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Reading: A Psycholinguistic Guessing Game

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As scientific understanding develops in any field of study, preexisting, naive, common sense notions must give way. Such outmoded beliefs clutter the literature dealing with the process of reading. They interfere with the application of modern scientific concepts of language and thought to research in reading. They confuse the attempts at application of such concepts to solution of problems involved in the teaching and learning of reading. The very fact that such naive beliefs are based on common sense explains their persistent and recurrent nature. To the casual and unsophisticated observer they appear to explain, even predict, a set of phenomena in reading. This paper will deal with one such key misconception and offer a more viable scientific alternative.

Simply stated, the common sense notion I seek here to refute is this:

“Reading is a precise process. It involves exact, detailed, sequential perception and identification of letters, words, spelling patterns and large language units.”

In phonic centered approaches to reading, the preoccupation is with precise letter identification. In word centered approaches, the focus is on word identifications. Known words are sight words, precisely named in any setting.

This is not to say that those who have worked diligently in the field of reading are not aware that reading is more than precise, sequential identification. But, the common sense notion, though not adequate, continues to permeate thinking about reading.

Spache (8) presents a word version of this common sense view: “Thus, in its simplest form, reading may be considered a series of word perceptions.”

The teacher’s manual of the Lippincott *Basic Reading* (6) incorporates a letter by letter variant in the justification of its reading approach: “In short, following this program the child learns from the beginning to see words exactly as

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the most skillful readers see them...as whole images of complete words with all their letters.”

In place of this misconception, I offer this: Reading is a selective process. It involves partial use of available minimal language cues selected from perceptual input on the basis of the reader’s expectation. As this partial information is processed, tentative decisions are made to be confirmed, rejected, or refined as reading progresses.

More simply stated, reading is a psycholinguistic guessing game. It involves an interaction between thought and language. Efficient reading does not result from precise perception and identification of all elements, but from skill in selecting the fewest, most productive cues necessary to produce guesses which are right the first time. The ability to anticipate that which has not been seen, of course, is vital in reading, just as the ability to anticipate what has not yet been heard is vital in listening.

Consider this actual sample of a relatively proficient child reading orally. The reader is a fourth grade child reading the opening paragraphs of a story from a sixth grade basal reader (5):

“If it bothers you to think of it as baby sitting,” my father said, “then don’t think of it as baby sitting. Think of it as homework. Part of your education. You just happen to do your studying in the room where the baby brother is sleeping, that’s all.” He helped my mother with her coat, and then they were gone.

hoped © a

So education it was! I ~~opened~~ the dictionary and picked out a
 word that sounded good. PH Phil/oso/phi/cal He yelled. Might
 as well study word meanings first. 1. Phizo 2. Phiso/soophical
 and courage in his face of ill fortune.” I mean I really yelled it. I
 guess a fellow has to work off steam once in a while.

He has not seen the story before. It is, by intention, slightly difficult for him. The insights into his reading process come primarily from his errors, which I choose to call miscues in order to avoid value implications. His expected responses mask the process of their attainment, but his unexpected responses have been achieved through the same process, albeit less successfully applied. The ways that they deviate from the expected reveal this process.

In the common sense view that I am rejecting, all deviations must be treated as errors. Furthermore, it must be assumed in this view that an error either indicates that the reader does not know something or that he has been “careless” in the application of his knowledge.

For example, his substitution of *the* for *your* in the first paragraph of the sample must mean that he was careless, since he has already read *your* and *the* correctly in the very same sentence. The implication is that we must teach him to be more careful, that is, to be more precise in identifying each word or letter.

But now let’s take the view that I have suggested. What sort of information could have led to tentatively deciding on *the* in this situation and not rejecting or refining this decision? There obviously is no graphic relationship between *your* and *the*. It may be, of course, that he picked up *the* in the periphery of his visual field. But, there is an important nongraphic relationship between *the* and *your*. They both have the same grammatical function: they are, in my terminology, noun markers. Either the reader anticipated a noun marker and supplied one paying no attention to graphic information or he used *your* as a grammatical signal ignoring its graphic shape. Since the tentative choice *the* disturbs neither the meaning nor the grammar of the passage, there is no reason to reject and correct it. This explanation appears to be confirmed by two similar miscues in the next paragraph. *A* and *his* are both substituted for *the*. Neither are corrected. Though the substitution of *his* changes the meaning, the peculiar idiom used in this dictionary definition, “in the face of ill fortune,” apparently has little meaning to this reader anyway.

The conclusion this time is that he is using noun markers for grammatical, as well as graphic, information in reaching his tentative conclusions. Altogether in reading this ten page story, he made twenty noun marker substitutions, six omissions and two insertions. He corrected four of his substitutions and one omission. Similar miscues involved other function words (auxiliary verbs and prepositions, for example). These miscues appear to have little effect on the meaning of what he is reading. In spite of their frequency, their elimination would not substantially improve the child’s reading. Insistence on more precise identification of each word might cause this reader to stop seeking grammatical information and use only graphic information.

The substitution of *hoped* for *open* could again be regarded as careless or imprecise identification of letters. But, if we dig beyond this common sense explanation, we find 1) both are verbs and 2) the words have *key* graphic similarities. Further, there may be evidence of the reader’s bilingual French-Canadian background here, as there is in subsequent miscues (*harms* for *arms*, *shuckled* for *chuckled*, *shoose* for *choose*, *shair* for *chair*). The correction of this miscue may involve an immediate rejection of the tentative choice made on the basis of a review of the graphic stimulus, or it may result from recognizing that it cannot lead to the rest of the sentence, “I hoped a dictionary...” does not make sense.

(It isn't decodable.) In any case, the reader has demonstrated the process by which he constantly tests his guesses, or tentative choices, if you prefer.

Sounds is substituted for *sounded*, but the two differ in ending only. Common sense might lead to the conclusion that the child does not pay attention to word endings, slurs the ends or is otherwise careless. But, there is no consistent similar occurrence in other word endings. Actually, the child has substituted one inflectional ending for another. In doing so he has revealed 1) his ability to separate base and inflectional suffix, and 2) his use of inflectional endings as grammatical signals or markers. Again, he has not corrected a miscue that is both grammatically and semantically acceptable.

He for *I* is a pronoun for pronoun substitution that results in a meaning change, though the antecedent is a bit vague, and the inconsistency of meaning is not easily apparent.

When we examine what the reader did with the sentence "*Might as well study word meanings first,*" we see how poorly the model of precise sequential identification fits the reading process. Essentially this reader has decoded graphic input for meaning and then encoded meaning in oral output with transformed grammar and changed vocabulary, but with the basic meaning retained. Perhaps as he encoded his output, he was already working at the list word which followed, but the tentative choice was good enough and was not corrected.

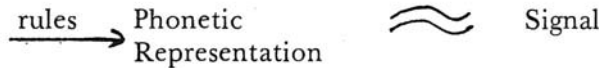
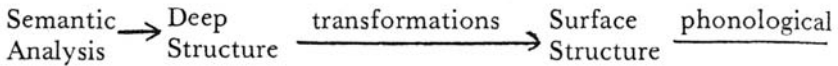
There are two examples, in this sample, of the reader working at unknown words. He reveals a fair picture of his strategies and abilities in these miscues, though in neither is he successful. In his several attempts at *philosophical*, his first attempt comes closest. Incidentally, he reveals here that he can use a phonic letter-sound strategy when he wants to. In subsequent attempts he moves away from this sounding out, trying other possibilities, as if trying to find something which at least will sound familiar. Interestingly, here he has a definition of sorts, but no context to work with. *Philosophical* occurs as a list word a number of times in the story. In subsequent attempts, the child tried *physica*, *physicacol*, *physical*, *philosovigul*, *phizzlesovigul*, *phizzo sorigul*, *philazophgul*. He appears to move in concentric circles around the phonic information he has, trying deviations and variations. His three unsuccessful attempts at *fortune* illustrate this same process. Both words are apparently unknown to the reader. He can never really identify a word he has not heard. In such cases, unless the context or contexts sufficiently delimit the word's meaning, the reader is not able to get meaning from the words. In some instances, of course, the reader may form a fairly accurate definition of the word, even if he never recognizes it (that is matches it with a known oral equivalent) or pronounces it correctly. This reader achieved that with the word *typical* which occurred many times in the story. Throughout his reading he said *topical*. When he finished reading, a check of his comprehension indicated that he knew quite well the meaning of the word. This phenomenon is familiar to any adult reader. Each of us has many well-defined words in

our reading vocabulary which we either mispronounce or do not use orally.

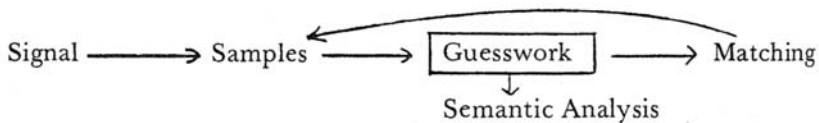
I've used the example of this youngster's oral reading not because what he's done is typical of all readers or even of readers his age, but because his miscues suggest how he carries out the psycholinguistic guessing game in reading. The miscues of other readers show similarities and differences, but all point to a selective, tentative, anticipatory process quite unlike the process of precise, sequential identification commonly assumed.

Let's take a closer look now at the components the reader manipulates in this psycholinguistic guessing game.

At any point in time, of course, the reader has available to him and brings to his reading the sum total of his experience and his language and thought development. This self-evident fact needs to be stated because what appears to be intuitive in any guessing is actually the result of knowledge so well learned that the process of its application requires little conscious effort. Most language use has reached this automatic, intuitive level. Most of us are quite unable to describe the use we make of grammar in encoding and decoding speech, yet all language users demonstrate a high degree of skill and mastery over the syntax of language even in our humblest and most informal uses of speech.



A model structure of the listener's sentence interpretation, according to Chomsky, is:



Chomsky (3) has suggested this model of sentence production by speakers of the language:

Thus, in Chomsky's view encoding of speech reaches a more or less precise level and the signal which results is fully formed. But in decoding, a sampling process aims at approximating the message and any matching or coded signal which results is a kind of by-product.

In oral reading, the reader must perform two tasks at the same time. He must produce an oral language equivalent of the graphic input which is the *signal* in reading, and he must also reconstruct the meaning of what he is reading. The matching in Chomsky's interpretation model is largely what I prefer to call a recoding operation. The reader recodes the coded graphic input as phonological or oral output. Meaning is not normally involved to any extent. This recoding can even be learned by someone who doesn't speak the language at all, for example, the bar-mitzvah boy may learn to recode Hebrew script as chanted oral Hebrew with no ability to understand what he is chanting; but when the reader engages in semantic analysis to reconstruct the meaning of the writer, only then is he decoding.

In oral reading there are three logical possible arrangements of these two operations. The reader may recode graphic input as oral language and then decode it. He may recode and decode simultaneously. Or, he may decode first and then encode the meaning as oral output.

On the basis of my research to date, it appears that readers who have achieved some degree of proficiency decode directly from the graphic stimulus in a process similar to Chomsky's sampling model and then encode from the deep structure, as illustrated in Chomsky's model of sentence production. Their oral output is not directly related to the graphic stimulus and may involve transformation in vocabulary and syntax, even if meaning is retained. If their comprehension is inaccurate, they will encode this changed or incomplete meaning as oral output.

The common misconception is that graphic input is precisely and sequentially recoded as phonological input and then decoded bit by bit. Meaning is cumulative, built up a piece at a time in this view. This view appears to be supported by studies of visual perception which indicate that only a very narrow span of print on either side of the point of fixation is in sharp focus at any time. We might dub this the "end of the nose" view, since it assumes that input in reading is that which lies in sharp focus in a straight line from the end of the nose. Speed and efficiency are assumed to come from widening the span taken in on either side of the nose, moving the nose more rapidly or avoiding backward movements of the eyes and nose, which, of course, must cut down on efficiency.

This view cannot possibly explain the speed with which the average adult reads, or a myriad of other constantly occurring phenomena in reading. How can it explain, for example, a highly proficient adult reader reading and rereading

a paper he's written and always missing the same misprints. Or how can it explain our fourth grader seeing, "Study word meanings first," and saying, "Study what it means"?

No, the "end of the nose" view of reading will not work. The reader is not confined to information he receives from a half inch of print in clear focus. Studies, in fact, indicate that children with severe visual handicaps are able to learn to read as well as normal children. Readers utilize not one, but three kinds of information simultaneously. Certainly without graphic input there would be no reading. But, the reader uses syntactic and semantic information as well. He predicts and anticipates on the basis of this information, sampling from the print just enough to confirm his guess of what's coming, to cue more semantic and syntactic information. Redundancy and sequential constraints in language, which the reader reacts to, make this prediction possible. Even the blurred and shadowy images he picks up in the peripheral area of his visual field may help to trigger or confirm guesses.

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. Silent reading can then become a more rapid and efficient process than oral reading, for two reasons: 1) the reader's attention is not divided between decoding and recoding or encoding as oral output, and 2) his speed is not restricted to the speed of speech production. Reading becomes a more efficient and rapid process than listening, in fact, since listening is normally limited to the speed of the speaker.

Recent studies with speeded up electronic recordings where distortion of pitch is avoided have demonstrated that listening can be made more rapid without impairing comprehension too.

Though the beginning reader obviously needs more graphic information in decoding and, therefore, needs to be more precise than skilled readers, evidence from a study of first graders by Goodman (4) indicates that they begin to sample and draw on syntactic and semantic information almost from the beginning, if they are reading material which is fully formed language.

Here are excerpts from two primer stories (1, 2) as they were read by a first grade child at the same session. Ostensibly (and by the intent of the authors) the first, from a second preprimer, should be much easier than the second, from a third preprimer. Yet she encountered problems to the point of total confusion with the first and was able to handle exactly the same elements in the second.

Note, for example, the confusion of *come* and *here* in "Ride In." This represents a habitual association in evidence in early reading of this child. Both *come* and *here* as graphic shapes are likely to be identified as *come* or *here*. In "Stop and Go," the difficulty does not occur when the words are sequential. She also substitutes *can* for *and* in the first story, but encounters no problem with either

later. *Stop* stops her completely in "Ride In," a difficulty that she doesn't seem to know she has when she reads "Stop and Go" a few minutes later. Similarly, she calls (ride) *run* in the first story, but gets it right in the latter one.

RIDE IN

Run
~~Ride~~ in, Sue.
Run
~~Ride~~ in here.
Come here
~~Here~~ I ~~come~~, Jimmy.
Can Come
~~And~~ here I (stop).

STOP AND GO

Jimmy said, "Come here, Sue,
Look at my ^{toy} ~~toy~~ train."
See it go.
Look at my lit/tle ^{toy} ~~train~~ go."
Sue said, "Stop the ^{toy} ~~train~~.
Come
Stop it ~~here~~, Jimmy."
Jimmy said, "I can stop the ^{toy} ~~train~~.
See the ^{toy} ~~train~~ stop."
Sue said, "Look at my ^{toy} ~~toy~~.
It is in the ^{toy} ~~train~~.
See my little red ^{toy} ~~toy~~, Jimm.
It can ride in the ^{toy} ~~train~~."
Jimmy said, "See the ^{toy} ~~train~~ go.
Look at it go."
Suzie
Sue said, "Look at my little red ^{toy} ~~toy~~.
See it go for a ^{toy} ~~train~~ ride."
Suzie
Sue said, "My little red ^{toy} ~~toy~~!
said ^{toy} ~~toy~~
© Jimmy, my ^{toy} ~~toy~~ is not here.
It is not in the ^{toy} ~~train~~.
Stop the ^{toy} ~~train~~, Jimmy.
Stop it and look for my ^{toy} ~~toy~~."

Though there are miscues in the second story, there is a very important difference. In the first story she seems to be playing a game of name the word. She is recoding graphic shapes as phonological ones. Each word is apparently a separate problem. But in “Stop and Go” what she says, including her miscues, in almost all instances makes sense and is grammatically acceptable. Notice that as *Sue* becomes better known she becomes *Suzie* to our now confident reader.

A semantic association exists between *train* and *toy*. Though the child makes the same substitution many times, nothing causes her to reject her guess. It works well each time. Having called (train) *toy*, she calls (toy) *too* (actually it’s an airplane in the pictures), not once, but consistently throughout the story. That doesn’t seem to make sense. That’s what the researcher thought too, until the child spoke of a “little red *too*” later in retelling the story. “What’s a ‘little red too,’” asked the researcher. “An airplane,” she replied calmly. So a train is *toy* and a plane is a *too*. Why not? But, notice that when *toy* occurred preceding *train*, she could attempt nothing for *train*. There appears to be a problem for many first graders when nouns are used as adjectives.

Common sense says go back and drill her on *come, here, can, stop, ride, and*; don’t let her go to the next book which she is obviously not ready to read.

But the more advanced story, with its stronger syntax, more fully formed language and increased load of meaning makes it possible for the child to use her graphic cues more effectively and supplement them with semantic and syntactic information. Teaching for more precise perception with lists and phonics charts may actually impede this child’s reading development. Please notice, before we leave the passage, the effect of immediate experience on anticipation. Every one of the paragraphs in the sample starts with “Jimmy said” or “Sue said.” When the reader comes to a line starting *Jimmy*, she assumes that it will be followed by *said* and it is not until her expectation is contradicted by subsequent input that she regresses and corrects her miscue.

Since they must learn to play the psycholinguistic guessing game as they develop reading ability, effective methods and materials used by teachers who understand the rules of the game, must help them to select the most productive cues, to use their knowledge of language structure to draw on their experiences and concepts. They must be helped to discriminate between more and less useful available information. Fortunately, this parallels the processes they have used in developing the ability to comprehend spoken language. George Miller (7) has suggested “...psycholinguists should try to formulate performance models that will incorporate...hypothetical information storage and information processing components that can simulate the actual behavior of language user.”

I’d like to present now my model of this psycholinguistic guessing game we call reading English. Please understand that the steps do not necessarily take place in the sequential or stretched-out form they are shown here.

1. The reader scans along a line of print from left to right and down the page, line by line.
2. He fixes at a point to permit eye focus. Some print will be central and in focus, some will be peripheral; perhaps his perceptual field is a flattened circle.
3. Now begins the selection process. He picks up graphic cues, guided by constraints set up through prior choices, his language knowledge, his cognitive styles, and strategies he has learned.
4. He forms a perceptual image using these cues and his anticipated cues. This image then is partly what he sees and partly what he expected to see.
5. Now he searches his memory for related syntactic, semantic, and phonological cues. This may lead to selection of more graphic cues and to reforming the perceptual image.
6. At this point, he makes a guess or tentative choice consistent with graphic cues. Semantic analysis leads to partial decoding as far as possible. This meaning is stored in short-term memory as he proceeds.
7. If no guess is possible, he checks the recalled perceptual input and tries again. If a guess is still not possible, he takes another look at the text to gather more graphic cues.
8. If he can make a decodable choice, he tests it for semantic and grammatical acceptability in the context developed by prior choices and decoding.
9. If the tentative choice is not acceptable semantically or syntactically, then he regresses, scanning from right to left along the line and up the page to locate a point of semantic or syntactic inconsistency. When such a point is found, he starts over at that point. If no inconsistency can be identified, he reads on seeking some cue which will make it possible to reconcile the anomalous situation.
10. If the choice is acceptable, decoding is extended, meaning is assimilated with prior meaning, and prior meaning is accommodated, if necessary. Expectations are formed about input and meaning that lie ahead.
11. Then the cycle continues.

Throughout the process there is constant use of long- and short-term memory.

I offer no apologies for the complexity of this model. Its faults lie not in its complexity but in the fact that it is not yet complex enough to fully account for the complex phenomena in the actual behavior of readers. But such is man's destiny in his quest for knowledge. Simplistic folklore must give way to complexity as we come to know.

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