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ABSTRACT

This paper discusses the reading diary study--a method that involves frequent observation and detailed note-taking of the strategies employed by a child while learning to read--and the problems of data reduction, limitations of methods employed by researchers, and analysis of data. The sections include "Miscue Analysis," which can be used for data reduction and which examines the techniques developed by Goodman, Weber, and Biemiller; "Soderbergh's Reading Diary Study," which discusses Soderbergh's study of her daughter's progress in Swedish from the first word at age 28 months to the first book a little over a year later and the data reduction system used; "Cognitive-Developmental Theory," which relates Piaget's notion of stages of development to when a particular strategy is employed by a child learning to read; and "Implications for Reading Diary Studies from Cognitive Theory," which discusses the importance of the reading researcher organizing diary notes on the acquisition of a specific cognitive skill--reading--into a general theory of reading acquisition. (WR)

# A Look at Reading Diary Studies: The State of the Art and Implications from Cognitive-developmental Theory

by

Barbara Foorman

Recently there has been a call among reading researchers (Calfee, 1973; Wanat, 1974; Cazden, 1974) for diary studies of the reading acquisition process, similar to those produced by linguists describing child language acquisition. The need for such in-depth studies is obvious: The "great debate" over the sequencing of the various component skills of the reading process continues with the meaning emphasis advocates emphasizing one sequence and the decoding advocates emphasizing another.[1] But no matter whether one belongs to the "pro decoding camp" or to the "pro meaning camp," the assumption that each child must begin at readiness skill number one and progress in an orderly fashion to skill number 450 (or whatever) denies the possibility that any child might have developed his own modus operandi with regards to learning to read. I am convinced that "early" and "late" readers alike frequently continue to learn to read in spite of the instructional sequence we lock them into.

In our zeal to write a sequential programmed analysis of the reading process we adults establish hierarchies of skills that will take the "typical child" through the steps of learning to read. But what child is ever the "typical child"? By imposing on children an external developmental model based on an adult conception of how the "typical child" learns to read, we are denying the child the opportunity to develop and exploit his own strategies for mastering the reading process. And it seems to me that it is in these unique strategies that lie important clues to the acquisition of reading.

A potentially more important drawback of such systems based

on skill hierarchies is their failure to explain or take into account that "all-or-none" phenomenon which teachers so often notice. One day Johnny cannot get "short" i or e and the next day he not only has these two "short" vowels, but he can combine them with known consonants to get basic trigrams such as tip and pit. These hierarchical skill systems were not describing for me those hurdles, leaps, and detours which children seemed to be taking during reading acquisition.

In an attempt to "get inside the head" of a child learning to read I decided to respond to the call of the reading researchers and do a diary study of a first-grade child learning to read. Using the diary study as a data collection technique fits in with my bias toward cognitive developmental theory because this learning theory emphasizes the process whereby the child integrates his mental organization with the demands of the environment. I chose for my study a teacher who shared this same bias and who was a clinician in the Piagetian sense -- observing and asking the right questions so as to promote self-discovery in the child.

A reading diary study is defined by different people in different ways, but is generally thought of as involving frequent observation and detailed note-taking of the strategies employed by the child while learning to read. Such a definition implies concern solely with data collection, but data reduction is also just as important in a discussion of diary studies because interpretation of diary notes requires some sort of classification system. Of course a researcher has to be careful that in his zeal to classify, categorize, and pidgeon-hole the data he does not miss those developmental breakthroughs which explain sudden, confident demonstrations of previously

unprocessable strategies.

To demonstrate the problems of data reduction I will first discuss both the limitations of the data reduction tool called miscue analysis, which I used in my diary study, and the limitations of the methods employed by Söderbergh (1971) in her reading diary study. Then I will turn to a discussion of the only thing left that made sense to an analysis of my data -- cognitive-developmental theory, particularly that of Jean Piaget, and its relation to reading acquisition.

Miscue Analysis

Miscue analysis is a technique for classifying reading errors. Goodman (1969), the central figure in miscue theory, includes in his taxonomy such categories as: words in the miscue, correction, repeated miscues, word-phrase identification, observed response in periphery, habitual association, dialect, graphic and phonemic proximity (on a scale from 0-9), and grammatical functions of expected and observed responses. For an analysis of errors made in initial reading instruction, however, such a classification scheme is not appropriate. Goodman points out that use of his inventory requires that a child read a passage of at least 250 words and make about twenty-five miscues. Few beginning readers can meet these requirements.

In order to analyze first-grade reading errors, therefore, I turned to Weber (1970) and Biemiller's (1970) studies. Weber's analysis of first-grade reading errors looks at approximations to the correct response in terms of letters, word structure, grammatical acceptability, and semantic appropriateness. Her graphic similarity index compares the stimulus word to the r ord with regard

to the number of letters the word shared, the position of shared letters, the position of shared letters relative to each other, the average length of the words, and the difference in length between the written word and the response. The limitation of her index as a data reduction tool for a reading diary study becomes readily apparent when one attempts to apply this complicated formula:

$$GS = 10\left\{(50F + 30V + 10C) + 5T + 27B + 18E\right\}$$ where

F = the number of pairs of adjacent letters in the same order shared by the printed word (P) and the response (R):

P HOUSE / R HORSE F=2
P EVERY / R VERY F=3

V = the number of pairs of adjacent letters in reverse order shared by P and R:

P WAS / R SAW V=2

C = the number of single letters shared by P and R:

P SPOT / R PUFF C=1
P FAMILY / R FUNNY C=2

A = average number of letters in P and R:

P EVERY / R VERY A=4/5

B = 1 if the first letter in the response is the same as the first letter in the printed word; otherwise, B = 0

P FAMILY / R FUNNY

E = 1 if the last letter in the response is the same as the lastletter in P; otherwise E = 0

P FAMILY / R FUNNY

Examples include: a score of 73 for IT/THE and 180 for SAW/WANT. Of course the weighting assigned to the selected features of this formula are debatable. Weber refers to her own analysis of the literature (1968) to validate her claim that initial and final letters are the most salient clues.

Weber's graphic similarity index revealed that better readers were superior to poorer readers in more closely approaching graphically the correct response. But this conclusion seems rather obvious and simplistic in light of all the trouble it takes to derive the formula. An easier and more powerful data reduction tool is provided by Biemiller's classification scheme. He categorized first-grade reading errors on the basis of whether they were non-responses (a vague term which is never clarified), substitutions, insertions, omissions, or self-corrections. In order to look at oral reading errors in terms of the use of contextual and graphic information, Biemiller looked at the following proportions (1970, p. 82):

1) The proportion of non-response errors to all errors was noted.
2) Contextually acceptable substitution, insertion, and omission errors were summed as 'contextual' errors. The proportion of these errors among all errors was taken as a measure of the child's use of contextual information in word recognition.
3) The proportion of 'graphically similar' substitution errors to all errors was taken as a rough measure of the child's use of the graphic information.

Biemiller found three main phases of development during first-grade reading instruction. The first is characterized by a predominant use of contextual information. The second is characterized by a predominance of non-responses and a marked increase in graphically constrained errors (graphic approximation of error response to printed word). The third phase is characterized by an increase in co-occurrence of graphic and contextual constraints (the latter being "making sense" in light of the preceding context).

In an attempt to reduce my reading diary data in a meaningful way, I applied Biemiller's classification system. Figure One presents a chart of the miscues collected November 26, 1973, three weeks after

| STIMULUS PRESENTED | | | WORD READ | | | | | | | NO RESPONSE | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Word | No. of times | con-text | 1st rdng | cue | 2nd | cue | 3rd | cue | 4 | | cue |
| This | 1st | X | (is) | | | | | | | | |
| | 2nd | | is | /th/ | think | This is a building | This | | | | |
| | 3rd | | is | /th/ | (think) | | | | | | |
| Has | 1st | | is | /h/ | ? | J has blue eyes | has | | | | |
| | 2nd | | blue | /h/ | ? | J has blue eyes | has | | | | |
| | 3rd | | | | | | | | | X | |
| | 4th | | | | | | | | | X | /hae/ |
| Are | | | | | | | | | | X | J's 2 eyes are blue |
| Lights | | | ducks | 2 red | lights | | | | | | |
| Christmas | 1st | | books? fish? | It's in 1 of your stories | Christmas | | | | | | |
| House | | | ducks | Christmas House | house | | | | | | |
| Book | | | /buk/ | | | | | | | | |
| The | | | /t/ /a/ | /th/ | the | | | | | | |
| Crazy | | | I don't know | has something to do with robbers | funny? | 2 crazy guys | curly | /kr/ | Crazy | | |
| Find | 1st | X | /f/friend | Find 3 silver airplanes | find | | | | | | |
| | 2nd | X | fat | /f/ | find | | | | | | |
| Three | | X | | | | | | | | X | It's a # word |
| Silver | | X | | | | | | | | X | color word |
| Yellow | | X | color word | ? yes | yellow | | | | | | |
| Ducks | | X | | | | | | | | X | Duck noise |
| Fat | | X | fish | /fae/ | fat | | | | | | |
| Head | | X | ? | /h/ | family | head | | | | X | |
| Fish | | X | head | | Hey, there's is (fish) | /fi/ | fish | | | | |
| Found | | X | find | found | | | | | | | |

○ = self-correction

FIGURE 1
Chart of Miscues (Nov. 26, 1973)

FIGURE 2: Miscue Chart (Feb 11, 1974)

| STIMULUS PRESENTED | WORD READ | | | | NO RESPONSE | |
|---|---|---|---|---|---|---|
| | 1st rdng | cue | 2nd rdng | cue | | cue |
| With | can | with | | | | |
| Blue | red | red? | blue | | | |
| Is | | | | | X | What word need for sentence to make sense? |
| Men | robbers | men | | | | |
| Rob | red | red? | (rob) | | | |
| Apartments | buildings | ? | (apartments) | | | |
| Circus | | | | | X | circus |
| Watching | | | | | X | watching |
| Four | three | /f/, /f/ | | | | |
| Green | red | | | | | |
| Got away | | | | | X | |
| My | | | | | X | |
| Right | left | Which says /l/? | | | | |
| Play | see | /p/ | | | | |
| Make | | | | | X | /m/ |
| Snowman | snow | snow... | (man) | | | |
| Fly | see | ? | (fly) | | | |
| Crazy | fun | ? | weird | crazy | | |
| In | at | in | | | | |
| snow | see | (context) | (snow) | | | |
| Not | | | | | X | |
| Found | | | | | X | |
| Are | have | are | | | | |
| The | there | the | | | | |

J. has a plane
It was a Christmas house
It was a ghost house
There are 2 people dead in the house

J. has a yellow plane
It was a Christmas tree
It was a ghost story
There are 2 (dead) people dead in the house

the beginning of my reading diary study and ten weeks after the beginning of school. Figure Two presents a chart of the miscues collected ten weeks later -- on February 11. The subject in my study is a first-grade boy named Jimmy, who turned six in October, 1973. Jimmy's teacher told me that his reading readiness test score had been poor and had revealed that Jimmy had "perceptual problems." (These "problems" were never clarified for me.) Coming from a family of an upper-middle socio-economic level and living in a community which stresses the importance of education, Jimmy's slow progress in reading was the object of considerable parental concern. For reading instruction in first-grade, therefore, Jimmy has been working with the district's educational psychologist. Fortunately this psychologist has a good understanding of cognitive theory and, therefore, has devised a program which I feel to be appropriate to Jimmy's needs. (This program will be discussed more fully in the final section of this paper.)

In Figures One and Two the stimulus word is given in the left column. In Figure One the next column to the right indicates an "X" if the word was presented in context. A blank means the word was presented in isolation. In Figure Two all the words were presented in isolation except for the four sentences at the bottom of the chart which were taken from Jimmy's own stories. Under the heading WORD READ in Figures One and Two are the sub-categories "1st rdng, cue; 2nd, cue; 3rd, cue; 4th." Each "reading" represents Jimmy's oral response to the stimulus. Cues were given by the teacher after each reading. A question mark under the clue columns represents those questioning silences by which teachers nonverbally communicate an inadequate response. Sometimes a clue consisted of a context

reference in one of Jimmy's stories. At other times the teacher simply told Jimmy the correct reading, particularly when he was starting to guess wildly or if the word was still "new" to him. And sometimes cues were not given at all. An "X" in the NO RESPONSE column on the right-hand side of the charts indicates that Jimmy gave no reply to the stimulus word. A cue was then provided.

The twenty-four miscues in Figure One represent the errors made on a total presentation of fifty-nine words. The twenty-nine miscues of Figure Two came out of a total of 208 words presented. When the miscues are categorized according to Biemiller's proportions (see page 5 above), the following information is obtained:

| | Figure One | Figure Two |
|---|---|---|
| $\frac{\text{Non-response errors}}{\text{Total errors}}$ | 29% | 23% |
| $\frac{\text{Contextual errors}}{\text{Total errors}}$ | 30% | 80% |
| $\frac{\text{Graphically similar substitution errors}}{\text{Total errors}}$ | 29% | 25% |

Exactly what these proportions can tell us about how Jimmy is going about the reading process is somewhat unclear. The only noticeable discrepancy between Figure One and Figure Two is the proportion of contextual errors to total errors. Figure Two's large increase in the use of contextual information in word recognition would seem to run counter to Biemiller's description of the movement from contextually constrained to non-response to graphic substitution errors, but in all probability Figure Two is depicting Jimmy in the height of what Biemiller refers to as the "pre-NP phase" (NP standing for non-response). If Jimmy's miscues were tabulated using Biemiller's proportions in April and again just before the end of school, one

would expect to see a large increase in the proportion of graphic substitution errors to total errors. According to Biemiller, then, this increase would reflect a change in strategy on the part of the child towards increasing his use of graphic information to identify words.

And so by the end of first-grade Jimmy will probably be fitting into the pattern of contextually constrained to non-response to graphic substitution errors which Biemiller found in his study. But Biemiller's proportions were specifically set up to look for the development of the use of graphic and contextual information in beginning reading and not to look at those individual moment-to-moment modus operandi which characterize the reading acquisition process and which a reading diary study could, hopefully, capture. Biemiller's categories cannot tell us if or why certain strategies were rejected, only to be picked up later on. Also, we get very little feeling for what went on between Figure One and Figure Two to account for Jimmy's reliance on contextual information as an aid to word recognition.

Thus, miscue analysis had provided a useful way to reduce and categorize my reading diary data, but in my opinion the key issue is how to reduce the data in order to get at the child's modus operandi for reading. The data reduction devices of researchers such as Biemiller and Weber are efficient tools for investigating the authors' hypotheses, but they may be masking some of the developmental breakthroughs which explain sudden, confident demonstrations of previously unprocessable strategies -- strategies for which the child seemingly had no previous mental plan for knowing how to solve a particular problem. That "all-or-none" phenomenon whereby a child who could not read a word on one day and can suddenly read it the next gets tucked

away into some tally sheet for substitution, insertions, or omissions only to be lost to further analysis.

Söderbergh's Reading Diary Study

In addition to exploring the data reduction techniques of miscue analysis I also investigated the tools used in the one example of a reading diary study (Söderbergh, 1971) that does seem to capture some of the strategies employed during reading acquisition.[2] Söderbergh's study of her daughter's progress in Swedish from the first word at age two-years-four months to the first book a little over a year later is based on very thorough data reduction devices. As a method of teaching reading Söderbergh drew upon Glenn Doman's approach in How to Teach Your Baby to Read of emphasizing the whole word without prior instruction in alphabetic letter identification. As a parent-researcher studying her child in the home setting, Söderbergh had the obvious advantage of being aware of the input available to the child. But it is just this awareness which seems to promote overconfident assumptions about what is going on in the child's head. Such an example is the following explanation of the child's reading (in Swedish) of hittade as hittde: when the girl sees hittade she first remembers hittat, then de. She realizes that hittade is hittat minus something at the end, plus -de. She then deletes -at and adds -de, thus getting the incorrect form hittde. Whether or not Söderbergh's interpretation of the child's strategy is accurate is, of course, highly debatable. Naturally it is extremely difficult to know what cues a child is utilizing in word recognition. One obvious approach is simply to ask the child how she arrived at a particular answer. One day Söderbergh's child obligingly revealed a graphic substitution strategy in her answer

to the question of "How can you read that (parken)?" with "I've had marken."

But children rarely have conscious control over their reasoning and Söderbergh's examples of such control, therefore, are few. Instead, she relies on her interpretation of her child's first apparent strategy of morphemic substitution, waiting for evidence of the child's ability to shift to an understanding of sound-symbol correspondences and, hence, "break the code." As an example of the code-breaking phenomenon, Söderbergh points out that the stimulus word gammalt is "sounded out" (/ga-m-a-lt/) rather than approached through the previous tactic of relating it to the well-known word gamla, substituting -alt for the final morpheme -la. Söderbergh saw this preference for "sounding out" over the previous and, therefore, simpler way of analysis into morphemes as clearly indicating a growing certainty as to the graphic-phonemic correspondence. I agree completely, but one cannot help but wonder what motivates the child to suddenly prefer the more difficult strategy. Söderbergh is not interested in the question of "Why?" Being a linguist she is more interested in analyzing her reading acquisition data in terms of the gap between competence and performance. But isn't she really masking an example of the "all-or-none" phenomenon -- in this case, "breaking the code" -- under the catch-all notion of the gap between competence and performance?

Cognitive-developmental Theory

But I find the question of why the choice of a particular modus operandi as well as the question of when will it be chosen the most crucial clues to the process of reading acquisition. In my opinion the answers to these questions are most adequately

answered within the framework of cognitive-developmental theory -- especially in the writings of Jean Piaget. Cognitive theory's description of an "active learner who seeks to assimilate environmental situations to his present cognitive structures and, at the same time, accommodates those structures to novel elements in the situation being assimilated" (Ammon, in press) presents a nice backdrop against which to explore the child's strategies displayed during the reading acquisition process.

In addition to its focus on the learner, cognitive theory's notion of equilibration is useful in explaining why and predicting when a particular strategy will be adopted. Equilibration is the energizing force by which a child moves from one stage of development to the next. At first the child is in a state of equilibrium: His mental structures are adequate for handling the world around him. But then the child encounters an aspect of reality for which his mental structures are inappropriate. In order to resolve this state of disequilibrium the child must alter his mental structures in accordance with the demands of reality. What the child chooses to do in accommodating to reality is his strategy. According to this notion of equilibration, then, the gap between competence and performance is explained by the discrepancy between the child's mental structures and what he perceives as being demanded from him by the environment. His attempt to integrate his internal capabilities with the difficulties posed by external elements will intrinsicly motivate the child to seek more complex strategies. It is by this continual process of equilibrium, disequilibrium, alteration of mental structures, and formulation of new strategies that

development takes place.

The question of when will a particular strategy be adopted is answered by Piaget's notion of stages of development. Piaget gives approximate age norms to his four major stages of development:

1) Sensorimotor (0-2)
2) Preoperations (2-7)
3) Concrete Operations (7-11)
4) Formal Operations (11 on)

The beginning of formal reading instruction at age six, then, comes towards the end of the preoperational period and for many children this would appear to be too soon. But what about Söderbergh's child who began to learn to read at age two-years-four months and was reading her first book a year later? How do we explain her early success? Simply saying that she must have been a "bright" child does not seem to be enough. Instead, I find the mental space notion of one of Piaget's students (Pascual-Leone, 1968) much more meaningful than a general theory of intelligence. Pascual-Leone relates the ability of children to perform certain tasks to the mental space (M space) or "central computing space" available for combining mental schemes.* He relates the number of mental schemes which can be combined to Piaget's developmental stages.

| Piagetian Stages | Age | # of schemes |
|---|---|---|
| early preoperational | 3-4 | 1 |
| late preoperational | 5-6 | 2 |
| early concrete | 7-8 | 3 |

Thus, adding one more mental scheme increases the passing age by two years. But at age three Söderbergh's child was "breaking the code," an activity involving at least two mental schemes and, therefore, placing her in the late preoperational period of development.

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* Piaget uses the word scheme both to refer to an organized pattern of behavior and to the basic structure underlying the child's behavior. I will be using the terms mental schemes and mental structure synonymously to refer to those structures which underlie overt action.

The following is an example in English of combining two mental schemes in order to resolve the state of disequilibrium brought on by the introduction of the unfamiliar printed word pip: If the child has a mental scheme for strongly aspirated p, /$p^h$/, as in pat and one for i, /I/, as in inch, then he can combine these into a higher order scheme, /$p^h$I/. While holding this mental scheme in memory he can add a second mental scheme for an unreleased p, /p/, combining it with the first to get pip.

If during the late preoperational stage two mental schemes can be processed, then some type of reading activity can be expected. Barring such exceptions as Söderbergh's child, most children will be five or six years old in the period of late preoperations. But most beginning reading programs not only demand that a six-year-old be able to combine previous mental schemes in order to decode a word, but they expect him to be able to encode as well by blending the sounds together to gain meaning. Such a notion of reversibility, Piagetian theory tells us, is not achieved by the child until approximately age seven when the child is entering the stage of concrete operations and has displayed the notion of conservation of substance. Conservation refers to that dawning realization that substantial change may take place in a system without the alteration of fundamental characteristics. Of the abilities which contribute to the development of conservation, reversibility and de-centration (the ability to take other points of view into account) appear to have substantial significance for initial reading instruction. Reversibility allows the child to solve a problem by "undoing" some operation and then coming back to the starting point again, a mental

activity not demonstrated by a preoperational child. The inference can be made, then, that a child who has not achieved reversibility would not be expected to succeed in decoding-emphasis reading programs which require him to convert graphemes to phonemes and then validate his transformations through the reversible process of encoding. According to Pascual-Leone's notion of "M space," then, we can expect a five- or six-year-old to be able to combine mental schemes for /$p^h$ɪ/ and /p/ to get pip, but we must not jump to the conclusion that he will then be able to "read" in the sense of encoding meaning from his decoding activity.

De-centration, the other ability characteristic of conservation, is likewises assumed to be present in the child by most beginning reading programs. Just as in the Piagetian task in which the child is so impressed with the height of a column of water that he fails to notice how narrow it is, so the preoperational child will have difficulty in de-centering to the two seemingly unrelated aspects of words -- their sound-symbol relationship on the one hand and their meaning significance on the other. Often an analytic phonics reading program will put so much emphasis on sounding out every word that a child will decode a passage from a story without comprehending a word or even realizing that there is meaning contained in those words.

Ability to classify objects into equivalent sets would also seem to be a pre-requisite for success in a reading program based on rules of grapheme-phoneme relationships. Skill in classification is not demonstrated until Piaget's state of concrete operations (ages 7-11). Piaget (1952) contends that the individual must create

his own rules, assimilating new experiences into his own system and periodically accommodating by revising the system when he sees that it no longer serves adequately. Thus, preoperational children may successfully memorize the rules of grapheme-phoneme correspondences but will have difficulty in classifying situations to which they are appropriate. The problem for the child is to understand that in English one letter can have more than one sound, and the same sound can be represented by more than one letter. Elkind (1965) suggests that the child handles this classification problem by logically multiplying all sound and letter combinations. From those combinations, he chooses those that apply to English. Elkind gives the following example of combining sounds (s) and letters (l):

> Logical multiplication of the two would result in the following classes: s x l = sl, $s\bar{l}$, $\bar{s}l$, $\bar{s}\bar{l}$, or in words, the combination of the sound without the letter, the combination of the letter without the sound, and the combination of neither sound nor letter, i.e., the null class. (1965, p. 51)

To illustrate such a matrix, consider the letter c. At first this is associated with the sound /s/ (sl). Then gradually the child realizes that s also represents the sound /s/, ($s\bar{l}$), and that another sound /k/ is associated with the letter c also, ($\bar{s}l$). Elkind feels that repetition of this process over all letters and sounds would provide the child with all the possible combinations that occur in English phonics and thus yield the necessary elements for a mastery of reading.

Implications for Reading Diary Studies from Cognitive Theory

In my opinion the main conclusion to be drawn about reading instruction from cognitive theory is that progress will be difficult if not impossible prior to the attainment of concrete operations.

Such a conclusion will not be well received in light of the pressure by many parents to push reading instruction into kindergarten and preschool. Advocates of early reading instruction support their position by pointing to the existence of such early readers as Söderbergh's child. But reading methods which seem to work with preoperational children, such as that which Söderbergh used, stress word recognition and not the phonics method so popular with early reading advocates. With the word recognition method, however, there is no emphasis on getting the child to view words as composed of meaningful parts which can maintain their identities in changing environments. It is assumed that initially the child will be able to view words only as static entities without relations to other printed words. The intuitions behind such methods are in accord with cognitive theory. Any attempt to use an analytic phonics method with a preoperational child is courting failure because if a different sound is taught for each letter, and a number of complex rules are taught for each vowel, the child may be required to operate on five or six different elements at once in order to decipher a new word. Such a method would attempt to build a mental scheme for each letter and then assume the mental ability to combine them. From Pascual-Leone's model we see that methods such as these would appear to be beyond the mental functioning of the preoperational child.

The fact remains, though, that reading instruction begins in kindergarten and first grades regardless of the developmental level of the child. If in our reading diary studies we can note in detail what types of instructional plans can be built for children which will be useful for reading, given the strategies displayed by a

child at a particular developmental level, then a lot will be explained about reading acquisition during this crucial time of the transition between preoperational and concrete operational thought. A diary study based on cognitive theory requires an instructional method devoted to self-discovery. Doman's word recognition approach which Söderbergh used or the language experience approach which Jimmy's teacher used allowed each child the opportunity to define, develop, and revise his stragegies for reading word cards, strings of word cards, and finally stories comprised of word cards. In each case, then, the role of the teacher was to provide the child with appropriate materials. Being a linguist (as distinct from a psycholinguist), Söderbergh did not define the appropriateness of the materials she presented in a developmental context. She just sat back in her house and took notes on the "natural" course of reading acquisition. Unfortunately, however, there is not very much that is natural about the school setting. I considered myself lucky that the teacher (who was actually the district's educational psychologist) shared my bias towards cognitive theory and that he favored the language experience approach to teaching reading. The individualized instructional setting allowed me to take note of how Jimmy went about learning to read without interference from peers or from a reading system.

In kindergarten Jimmy had done poorly on his phonics-based reading readiness program and end-of-year test. By the time he began working with the district's educational psychologist in first-grade, he had already developed an aversion towards reading and had perfected many diversion tactics so as to avoid reading. His

reading strategies seemed to have fixated on upper- and lower-case alphabetic letter identification. He would write lion "Llion" and five minutes later not be able to read what he wrote. Piagetian tasks involving seriation, conservation, and classification revealed Jimmy to still be functioning at the intuitive level of preoperations. But definite transition tendencies were obvious (eg., He could seriate wooden cylinders standing up but not if they were lying flat, because then he would have to attend to matching the bottoms as well as to seriating the tops.). I expected that Jimmy would demonstrate the same kind of strategy of morphemic analysis that Söderbergh's child had displayed in the hittade example. But Jimmy had a great deal of trouble de-centering from his focus on only a limited amount of the information available. But one day he did display an understanding of de-centration. His excitement was obvious. He pointed to the final two letters of this and exclaimed, "Look, here's is!" This event was something which would not have been captured by miscue analysis and would have been left unexplained under the heading "all-or-none" phenomenon. But it was an important part of my reading diary study, for it had been preceded by carefully planned de-centering games played by the instructor with Jimmy (eg., finding all the "small" words that are contained in a "big" word).

This stragegy of morphemic analysis was further expanded a few days later by Jimmy's extension of his new understanding of part-whole relationships to the sound-symbol correspondence. It all began when Jimmy wrote My dinosaur is a do do bird on the blackboard. When the instructor said that there should be no space

between do do, Jimmy pointed out that it was pronounced do/do. The instructor was able to further Jimmy's insight into the fact that a word was made up of several parts, each having a distinct sound, by reminding him that his own name was pronounced Jim/my, yet written as one word.

Jimmy's ability to devise and perfect a strategy to use in word recognition was severely hampered by his undeveloped capacities for visual discrimination. He had a difficult time making use of distinctive features of letters (eg., b versus d) in both his reading and writing. Much of my reading diary data is full of observations of perceptual training activities. Practice in copying and tracing his word cards using left-to-right orientation, first on a chalkboard and then on paper, has helped improve his visual memory and scanning techniques, while copying words using the typewriter has provided an easy explanation of capital and small letters, thus taking care of the "Llion" confusion.

Perhaps the most noticeable change in Jimmy has been his attitude towards reading. From an attitude of frustration and defeat, Jimmy has gained confidence in his ability to unlock the puzzle behind those mysterious words. His mother puts it quite simply: He no longer wets his bed and eagerly seeks his older sister's help in reading a road-sign. Much of the motivating force comes from the language experience method of having the child learn to read from his own stories. The trend towards a strategy of reliance on context (see discussion of Figures One and Two above) is not surprising given the fact that Jimmy was the author of the context. But as skill in de-centering improves, and an understanding of part-

whole relationships grows, the strategies of analysis into morphemes and then analysis into phonemes has begun to appear on a trial-and-error basis.

Thus, with a learning theory rooted in cognitive theory, the teacher can follow the child's initial response with additional probes designed to test tentative hypotheses about the child's thinking, which can then be built into the instruction. An incorrect response, therefore, does not equal an error, but rather a miscue which reflects the child's information processing system. The researcher doing the reading diary study can then take note of these miscues as clues to the strategies employed by the child. Sequences of strategy formulation, revision, refinement, and reformulation can be noted in light of the learner's developmental level and the instructor's intervention. Hopefully the researcher and teacher can work as a team, the researcher sharing observations with the teacher who then can use this knowledge in the instructional program. Occasionally one person will be able to fulfill the roles of both researcher and teacher. Söderbergh's advantage of being a parent-researcher with no interference from an instructional system is obvious. What is needed is a Söderbergh-type diary study done in English and done from the framework of cognitive-developmental theory. Then, just as Piaget organized his diary notes on his children's cognitive development into a theory of general cognitive development, so a reading researcher can organize diary notes on the acquisition of a specific cognitive skill -- reading -- into a general theory of reading acquisition. Perhaps then we will be able to explain in detail what types of instructional sequences can be built for children which do not force them into operations for which they are not developmentally ready.

FOOTNOTES

1. Carroll (1970) gives the following skill sequence for the decoding emphasis advocates (The sequence for meaning proponents is given paranthetically):

   (1) 1. Knowledge of spoken language
   (6) 2. Ability to dissect spoken words into component sounds
   (7) 3. Recognition and discrimination of letters of the alphabet
   (8) 4. Use of left-to-right orientation
   (4) 5. Ability to recognize and employ patterns of highly probable correspondences between letters and sounds
   (3) 6. Using configuration and context cues to recognize printed words
   (2) 7. Understanding that printed words are signals for spoken words
   (5) 8. Ability to use inductive and deductive reasoning

2. There are very few examples of reading diary studies in the literature. Besides Söderbergh, the only ones I could find were Monroe (1932), MacKinnon (1959), and Steinberg (1973). Monroe's classic study comparing 415 children who had special reading defects with a control group of 101 "average" children is monumental in its scope and depth and most useful procedurally in its error classification system. It is essentially, however, nothing more than a case study with its own miscue scheme. The diary method was utilized by MacKinnon in his comparison of two sets of Canadian reading materials and in his exploration of the optimal grouping procedure for reading instruction. During the study detailed profiles were made of each reading session, but much of the richness of those raw data profiles was never tapped because MacKinnon based his conclusions on a battery of standardized tests. On the other hand, the "process aspect" is the strength of the Steinberg diary study. The early acquisition

of reading by Kimii Steinberg is vividly described by Danny and Miho Steinberg, but unfortunately most of their data has had to be reconstructed from memory and, therefore, is not amenable to the precise tools of miscue analysis.

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