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Various trends in linguistics research as they are currently applied to reading instruction are described. The rationale of both Bloomfield and Fries stressing the alphabetic principle of sound-letter correspondence is evaluated, and research comparing the effectiveness of applying this principle with other approaches to beginning reading is presented. The studies of Chomsky and Halle stressing a deeper phonological explanation for the relationships between the sounds and spelling of English suggest that the traditional spelling of a word can give, in addition to the sound of a word, syntactic and semantic clues. Several studies analyze oral reading errors of beginning readers at various linguistic levels, including morphological structure, syntactic acceptability, and semantic appropriateness in the sentence and the entire passage. Generally, very high use of context is found. Biemiller notes three phases of errors in which first graders moved in a fairly regular progression from heavy reliance on context, to nonresponse strategy, to greater flexibility in word identification strategies. Labov's studies of Negro speech are summarized, and implications for adjusting reading instruction are pointed out. The influence of linguistics research on college and adult reading is also discussed briefly. A bibliography is included. (CM)

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Research in Linguistics and Reading Instruction: Implications for Further Research and Practice*

Symposium I: Extending Frontiers in Research

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Linguists are relative newcomers to reading instruction. Not that they didn't have something to offer us earlier. But, somehow, we were not ready to listen to them. When we did listen, it was to the structural linguists--particularly to Bloomfield and Fries--who addressed themselves primarily to problems of beginning reading, and more specifically to problems of word recognition.

We started to take linguistics seriously after Flesch (1955) cited the earlier works of Bloomfield (1942) in his call for a return to phonics as the way to start,

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although Bloomfield himself was just as opposed to phonic methods as he was to the prevailing look-say methods. It is significant to note, however, that Bloomfield's beginning reading program, co-authored by Clarence Barnhart, was not published until 1961, although it had been used experimentally in some schools since the 1930's. Also, Fries' Linguistics and Reading did not appear until 1962 and his reading program was not published until 1965.

Bloomfield and Fries shared certain views about reading and its relation to spoken language. Both subscribed to the primacy of spoken over written language; the written form being essentially a visual representation of the spoken form. In alphabetic languages, the letters stand for speech sounds. Thus for the native speaking child who already has considerable command of the vocabulary and syntax of his language, learning to read is primarily learning the code--or the alphabetic principle--i.e., which letters represent which sounds.

Alphabetic languages, however, are more or less regular; there is a greater or lesser consistency between their distinctive speech sounds (phonemes) and the letters used to represent them (graphemes.) Italian, for example, is quite regular while English is comparatively irregular. Thus, according to these linguists, learning to read English presents an additional hurdle to the beginner. This hurdle becomes even greater, they postulated, when the beginning reading materials use high frequency words that contain different spellings for the same sounds and different sounds for the same spellings, and when the major focus in teaching is on directing the child's attention to the content of what is read.

To simplify the process of learning to read, each believed that the linguist's contribution lay in identifying the basic speech sounds of English and establishing the relationships between these sounds and the letters that are most commonly used to represent them. With this information, it would then be possible to program the first steps in order to faciliate the learning of the alphabetic principle.

Now the crucial question for reading instruction is how these linguistic data are to be used. Knowing that certain sounds are more often spelled in certain ways and knowing that certain sound-letter correspondences are more frequent than others does not automatically lead to decisions regarding programming and teaching procedures--i.e., when they are to be taught and how they are to be taught. Yet, as we know from the reading programs produced by Bloomfield (Bloomfield and Barnhart, 1961 and 1963) and later by Fries (1965), they chose to teach the most frequent and most regular correspondences first. They also assumed that the best way to teach them was in words carefully selected to permit the learner to discover for himself the relations between the letters and sounds. They were opposed to isolating sounds, to giving direct instruction in letter-sound relations, and to the teaching of rules. They were also opposed to the use of pictures and to encouraging the child's use of context clues since they might distract the beginner from the major task--paying close attention to the letters. They also believed that the words used in the connected reading matter for the beginner should be selected on the basis of the correspondences previously taught. Only gradually, as each "spelling pattern" is mastered by reading orally words containing a pattern, is another introduced.

There are some minor differences between the Bloomfield and Fries beginning reading programs. But essentially, they are similar when compared to the most widely used beginning reading programs of the 1950's and 1960's as represented by the conventional basal readers (Chall, 1967). The Fries program puts more emphasis on comprehension (or reading for meanings) than does the Bloomfield, but it contains the same kind of connected reading matter. In the Bloomfield first reader, "Nan had a fat cat." (p. 45), while in the Fries Reader 1, "Dan can pat the cat." (p. 36).

Other linguists or writers who based their programs on "linguistic principles" drew somewhat different implications from these linguistic data for reading instruction. Although they agreed that beginning reading is essentially mastering a code, some gave direct instruction in the sound-letter relations in addition to controlling vocabulary on spelling regularity. Some also used pictures and introduced common, "irregularly" spelled words earlier.

The point I wish to make here is that the choice of what, when and how to program materials for the optimal learning of sound-letter relations (or phoneme-grapheme correspondences) is not based solely on linguistic principles, even though the choice may have been made by a linguist. Indeed, as we shall see later, other linguists have come up with different ways of relating spelling to spoken language. But even if we accept the Bloomfield or Fries schemes for relating sound to spelling, the validity of their programming cannot be established solely by linguistic data or theory but must be tested ultimately by psychological and educational experimentation.

What is the experimental evidence so far? Levin's (1963) laboratory experiments suggest that the Bloomfield type of programming of one sound for one spelling pattern may not be optimal, i.e. mastering can, fan, Dan. then moving to .at, fat, rat. Although Levin found that it takes longer to learn two sounds for one letter (e.g., to learn that g is pronounced as in both go and gem) than to learn one association at a time, dual-association learning had greater transfer value. Thus, systems that teach single associations may be easier for initial learning, but their transfer value for reading of English--where more than one sound for one letter or letter combination occurs--may be limited.

There is also some older evidence that direct teaching of letter-sound correspondences helps most pupils even when words are controlled on spelling regularity. (Winch, 1925). A more recent laboratory experiment by Bishop (1962)

which simulated a beginning reading situation using adult subjects also found that direct teaching of letter-sound correspondences helps in learning regularly spelled words. However, she did find that about half of the group who did not receive direct letter-sound instruction were able to make the inferences themselves, and their performance was as good as those who received direct instruction in letter sound relations. Thus direct teaching of sound-letter correspondences (phonics) had more transfer value. But word training did produce some transfer.

What about the linguists' view of beginning reading as primarily a decoding process? My interpretation of the experimental, clinical, and correlational studies from 1912 to 1965 (Chall, 1967) tended to confirm this view. While there were too few experimental comparisons of the Bloomfield and Fries type programs with others, I hypothesized that they would probably produce better results than basal systems (with no control of sound-letter relations) but not necessarily better results than systematic phonics programs which also put greater stress on teaching sound-letter correspondences.

To a certain extent I was not too far off. In his summary of the USOE Cooperative first and second grade studies, Dykstra (1967) reported that at the end of Grades 1 and 2, the "linguistic" programs when compared to basal programs tended to produce better results in word recognition and spelling although no significant differences were found in comprehension.

However, a phonic/linguistic approach (one that taught sound-letter correspondences directly and used illustrations as well as words controlled on spelling regularity) when compared to basal programs tended to produce better results in word recognition, spelling, and reading comprehension at the end of Grades 1 and 2.

Admittedly, such large scale "methods" comparisons are not the best way to determine the effectiveness of the application of linguistic data to reading

instruction, since other variables may have possibly contributed to producing the differences found. Yet, viewed over the long run, it appears that some concern for the programming of sound-letter correspondences is important, at least for beginning reading instruction. I quote from Dykstra (1967, p. 161); "Control of vocabulary, either by means of a transitional alphabet (ITA) or by means of introducing initially only regularly represented words, appears to facilitate acquisition of skill in unlocking words and in spelling. Some control of vocabulary according to phoneme-grapheme correspondences is likely to be helpful in the teaching of primary reading and spelling."

More recent analyses of English words by linguists go considerably beyond the simpler correspondences postulated by Bloomfield. Hockett postulated an implicit inner level of representation involved in the acquisition of literacy since English written words are not a simple and direct representation of spoken words, (there are too many cases in which the spelling is not predictable from the pronunciation) and English spoken words are not a simple direct representation of written words (there are too many cases in which the pronunciation is not predictable from the spelling).

Indeed, the computer-based data reported by Hanna et. al. (1966) on sound-to-spelling correspondences and by Venezky and Weir (1966) on spelling-to-sound correspondence patterns indicates that the relationships are more complex than once thought from the analysis of Bloomfield and Fries.

Recent work by Chomsky and Halle (1968) may lead to even more complex and powerful rules for the relations between written and spoken words. According to their theoretical analysis, there is a deeper phonological explanation for the relations between the sounds and spelling of English than is found by comparing phonemes with graphemes. Indeed, Chomsky claims that when understood from the

standpoint of this deeper phonological level, English spelling makes more sense than we have been led to believe by the descriptive linguists since it gives the native speaker considerable syntactic and semantic information. Thus when analyzed on a deeper level, retaining the "silent" g in sign and the silent b in bomb makes sense when we come to the derivatives signal and bombardier. He also believes the the written language has a life of its own--at a certain point it is not a direct representation of the spoken language, but an even better carrier of semantic and syntactic information for speakers of various dialects.

When the Chomsky-Halle analysis in completed, what will it mean for reading instruction? Carton suggested earlier today that it may bring back a whole word or sight approach as the first step in learning to read. In other words, we need not concern ourselves with teaching or programming sound-letter correspondences. It could, though, mean a different and perhaps more powerful kind of vocabulary control or phonic teaching; it could mean that the value of long and short vowel sounds can be taught more effectively in syntactic environments such as sign-signal, hide-hidden, bath-bathe then in the traditional pin-pine, cap-cape contrasts which have no syntactic connection. Since it may prove difficult to find enough examples of the bath-bathe paradigm (many are of the type explain-explanatory), the question arises whether it would be better to delay such instruction until more relevant examples are in the child's spoken vocabulary, or perhaps even to develop the spoken vocabulary in this direction.

The broader implication of the work of Hockett and particularly of Chomsky is to ask if the phonics or the simple sound-letter correspondences now taught in the present "linguistic" type programs is general enough? Or would Chomsky's more sophisticated information about the relationships between spelling and sounds lead to more effective sets of phonic principles and sequencing? It may be that Chomsky's deeper phonological rules will be more useful at later stages of reading and spelling instruction, while the simpler, more naive ones now taught

are quite suitable for the beginner.

The Influence of Context on Word Recognition

The Chomsky-Halle scheme suggests that the spelling of a word gives the reader more than a clue to the sound of the word, that it can also give the native speaker syntactic and semantic clues.

Recent research on the oral reading errors made by first graders suggests that in the reading of connected material syntax and meaning do, in fact, play an important role in word recognition.

In a recent study, Rose-Marie Weber (1961), a linguist with Project Literacy at Cornell, does a magnificent job of summarizing the past research on oral reading errors. She notes: "In all of reading research the interest shown in words as visual displays stands in contrast to the neglect of written words as linguistic units represented graphically. That the reader's knowledge of the grammatical structure of his language comes into play during reading hardly enters into any discussion of reading errors." p. 29. This is somewhat surprising since most programs, since at least the 1920's, have put so much stock in context as a clue to word recognition.

Her own analysis of the errors made by 21 first graders who were taught by a regular basal reading program (Scott, Foresman) considered various linguistic levels: (a) the word's match with the stimulus as a graphic display, (b) its morphological structure relative to that of the stimulus, (c) its syntactic function in a phrase as indicated by its part of speech, (d) its syntactic acceptability in the sentence, (e) its semantic appropriateness to the sentence, and (f) its appropriateness to the meaning of the entire passage. Full stops (non-recognitions), hesitations, and repetitions were not counted as errors.

She found that substitutions of one word for another comprised 80% of the total errors made by these first graders. Omissions and insertions, 10%; reversals and scrambles of words, less than 3%.

When substitution errors were further classified on an index of graphic similarity, (e.g. identical letters, position of identical letters, length), she found that the High Group had a higher index of graphic similarity than the Low Group. Comparing errors over time, both High and Low Groups showed an increase in the degree to which their substitutions approached the graphic similarity to the stimulus words.

No particular part of speech was more susceptible to error than any other, when compared to frequency in the text read. However, parts of speech that expanded the sentence (i.e., noun modifiers, adverbs, and some function words) were most often omitted or inserted.

Grammatical constraints were also a factor in the substitution errors, with 91% of the errors judged grammatical in terms of the preceding context, and 64% judged grammatical in terms of the entire sentence.

For sentences that remained grammatically intact in spite of the error, 93% were found semantically appropriate up to the point of the error, and 68% semantically appropriate in terms of the entire selection.

She also found an interaction between the use of graphic cues and contextual cues (syntactical and semantic). The higher the graphic similarity of the error, the lower its contextual appropriateness. Also, grammatical acceptability and semantic appropriateness tended to decrease with time, reflecting, no doubt, the increasing ability of the children to respond to the words in terms of sound-letter correspondences.

Her conclusions with regard to the strategies used by first graders were: "This analysis of errors on the syntactic and semantic levels suggests that even early readers can successfully make use of preceding verbal context; it is clear that they do not depend solely on graphic representation to make a response. Reading instruction might well incorporate guidance on the optimal balance in the

use of correspondences between sounds and letters and the expectations transferred from verbal experience. However, this description leaves us far from discerning what the optimal balance might be." (Emphasis mine) p. 102.

In a similar study of oral reading errors (although he counted non-recognitions as errors) among first graders who also learned to read in a basal reading program Biemiller (1968) found a "fairly regular" progression in the types of errors made at the beginning to the end of the first grade. He divided these into three major phases; the first phase was characterized by a preponderance of substitution errors that showed heavy reliance on context. Some children remained at this phase all year. However, most moved to a second phase when the majority of their errors were "non-responses." It was the better readers who reached this second phase earlier and they were the most able readers by the end of the year, "while those children who never adopted a non responding strategy (and continued using context predominantly) were almost without exception the poorest readers at the end of the year." (Biemiller, March, 1968)

The third phase was characterized by greater flexibility in strategies used to identify words. When reading relatively easy material (overall error rate less than 5 to 10% of words read), most errors indicated the use of context information. But, in addition, some errors also showed evidence of paying attention to graphic details. On difficult materials (overall error rate higher than 10%), less context information and more graphic information was used.

Biemiller noted that all children seemed to go through these three phases--the better readers at a faster pace, the poorer readers at a slower pace.

The implications for research of the Weber and Biemiller error studies are extremely suggestive.

The most obvious question that arises is whether the same kinds of errors

and particularly the developmental phases described by Biemiller, would be found among first-graders taught by other than basal reader programs? Is it possible that the particular methods and materials by which these children were taught (with their use of illustrations, their emphasis on reading for meaning, the learning of a limited number of sight words first with a slow introduction of phonics and the relatively limited vocabulary load) influenced the strategies they used to recognize words? Or are the strategies part of a general developmental sequqnce in learning to read, irrespective of the methods and materials used?

Biemiller (1968) also analyzed the errors of 1st graders who were taught by a modified basal plan where "less constrained books were used," along with a somewhat heavier phonics program. He found no important differences in the kinds of errors made by children of comparable ability on materials of comparable difficulty as compared with those taught by a regular basal program.

Since neither programs controlled words used in the connected reading matter for spelling regularity and in fact encouraged the use of contextual constraints, we still do not know whether those programs that discourage guessing--e.g. highly systematic phonics programs as well as the "Bloomfield type" linguistic programs produce similar or different kinds of strategies. Also do they ultimately produce the kind of flexibility in strategy in the third stage found by Biemiller at about the same time?

An earlier less systematic study by MacKinnon (1959) suggests that the materials (particularly the sentences, and types of illustrations) make a difference in pupils' ability to recognize new words. He found that comparable groups using the Gibson-Richards materials (1963) which carefully control sentence patterns and use stick figures that help trigger the meaning of the sentence were more successful in recognizing untaught words than those using regular basal readers.

It seems to me that longitudinal studies of oral reading errors carried out on the same children over a number of years may be one of the best ways to study how children learn to read. This kind of careful analysis may lead to more definitive answers on the recurring debates over which methods and materials are better or worse, and indeed, whether methods make any difference at all.

Analyses of oral reading errors of children strong or weak on different "readiness" factors, of children taught by different methods and materials, might well be a welcome relief from the too common experimental design of comparing Method A with Method B, where pupils are tested only at the beginning and at the end of each school year, losing much too much valuable data, and where it is very difficult to disentangle the significant factors that make for any of the differences found.

The implications of these kind of error data for understanding the beginning reading process and for the diagnosis and teaching based on individual needs are enormous. We may find that the same kinds of errors may be signs of progress for certain kinds of pupils, at certain times, while they may be signs of problems for others. Biemiller (March, 1968), in fact, suggests that the beginning context phase, which he found among 1st graders using basal reader types of programs, should be skipped or deemphasized--that the beginner should be discouraged from obvious guessing. At a later point, after he has passed the "non response" phase, guessing should be encouraged since the child now has more command of the sound-letter correspondences to make a good guess. Indeed, he found the poorest readers at the end of Grade 1 never went beyond the first context phase. It was only when they went through the "stop" or non-recognition phase that they were able to proceed to the third phase--the one of flexible strategies--relying on context when reading relatively easy materials and relying more on graphic cues

when reading more difficult materials.

As you can see, I'm quite excited about the possibility of this type of research. Such studies can help give us a picture of the developmental process of learning to read as it relates to ways pupils are taught, the materials on which they practice, and their own strengths and weaknesses and styles of learning. For example, do children with poor visual memory and good intelligence stay too long in the early context phase when taught by a basal approach? Does a heavier decoding emphasis program (whether a Bloomfield type, a strong phonics type, or ITA) help them skip the early context phase, but keep them too long on the non-recognition phase? Or does it keep them too long on a graphic similarity phase, with little flexibility in using syntactic and semantic cues?

It seems to me that a linguistic analysis of oral reading errors, similar to those of Weber and Biemiller, would be especially helpful in studying the kinds of reading problems found among children with non-standard speech, and then, perhaps to clues as to the methods and materials most suitable for them. At least such studies could give us some idea as to where their greatest difficulties lie --whether in the use of context or in the ability to use sound-letter correspondences. Would an early emphasis on phonics help or hinder their acquisition of early reading skill? Or would the phonological differences between their own dialects and those of standard English make for more problems?

Labov's extensive analyses of Negro speech suggests that some phonics teaching would indeed help--but the teacher must be especially sensitive in teaching it. He found large-scale phonological differences among Negro speakers of non-standard English that coincide with important grammatical differences. The result is a large number of homonyms in the speech of Negro children which are different from the set of homonyms in the speech of their teachers. Some of the phonological differences and their grammatical consequences found by Labov are:

1. l-lessness resulting in such homonyms as tool=too; help=hep; all=awe.
2. Simplification of consonant clusters at end of words e.g. passed=pass; mend=men: hold=hole.
3. Other phonological variables, such as no distinction between short i and short e before nasals so that pin=pen; tin=ten, and since=cents.

Such phonological differences, according to Labov, make it difficult for Negro children to recognize many words in standard spelling. They may look up words in a dictionary under the wrong spelling, and may be unable to distinguish words which are plainly different for the teacher. If neither the teacher nor the children are aware of the great differences in their set of homonyms, confusion may occur.

What is even more serious for reading, according to Labov, is that the various final consonants affected by phonological differences represent the principal English inflections, coinciding with grammatical differences. Thus with the loss of /l/, the colloquial future is identified with the colloquial present e.g. you'll=you, and they'll=they. The past tense may also be affected since the -ed is often omitted by phonological processes. Through the use of an ingenious series of tests, particularly the oral reading of sentences designed to determine the grammatical significance of -ed, e.g., "When I liked a story, I read every word" the proper reading of the homograph read indicates whether or not the reader interpreted the -ed suffix as a past tense signal;, Labov found that -ed was interpreted correctly less than half of the time, less often, in fact, than the -ed was pronounced.

The implications of such dialect differences for the teaching of reading, according to Labov, are:

1. In the analysis and correction of oral reading, teachers must distinguish between errors in word recognition and differences in pronunciation from standard phonology because of dialect differences. [It is interesting to note that W.S. Gray made the same point in his instructions to the examiner for his Standardized Oral Reading Paragraphs Test (1916)]. Information on the dialect patterns of Negro children should be helpful in making such distinctions.

2. In the early stages of teaching reading and spelling, it may be necessary to spend more time on the grammatical function of certain inflections, e.g. -ed. The child may say pass for passed, but if he knows that it means the past tense, no fuss should be made. Also, it may be necessary to treat the final elements of certain clusters with the special attention given to silent letters such as the b in lamb.

3. A certain amount of perception training in the first few years of school may be helpful in teaching children to hear and make standard English distinctions.

The key to the situation, according to Labov, is for the teacher as well as the writer of instructional materials to know the system of homonyms of non-standard English and to know the grammatical differences that separate her own speech from that of the child. She should accept his system of homonyms but not his grammatical differences.

Would Labov's suggestions help the teacher? Can materials be produced that give special attention to the non-standard phonological and grammatical differences? And would such materials help those teachers who may not be sensitive to phonological and grammatical differences?

It seems to me that a linguistic analysis of the oral reading errors of Negro children taught by different methods and materials would be extremely useful, especially if such analyses were combined with measures of understanding of sentences and selections. Such studies may reveal that programs which emphasize

phonics or spelling patterns may be more confusing, expecially if the teacher is not aware of dialect differences and insists on standard English pronunciation. Or, they may reveal, as some authors of phonics programs claim, that an early and heavy phonic and spelling emphasis is beneficial not only for reading and spelling but for the development of accurate and distinct speech. Indeed, if this is the case, it may be less threatening and condescending to teach standard English phonology and grammar through reading instruction than through more direct practice in speech.

But we are still left with an important question. Why the cumulative deficits found in reading achievement among disadvantaged children? Why the increasing retardation, compared to national norms, found among lower class children, particularly lower class Negro children, as they advance through school? Can this be explained by the dialect differences found by Labov and can they be corrected by better beginning reading instruction? Or are more fundamental differences in language involved? If reading is the psycholinguistic guessing game that Goodman (1967) suggests, then I believe we must look for more than dialect differences. According to Goodman, "Skill in reading involves not greater precision, but more accurate first guesses based on better sampling techniques, greater control over language structure, broadened experiences, and increased conceptual development. As the child develops reading skill and speed, he uses increasingly fewer graphic cues." (p.7) If Goodman is correct, then it seems to me we might find a more powerful hypothesis for the cumulative deficit phenomenon in Basil Bernstein's theory of the different "codes" of lower and middle class speakers. According to Bernstein (1960), language depends on the social relationships that exist between speakers. If the relationships are close, if much is shared in the environment, then a restricted code is used. In a restricted code there is heavy dependence on gesture and facial expression;

sentences are short, with few logical connectives, since everyone "knows" what you mean. When the relationships are not close, more is put in the verbal messages; sentences are longer, more modifiers and clauses are used, etc. According to Bernstein, the middle class child is exposed at home to both codes while the lower class child is exposed only to a restricted code.

From my work in readability measurment (Chall, 1958), it seems to me that the restricted and elaborated codes of Bernstein are essentially simpler or more complex forms of language--in fact, they would easily be classified as easier or harder to read and understand by any standard readability formula. If so, we may then hypothesize that it is probably at about 4th grade level, when the language of the reading materials and textbooks approaches the "elaborated code" stage--when the language becomes more abstract, more removed from the here and now, etc--that the lower class child begins to experience still other difficulties in reading, difficulties over and above any dialect differences that may interfere in his early reading.

We need to test these hypotheses. More specifically, we need to compare the oral language performance of lower class children--in terms of complexity of syntax, breadth of vocabulary, level of concept, etc--with this reading ability on material of equal complexity. We need to make the same kind of comparisons among children of the same age from middle class homes. Thus we may determine where the essential problems lie.

When such data are obtained, it may be possible to devise and test different instructional strategies for the teaching of reading to lower class children. At least two major strategies seem appropriate even at our present state of uncertainty. One would emphasize language, enrichment of experience, and concept development right from the first grade or even eariler, with no major change in the teaching of reading since the improved language should help the lower class child

deal with the elaborated code of the more advanced reading material he meets in later grades. The other strategy is to put an early and heavy stress on reading. Perhaps through early independence in reading, he may develop an earlier understanding of the elaborated code, which may, in turn, influence his own use of it in speech and writing. Other strategies may be various combinations of the previous two. Indeed many of the existing programs may be thus classified.

Reading at the Higher Levels

Although most of my paper was devoted to implications of the work of linguists to problems of beginning reading instruction, I believe the real promise of linguistics and perhaps its greatest contributions to reading instruction will ultimately come in its application to the understanding of the comprehension process.

Much of the exciting work in linguistics, particularly Noam Chomsky's transformational grammar (1957 & 1965), has resulted in a series of studies in the reading and understanding of sentences and in readability measurement (Bormuth, 1965), that confirm the importance of syntax in the comprehension process.

Many studies [See for example Levin & Turner (1966)] indicate that the reader supplies his knowledge of grammar in reading to a greater extent than previously supposed. However, there does not seem to be any simple relationship between transformational grammar and the performance of the reader. The reader employs his knowledge of grammar, but not in an obvious way.

The study of Bever and Bower (1966) suggests that the best readers among able college students do not read sentences in a linear fashion, but in terms of their deep syntactic structure in Chomsky's sense. Since only 8% of the best readers did so, and were self-taught, it suggests the possibility that

others can be taught to do so.

Considerable research has been carried on within the past few years on the relation between syntactic structure and the comprehension of written text--mostly sentences. Audrey Toan Edwards (1967) in a review of such studies (most of them carried out with adults and college students and far from conclusive) suggests that statements are easier than questions; positive statements easier than negative ones; and positive statements containing verbs easier then those containing nominalizations.

However, should we know more definitely than we now know what syntactic structures make sentences easier or harder, the implications of such knowledge for reading instruction are by no means obvious and are open questions for the researcher in reading.

According to Edwards, it could mean that the best way to program instructional materials would be to introduce sentence types in order of increasing difficulty. On the other hand, one can make a point for introducing together such corresponding forms as statements and questions in order to make clear their relationship. The findings of the Levin-Turner eye-voice span studies (1966) suggest that marking phrase boundaries by large spaces and gradually fading them out--and gradually elaborating phrases, as suggested by Allen (1964) might have validity as a training device.

It might also suggest programming instructional materials by including sentences containing adverbs and prepositional phrases which can appear in several positions, and having the child read all the possible sentence permutations, so as to gain insight into the permutability of language (Hansen, 1966), or reading a sentence and then writing prescribed transformations. Mellon (1967) found this effective for improving writing, i.e. the writing became more complex in sentence structure. A tenable hypothesis is that such practice in writing may improve reading ability as well.

The Bever and Bower (1966) study referred to earlier suggests the possibility of using typographical devices to focus the reader's attention on the deep structure rather than on the linear order of words.

In conclusion, reading comprehension has so far remained a mystery. While the battles have raged over the beginning reading process and the best possible procedures for teaching the beginner, it is at the higher levels of reading where we really need to know what is happening and why. Hopefully, when we know this,--with the help of some of the newer linguistic and psycholinguistic research, we may be able to design instructional and remedial methods and materials that will work better than the ones we use today.

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