children increase, so correspondingly do their meaning vocabularies. The mature child requires relatively less contextual support to aid decoding. Words used in text may also differ from common spoken forms with resultant dissonance for some readers.

In regard to instruction, children should be encouraged to use their vocabulary knowledge to confirm their guesses about the identity of the words they encounter. Problems may arise when the purpose of reading is not clear. Because of some questionable instructional procedures, children may believe that reading is more a matter of word calling and correct pronunciation than a search after meaning. They may not realize the role that meaning plays.

In teaching vocabulary, Johnson and Pearson (1978) encourage the use of the dictionary as a problem-solving instrument as opposed to a skill and drill, copy the correct meaning, busy work device. To enhance understanding of word meanings the following are suggested:

1. Building background and establishing story and informational settings before assigning reading;
2. Employing first hand and simulated activities to clarify abstractions, through dramatization and role playing, for example;
3. Stressing reading to comprehend more than accurate word calling; and
4. Directing questions so that children are led to infer the meaning of words as they are employed in particular settings.

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Syntactic Knowledge

Just as in the case of lexical knowledge, the section on syntactic or grammatical knowledge will be separated into two parts: syntax as it affects word identification and syntax as it affects comprehension.

Syntax as It Affects Word Identification

As suggested in the foregoing regarding the interactive mode of the reading process, lexical features or knowledge of how words pattern may also assist in helping readers predict and confirm word identity. In addition to the cues inherent in the visual or graphic display, lexical knowledge related to word meanings serves as a redundant cue to confirm word identification. Syntax (or one's sense of how words string together) also functions as an additional informational source to support word identification. Examples outlined by DeStefano (1978) illustrate and help clarify how syntax functions in word perception. Skilled readers, because of the predictable language pattern, would experience no difficulty identifying words in such statements as the following:

- Before bed, Jeff ate bread and b_____.
- Before bed, Jeff _____ bread and butter.
- Before bed, Jeff ate _____ and butter.
- Before bed, Jeff ate bread _____ butter.

Instructional Implications

Practice in this type of activity would be advantageous in helping struggling readers employ redundant syntactic cues. Similarly, stories with redundant patterns are also appropriate for first ensuring reading success and second, providing opportunities to help students realize the value of their syntactic knowledge. The progressive exposure technique (Holdaway, 1979) is an effective approach to employ in the application of syntactic knowledge for generating predictions about what the upcoming words might be. Cloze activities completed as a group with the text being shown on an overhead transparency and discussion taking place regarding the appropriateness of the words predicted by various students may also be valuable to raise consciousness about how to apply syntactic cues.

Syntax as It Affects Comprehension

There is a widespread notion that once children have learned to decode, their reading problems will be solved. This conviction is mistakenly based on two false assumptions (Adams, 1980). First that children are linguistically competent enough to grasp the meaning of the text, and second that the processes they use to interpret spoken language are adequate for interpreting written language. Problems stemming from these premises are clear.

To address the first issue it has been broadly assumed that children's language acquisition is essentially completed by five years of age (Brown, 1965; Menyuk, 1963). This is very different from saying that young children can actually produce sentences of the same syntactic complexity as a mature person. While children probably need little syntactical sophistication to understand what is said to them, the same is not true for reading. Entwistle and Frasure (1974) found considerable variance when investigating the ability of five to eight year old children to repeat syntactically well formed sentences, although a developmental trend was evident. Children increased noticeably in their ability to use grammatical cues across the ages of six to nine as measured by their skill in sentence processing. Palermo and Molfese (1972) concluded that children continue to demonstrate gains in the ability to understand syntactic structures until they are at least 13 years old. It would appear that young children do not have as much syntactical sophistication as was previously believed. Since it has been demonstrated that good readers impose an intonation pattern on the text (Cohen and Freeman, 1978) and good readers encode in phrasal units (Levin and Kaplan as cited in Adams, 1980) syntactic competence should facilitate the processing of print.

Kleiman (1975) hypothesizes how this process might function. As readers progress through textual material they evaluate the word strings to judge whether a phrase has been completed. The phrasal information is then collapsed and recorded into a composite idea which is subsequently stored in memory. The reader then advances to the next syntactic unit or phrase. Adams (1980) points out the significance of breaking up the print in this way suggesting that the human mind is a "limited-capacity processor." If readers recode after each word they miss the way in which the ideas of the message relate to each other in thought patterns, and memory capacity is simply overloaded. Thus, for the sake of comprehension, words need to be processed in thought units.

The second issue regarding syntactic knowledge and its effect on reading comprehension revolves around the difference between spoken and written language. Spiro (198) distinguishes succinctly between the two, indicating that in listening, the speaker's intent is all that needs to be communicated implying that if the intent is apprehended, the goal of communication is met and understood. Spoken messages are also more easily understood because there are accompanying cues in the intonation patterns of stress and pitch, and in both pauses and timing. Even gestures may be present, so that to group the utterance into meaningful segments and to understand most of what is said requires little syntactic sophistication. But the written word is different. While punctuation may serve as a form of cue, readers are mainly left on their own to separate the text into meaningful units. Also, Spiro (1980) intimates that in terms of wanting to communicate, there seems to be a more urgent and specific intent in the case of textual material, such as the desire on the part of the author to impart knowledge and information. The purpose of reading text, nonetheless, may be obscure. In school, correct pronunciation rather than comprehension may be stressed (Anderson and Shifrin, 1980). Because of the differences between oral and written language outlined, comprehending print may be a laborious effort.

Dialect

Another factor related to syntactic knowledge which may have an impact on reading acquisition is found in regional dialect variations. This is over and above the ability to separate written

language into its phrasal constituents and the sophistication or facility to process more complex syntactic units. Some of these possible variations, the rules for which do not hold true absolutely, include:

1. the deletion of the verb to be in which case Standard English is contracted. For example: the use of "S/He go", for "S/He goes", "do" for "does", "talk" for "talks". These variations usually affect the third person form she or he only;
2. the employment of the contracted form when the possessive is required as in: "Man hat" for "man's hat" or the hypercorrect "he had" for "his";
3. the alteration of the verb to be to form "It don't be all her fault," for example; and
4. the use of the verb to be to imply a repeated but not continuous occurrence as in "Sometimes he be up there and sometimes he don't"; or
5. the employment of the double negative as in "Ain't nobody doin' it?" (Labov, 1969).

For the reader whose language pattern or grammar differs somewhat from the language of the text there is a potential problem. It is conceivable (Hall and Guthrie, 1980) that the dialect speaker must carry out an additional analysis of the text and have to translate the Standard English into idiomatic speech to facilitate comprehension. The danger lies in having to carry out this extra step successively, should it be necessary, over and over again across large amounts of text. For speakers of regional dialects, grammatical interference may have a tiring effect as much as an impeding consequence. To date, as described earlier, studies regarding the effect of grammatical interference on reading comprehension do not adequately identify sources of difficulty. Methodological flaws cast doubt on their validity.

Summary

Far from the common belief that once children have "cracked the code" their reading problems are over, the manner in which the written word differs from the spoken leaves the task of breaking written communication into thought units to the reader alone. This is a potential problem since children differ in linguistic competency - in the ability not only to produce but to isolate syntactic units. Difficulties with reading comprehension and the ability to recall what has been read may also be related to syntactic competence. Sentence complexity also may inhibit sentence comprehension.

Implications for Instruction

If readers fail to read with correct phrasing, specific instructional strategies as follows may be helpful.

1. Providing textual material commensurate with both children's experiences and level of grammatical expertise. (A time-honoured approach to matching the student's level of reading achievement with appropriate material is language-experience.)

2. For beginners, furnishing practice in reading text in which sentences overlap from one line to the next.
3. Practising echoic reading in thought units.
4. Supplying activities which require students to mark off phrase units in textual materials.
5. Simplifying sentence constructions through embedding, combining or chunking.
6. Providing exercises on solving sentence anagrams (Weaver, 1979).
7. Constantly clarifying pronouns which stand for nouns or verb phrases (anaphoric references) through appropriate questioning.
8. Reading to children on up through the grades to familiarize them with formal written language expression.

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Semantic Knowledge

Semantic or background knowledge influences reading at both the word identification and the comprehension level. As in the previous discussion, each component will be addressed in turn.

Word Identification

First in regard to word identification, prior knowledge plays an important role (see earlier discussion on the "top-down" model). It is believed that as readers progress through the text and interact with the printed page they form tentative hypotheses about the identity of upcoming words based upon their previous experiences. These provisional guesses are subsequently accepted and confirmed when meaning is constructed. If meaning is not constructed, the prediction is rejected and the reader re-samples the print to begin the process anew. Semantic knowledge therefore partially assists and interacts with text-based information to facilitate the process of word identification.

Comprehension

Semantic knowledge plays a much larger role in terms of understanding or comprehending the author's message. As Paul Kolars points out in his introduction to Huey's *Psychology and Pedagogy of Reading* republished in 1968,

What the reader understands from what he has read is the result of a construction he makes and not the result of a simple transmission of the graphic symbols to his mind.

Thus it is acknowledged that the reader plays an active role in the process of comprehension.

Empirical support for this view of reading comprehension is found in the classical research of Bartlett (1932). In his study, English subjects were asked to read and recall a story from an unfamiliar culture - *The War of the Ghosts*, a tale of Canada's Northwest Coast Indians. The major finding was that recall was inaccurate. Distortions found in the retellings made the story conform to the past experiences of the readers. Moreover, additions to and elaborations of the story line in the retellings caused redundancies to occur. These redundancies, in turn, facilitated the making of inferences. Thus recall consisted of not only what was stated directly in the story but included also what seemed to follow, based on the prior knowledge of the reader. What was remembered was not the exact text, but instead the story gist or stored paraphrases based on reader inferences.

Predicated upon this evidence, Bartlett described reading comprehension as an "effort after meaning." He theorized that one's background knowledge is organized and stored in hypothetical abstract cognitive structures called schema. The construct of schema helps to clarify how information is picked up from the environment. It is in these schema that previous experiences are recorded and it is these schema which in turn direct and determine what will be perceived in future events or activities. Moreover, information can only be picked up by an appropriately tuned schema. To put it another way "we can see only what we know how to look for" (Neisser,

1976). Conversely, all information that is picked up modifies and rebuilds existing cognitive structures or schema.

Applied to the construct of reading comprehension, the concept of schema functions as follows: previous semantic knowledge stored in the form of schemata creates a framework on the basis of which readers expect and anticipate certain events to occur in the text. Schemata already in the learner's mind thus direct the search for information. In turn, the knowledge gained from reading alters the reader's original script or schema. Viewed in this way, reading comprehension is a constructive process which is reciprocal and cyclical, new knowledge being interpreted in the light of existing knowledge and new information reconstituting existing knowledge. Fresh insights assimilated into the reader's schema then redirect and determine further information pickup.

In a review of research, Goetz and Armbruster (1980) report the following major findings which support the notion of schema; that: (1) connected discourse is much easier to learn and remember than collections of unrelated sentences; (2) text which is more congruent with what the reader already knows and expects is also better remembered; (3) the processing of text is selective - it is the most important element in a selection that will be stored and remembered; and (4) the reader interacts with the content of the text in such a way that individual interests and perspectives influence interpretation of the text.

In this connection a more recent study by Steffensen, Joag-Dev and Anderson (1979) supports Bartlett's research and has implications for instruction. Two friendly letters - one describing a typical American wedding, the other an East Indian wedding were assigned to two groups of subjects with different cultural heritages, East Indian and American. The investigators found that subjects not only read the passage related to their own culture more rapidly, but also recalled a larger amount of information from the passage native to them. Conversely, each group of subjects produced more culturally based distortions on the foreign passage. This would suggest that differences in background knowledge may be an important source of individual differences in reading comprehension and mismatches may occur between subcultures and the majority culture whose viewpoint predominates in the materials children are given to read.

Summary

As they construct meaning from text, readers make provisional hypothesis as they decode upcoming words. These guesses are accepted and confirmed as meaning is constructed. When the prediction fails to make sense, the guess is rejected and the reader who is seeking after meaning, is compelled to re-sample the print, at this time perhaps employing orthographic and/or syntactic cues to facilitate decoding. This occurs because comprehension is a constructive process in which the reader actively seeks meaning.

The theoretical explanation explaining the role of topic familiarity in the construction of meaning is that as experiences and attitudes are assimilated, they form cognitive structures. These cognitive structures are called "schema". Schema store previous experiences, direct information pickup, and in turn become modified as new knowledge is accommodated and assimilated. In terms of learning from text, what will be remembered is what is both presented in a meaningful

context, and congruent with what the reader already knows or expects. Thus the match between the text and the interests and perspectives of individual readers predicts comprehension and memory.

In general, problems in both decoding and reading comprehension may be due to disharmony between the background knowledge necessary to comprehend a given text and the background knowledge actually possessed by the reader. Specifically, Pearson (1979) outlines a variety of possible discrepancies which might have an effect on reading comprehension. Readers may:

1. Lack schema availability - that is lack background information;
2. Have difficulty with schema selection - that is possess appropriate schema but be unable to call them up at appropriate times; or
3. Have trouble maintaining schema - that is be able to call up the appropriate schemata but then lose it, perhaps because of over-reliance on "top-down" or "bottom-up" processing so that word identification takes up too much of the processing space.

Therefore, the provision of essential background information in order to develop initial schema or having students engage in structured activities to call up existing schema is a fundamental instructional procedure if word identification and text comprehension are to be improved.

Instructional Implications

Very briefly some general strategies to implement prior to assigning reading to foster word identification and comprehension include:

1. The use of pictures - when they illustrate information central to the text, when they represent new content that is important to the overall message and when they depict structural relationships mentioned in the text (Schallert, 1980);
2. The provision of both first-hand and indirect experiences prior to reading including field trips, films and filmstrips, and collateral reading supplemented with discussion, as well as brainstorming to develop adequate schemata and relate new knowledge to existing knowledge; and
3. The use of advance organizers and other adjunct aids such as cognitive maps, structured overviews, anticipation guides, diagrams, paragraph heads, and appropriate questioning to establish purpose, create psychological set, and activate schemata.

Concluding Statement

There are a number of important messages with implications for instructional procedures inherent in this overview of the reading process. In global terms the interactive model of reading implies an eclectic approach to teaching. That is neither a completely phonic nor a completely holistic approach is correct in teaching beginning reading. Instead direct instruction which emphasizes both meaning and mechanics is in order to integrate the application of all knowledge systems (orthographic, lexical, syntactic and semantic) to facilitate the development of fluent word recognition. This may call for some modifications in traditional approaches to reading instruction such as embedding letters in orthographic strings, demonstrating how words pattern,

making analogies between new and previously-mastered words, ensuring a match between the children's language and the language of the text, and realizing the importance of prior knowledge. One point is evident. Children need to be automatic in word recognition skill if fluent, accomplished reading with understanding is to develop.

Within the parameters of the four knowledge sources there is an implicit need to institute a diagnostic approach to teaching, to constantly assess each child's progress in order to determine along which dimension inhibitors to reading success are operant. Thus it is necessary to question constantly whether orthographic, lexical, syntactic or semantic knowledge constraints are interfering with learning to read and to make the required teaching adjustments. Perhaps the best way to guarantee that the beginning reader is integrating all knowledge systems to facilitate word identification is to keep running records (Clay, 1993) and prompt children to "try that again" when their reading does not make sense. In guiding the reading of [beginning readers](#), our goal is to raise their level of consciousness about which cues or knowledge sources - orthographic, lexical, syntactic or meaning they are employing to predict and confirm word identity.

The overall goal of reading, however, is comprehension. We must ensure, therefore, that we activate prior knowledge or build topic familiarity before we actually assign reading. Developing a schemata for the text not only facilitates word recognition but also comprehension and recall.

One last observation is important. Grade-wise the traditional focus in the primary school has been typically on word identification at the expense of comprehension. At the other end of the continuum, in the high school, the focus has been on teaching content area subjects with less emphasis on the reading process. With increased understanding of the factors which influence reading performance including knowledge of textual constraints and the effect of the reader's previous experiences on inferencing behaviours, it is evident that as teachers we need to adjust instructional strategies and opportunities so that students' efforts to read to learn are facilitated at all levels.

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REFERENCES

- Adams, M. Jr. (1980). "Failures to Comprehend and Levels of Processing in Reading." In Rand J. Spiro, Bertram C. Bruce, and William F. Brewer (Eds.), *Theoretical Issues in Reading Comprehension*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Anderson, R. C., and Shifrin, Z. (1980). "The Meaning of Words in Context," In Rand J Spiro, Bertram C. Bruce, and William F. Brewer (Eds.), *Theoretical Issues in Reading Comprehension*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Barr, R. (1975). "The Effect of Instruction on Pupil Reading Strategies," *Reading Research Quarterly*, 10, 555-582.
- Bobrow, D. G. And Norman, D. A. (1975). "Some Principles of Memory Schemata," In Daniel G. Bobrow and Allan Collins (Eds.) *Representation and Understanding*. New York: Academic Press.
- Brown, R. (1965). *Social Psychology*, New York: The Free Press.
- Chall, J. (1967). *Learning to Read: The Great Debate*. New York: McGraw-Hill.
- Clark, E.V. (1973). "What's in a Word? On the Child's Acquisition of Semantics in His First Language," In T.E. Moore (Ed.), *Cognitive Development and the Acquisition of Language*. New York: Academic Press.
- Clay, M. M. (1993). *Reading Recovery: A guidebook for teachers in training*. Portsmouth, NH: Heinemann.
- Cohen, G. And Freeman, R. (1978). "Individual Differences in Reading Strategies in Relation to Handedness and Cerebral Asymmetry." In J. Requin (Ed.), *Attention and Performance VII*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Cromer, W. (1970). "The Difference Model: A New Explanation for Some Reading Difficulties." *Journal of Education Psychology*, 61, 471-483.
- Dechant, E. V. (1982). *Improving the Teaching of Reading*. 3rd Ed. Englewood Cliff, New Jersey: Prentice Hall.
- DeStefano, J. S. (1978). *Language, the Learner and the School*. New York: John Wiley and Sons.
- Gibson, E. J. (1973). "Trends in Perceptual Development: Implications for the Reading Process," In *Minnesota Symposia on Child Psychology*, Vol. 8. Minneapolis: University of Minnesota Press. A.D. Pick (Ed.).
- Gibson, E. J., and Levin, H. (1975). *The Psychology of Reading*. Cambridge, Mass.: M.I.T. Press.

Goetz, E. T., and Armbruster, B. B. (1980). "Psychological Correlates of Test Structures," In Rand J. Spiro, Bertram C. Bruce, and William F. Brewster (Eds.), *Theoretical Issues in Reading Comprehension*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Goodman, K. S. (1970). "Reading a Psycholinguistic Guessing Game," In Harry Singer and Robert B. Ruddell (Eds.), *Theoretical Models and Processes of Reading*. Newark, Delaware: International Reading Association.

Gough, P.B. (1972). "One Second of Reading," In J.F. Kavanagh and I.G. Mattingly (Eds.). *Language by Ear and by Eye*. Cambridge, Mass.: MIT Press.

Hall, William S. And Guthrie, Larry F. (1980). "On the Dialect Question and Reading," In Rand J. Spiro, Bertram C. Bruce and William F. Brewer (Eds.), *Theoretical Issues in Reading Comprehension*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Holdaway, D. (1979). *The Foundations of Literacy*. Sydney: Ashton. Scholastic.

Huey, Edmund Burke (1908/1968). *The Psychology and Pedagogy of Reading*. Cambridge, Mass.: MIT Press.

Huggins, A.W.F., and Adams, M. J. (1980). "Syntactic Aspects of Reading and Comprehension," In Rand J. Spiro, Bertram C. Bruce, and William F. Brewer, (Eds.), *Theoretical Issues in Reading Comprehension*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Johnson, D. D. And Pearson, P. D. (1978). *Teaching Reading Vocabulary*. New York: Holt, Rinehart and Winston.

Juel, C. (1980). "Comparison of Word Identification Strategies with Varying Context, Word Type, and Reader Skill." *Reading Research Quarterly*, 3, 358-376.

Kleiman, G.M. (1975). "Speech Recoding in Reading," *Journal of Verbal Learning and Verbal Behavior*, 14, 323-339.

Labov, W. (1969). "Some Sources of Reading Problems for Negro Speakers of Nonstandard English." In Joan C. Baratz and Roger W. Shuy (Eds.) *Teaching Black Children to Read*. Washington: Center for Applied Linguistics.

Menyuk, P. (1963). "Syntactic Structures in the Language of Children," *Child Development*, 34, 407-422.

Mitchell, D.C., and Green, D.W. (1978). "The Effects of Context and Content on Immediate Processing in Reading." *Quarterly Journal of Experimental Psychology*, 30, 609-636.

Nash-Webber, B. (1975). "The Role of Semantics in Automatic Speech Understanding," In Daniel G. Bobrow and Allan Collings (Eds.) *Representation and Understanding*. New York: Academic Press.

- Neisser, U. (1976). *Cognition and Reality*. San Francisco: W.H. Freeman and Company.
- Nelson, K. (1974). "Concept, Word and Sentence: Interrelations in Acquisition and Development." *Psychological Review*, 31, 267-285.
- Nelson, K. (1977). "Cognitive Development and the Acquisition of Concepts," In R.C. Anderson, R.J. Spiro and W.E. Montague (Eds.), *Schooling and the Acquisition of Knowledge*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Paris, S.W., and Lindauer, B.K. (1976). "The Role of Inference in Children's Comprehension and Memory for Sentences." *Cognitive Psychology*, 8, 217-227.
- Palermo, D.S., and Molfese, D.L. (1972). "Language Acquisition from Age Five Onward," *Psychological Bulletin*, 78, 409-427.
- Pearson, P. D. (1979). "Schema Theory", Presentation The University of Minnesota, September.
- Perfetti, C.A., and Hogaboam, T. (1975). "The Relationship Between Single Word Decoding and Reading Comprehension Skill." *Journal of Educational Psychology*, 67, 461-469.
- Perfetti, C. A., & Roth, S. (1981). Some of the interactive processes in reading and their role in reading skill. In A. Lesgold and C. Perfetti (Eds.), *Interactive processes in reading*. Hillsdale, N.J.: Erlbaum, 269-297.
- Pillsbury, W.B. (1977). "A Study in Apperception," *American Journal of Psychology*, 1897, 8, 315-393, as cited in Rumelhart, David E. "Toward an Interactive Model of Reading." In S. Dornic (Ed.), *Attention and Performance VI*. Hillsdale, New Jersey, Lawrence Erlbaum Associates.
- Reicher, G.M. (1967). "Perceptual Recognition as a Function of Meaningfulness of Stimulus Material." *Journal of Experimental Psychology* 81, 274-280.
- Rumelhart, D.E. (1977). "Toward an Interactive Model of Reading," In S. Dornic (Ed.), *Attention and Performance VI*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.
- Sachs, J. (1967). "Recognition Memory for Syntactic and Semantic Aspects of Connected Discourse," *Perception and Psychophysics*. 2, 437-442.
- Savin, Harris B. (1972). "What a Child Knows About Speech When He Starts to Learn to Read," In J.F. Kavanagh and I.G. Mattingly (Eds.), *Language by Ear and by Eye*. Cambridge, Mass.: MIT Press.
- Samuels, S.J., Begy, G. And Chen, C.C. (1975-76). "Comparison of Word Recognition Speed and Strategies of Less Skilled and More Highly Skilled Readers." *Reading Research Quarterly*. 11, 72-86.

Schallert, D. L. (1980). "The Role of Illustrations in Reading Comprehension," In Rand J. Spiro, Bertram C. Bruce, and William F. Brewer (Eds.), *Theoretical Issues in Reading Comprehension*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Spiro, Rand J., (1968). "constructive Processes in Prose Comprehension and Recall," In Rand J. Spiro, Bertram C. Bruce, and William F. Brewer (Eds.), *Theoretical Issues in Reading Comprehension*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Stanovich, Keith E. (1980). "Toward an Interactive- Compensatory Model of Individual Differences in the Development of Reading Fluency," *Reading Research Quarterly*, 16, 32-71.

Steffensen, M. S., Joag-Dev, C., and Anderson, R. C. (1979). "A Cross-Cultural Perspective on Reading Comprehension," *Reading Research Quarterly*, 15, 10-29.

Weaver, P. A. (1979). "Improving Reading Comprehension: Effects of Sentence Organization Instruction," *Reading Research Quarterly*, 15, pp. 129-146.

Wildman, D. M. and King, M. (1978-79). "Semantic Syntactic, and Spatial Anticipation in Reading." *Reading Research Quarterly*, 2, 128-164.

Wittrock, M.C., Marks, C., and Doctorow, M. (1975). "Reading As a Generative Process," *Journal of Educational Psychology*, 67, 484-489.