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Technical Report No. 135

LEVELS OF PROCESSING:

THE STRATEGIC DEMANDS OF READING COMPREHENSION

Robert M. Schwartz

Oakland University

August 1979

Center for the Study of Reading

CENTER FOR THE STUDY OF READING

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Abstract

The research presented here is designed to measure the effect on reading

comprehension of forcing attention to different levels of analysis. Since

texts can be analyzed at a variety of levels, such as letters, spelling

patterns, words, etc., comprehension requires a basic strategic coordination

of processing activities. Forty second grade, fifth grade, and college

students read and recalled stories under four sets of orienting instructions.

These treatment conditions consisted of an intentional memory set and three

secondary orienting tasks differing in the amount of semantic processing

required. Adults' recall reflects the level of semantic analysis involved

in the orienting task; the younger groups were only affected by the least

semantic task. Beginning readers appear to lack the processing flexibility

necessary to establish goals for reading and efficiently achieve them.

Levels of Processing:

The Strategic Demands of Reading Comprehension

Written text can be analyzed at a variety of conceptual levels. For example, proofreaders are required to attend to spelling patterns within words while ignoring syntactic and semantic information which might lead them to overlook typographic errors. Teachers, on the other hand, often complain that abnormalities in the syntactic pattern of their students' papers make it difficult (or impossible) to focus on the thematic content of the papers. The various levels at which text can be analyzed, and the interdependence of these codes, require a basic coordination of processing activities for reading. The orchestration of mental processing appears to be a key component in the development of memory skills (Brown, 1978a; Flavell, 1970); therefore, the purpose of this study is to explore its importance in the development of reading comprehension.

Since one of the main goals of reading is the construction of a semantically well-integrated representation of the meaning aspects of the text, the subordination of other codes to this goal is required. As the information processing system for reading develops toward fluency, there should be increased efficiency in the construction of the semantic representation. This in itself could constitute one definition of reading fluency. Secondary attentional tasks imposed during reading can effect the representation of the thematic structure in memory. The extent of the effects produced by various tasks provides a possible test of the efficiency of processing.

Attentional manipulations in reading are particularly interesting since secondary tasks can direct processing to various aspects of the written code. These smaller elements, such as features, letters, or words, appear to be logical constituents of the semantic content and are often sequenced in a type of learning hierarchy for instructional purposes. Therefore, if developmental differences exist in the information processing of beginning versus fluent readers, these differences should be reflected in memorial effects of orienting tasks at various code levels.

An interactive view of information use in reading (Levy, 1977; Rumelhart, 1976) suggests that all codes can contribute to reaching a criterion decision among alternative possibilities at any one code level. In fluent reading, where attention is directed at thematic analysis, this interactive system should provide optimum efficiency for construction of a semantic representation. However, when attention at the thematic level is disrupted and criterion decisions required at other code levels, then a serial processing component is introduced. The convergence of information necessary for a decision at a constituent or lower level code will not necessarily yield sufficient information to construct an integrated semantic representation. Rather, the constituent decision must be subordinated to the goal of comprehension so that the information obtained is subsequently utilized.

This means-end subordination of processing constitutes the definition of strategic behavior (Flavell, 1970). Brown (1975, 1978a) indicates that metacognitive aspects of strategic behavior are likely to result in developmental differences on tasks requiring strategic coordination. Thus, part of

the difficulty experienced by beginners and poor readers may result from

the frequent need to coordinate criterion decisions made at different code

levels.

The research presented here is designed to measure the effect on

reading comprehension of forcing attention to different levels of analysis.

These levels represent codes available in written text and are analogous

to processing involved in mediated word recognition (LaBerge & Samuels,

1974). Within an incidental learning paradigm, the shift to lower level or

less semantic tasks should result in less recall (Anderson, 1970; Craik

& Lockhart, 1972; LaBerge & Samuels, 1974). Reading, however, differs from

the situations generally investigated under this paradigm in that component

analysis constitutes an integral rather than incidental part of the task.

Therefore, specific orienting tasks are introduced as secondary to a general

goal of story recall. This establishes a situation in which processing

induced by the orienting activity can either enhance or retard comprehension

depending on its compatibility with the subject's normal processing mode

and strategic ability.

Four treatment conditions are compared in the present research. The

basic intentional memory set occurs in isolation as the normal reading

condition, but also in combination with the remaining tasks. These latter

conditions modify the text materials such that every fourth word of four

or more letters becomes an operative site for the following tasks: (a)

Word Choice--a pair of words is presented above and below the target site.

The task requires semantic analysis of the alternatives in terms of context

to choose the appropriate words. (b) Reverse Reading--the target word is raised above the normal line of text and typed in reverse sequence beginning with the last letter of the word. This task approximates mediated word recognition in that both context and orthographic cues contribute to identification of an unfamiliar printed stimulus. (c) Letter Match--each target word is presented above a set of randomly selected letters, one to four of which also appear in the target word. The subject is to draw a line through each letter in the random set which also appears in the target word. This condition lacks the semantic component of the previous two tasks while focusing attention to the orthographic level. (See examples in Table 1.)

Insert Table 1 about here.

The main hypothesis derived from the level-of-processing paradigm (Craik & Lockhart, 1972) suggests that the three orienting tasks will produce different levels of recall based on the amount of semantic processing induced; thus, the ordering should be: word choice > reversed word > letter match. The relationship of performance on the normal reading condition to the other orienting tasks depends on the type of processing induced by intentionality. Since fluent reading requires criterion decisions at a semantic level (LaBerge & Samuels, 1974; Rumelhart, 1976), performance of skilled readers should be similar in the intentional and word choice conditions.

For beginning readers, attentional processing is necessary at lower
code levels. The necessity to coordinate information resulting from these
intermediate level decisions will impose strategic demands similar to those
involved in the non-semantic orienting tasks. Therefore, intentionality
may fail to invoke appropriate forms of semantic processing (Murphy & Brown,
1975). Given these considerations, beginning readers should perform better
in the word choice condition than under simple intentional learning
instructions, since the former insures some degree of semantic processing.

Method

Design. The four treatment conditions are a within-subjects factor.
The various combinations of story x treatment and trial x treatment are
counterbalanced, using a Greco-Latin Square design that is replicated at
each ability level--college, and grades two and five. The use of different
stories with each grade prevents direct comparisons across grades and thus
establishes three separate experiments. Since all other aspects are
identical, these studies are reported and discussed concurrently.

In each study, retention of the task materials was the dependent
measure, assessed through free recall scores. The total amount of infor-
mation recalled as a function of treatment conditions was of interest,
as were differences in the overall pattern of results across ability
levels.

Subjects. Forty subjects from each of the three grade levels--second,
fifth, and college undergraduates--participated in the study. Grade school
subjects were from three elementary buildings of the local public school

district. College subjects were enrolled in sections of introductory

educational psychology courses at the University of Illinois, Urbana-

Champaign.

Grade school students receiving remedial instruction in reading were

eliminated from the subject pool, with further screening of subjects con-

ducted through a pre-test on vocabulary recognition. Two subjects who

failed to qualify on this vocabulary criterion were eliminated from the

testing sample.

Materials. The materials for this experiment consisted of stories at

each grade level, a recognition test comprised of single words sampled

from the story vocabularies, and random digit sets for use in a distractor

task. Of these items, the stories and their variations for different

treatment conditions are the most crucial elements. Three sets of five

passages were selected from comprehension tests, instructional materials,

and research protocols designed for use with the appropriate grade subjects.

Story selection was limited to sequential narratives rather than descriptive

or topical, factual accounts, since the pilot data on the three types of

passages indicated that recall of the latter two forms was relatively low.

Four stories from each set were designated as target passages for use

in combination with the treatment conditions. The remaining story was

tape-recorded for use in an aural practice trial. The target passages

varied in length, both within and between grade levels, ranging from 65

to 67, 92 to 100, and 97 to 115 words for second, fifth, and college levels,

respectively.

A separate study (Schwartz, 1978) was conducted to determine an idea unit structure for these stories against which subjects' recall protocols could be scored. In that study, two segmentation procedures were contrasted, that of Johnson's (1970) pausal units and a modification of Spencer's (1974) functional units. Both procedures yielded an idea structure that was highly replicable across groups. The functional unit segmentation is utilized in this study since it resulted in approximately twice as many scoring units in the idea structure as Johnson's procedure. These smaller units should enable a more precise scoring, requiring less inferencing by scorers in judging whether a given idea unit is represented in a subject's recall. Some additional support for this decision and validation of the functional units is provided by the fact that 88% of the terminal words identified in the pausal system also constitute terminal words in the functional segmentation. The final idea structure for the passages varied in the number of units identified both within and across grades. These range from 16 to 18, 21 to 39, and 21 to 35 for second, fifth grade, and college levels, respectively.

Treatment conditions were embedded within stories by designating specific target words in each passage as operative sites. Every fourth word or four or more letters served as a target site for the three secondary orienting tasks. Proper names were included in the spacing of target words but could not in themselves serve as targets. The final operative site in a passage had to precede one spacing unit of four-letter words.

This last requirement allowed subjects to rapidly conclude the passage and thus terminate the exposure period.

In the Normal Reading condition, no modification of target sites occurred; the passage was centered on the page with four spacing units between lines. In the other three conditions, the same arrangement was used, with target words replaced by underlining in the appropriate position.

The Word Choice condition was created by printing the target word and a distractor word above and below the target site. Distractors were syntactically compatible, but semantically unacceptable, within the context of the story. The positional placement of these alternatives above or below the site was randomly decided for each pair.

For the Reversed Reading condition, the appropriate target word, printed above the target position in a reversed sequence, began with the last letter of the word and ended in the right-most position with the first letter of the word. The final orienting condition, Letter Matching, was produced by printing the target word a line above its site and an equal number of randomly arranged letters below the line, one to four of which were also in the target word. Examples of these formats are presented in Table 1.

The word recognition tests were based on a set of twenty words sampled from the second or fifth grade passages, respectively, the samples re- stricted to non-target words of four or more letters. These items were then typed on 3 x 5 cards, one word per card.

Each of five sets of random digits, selected for use as an interpolated task between passage presentation and recall, consisted of three separate strings of four, five, and six digits, respectively. The last digit of each string was omitted in use with second and fifth grade subjects, yielding trials of three, four, and five digits.

Procedure. Subjects were tested individually in sessions lasting approximately one-half hour. Each testing session consisted of five recall segments, one aural practice trial, and the four treatment conditions. The sequence of events within a segment was: orienting instructions for the treatment condition, presentation of the story, reversed digit span task, and free recall. The isolated word recognition test was administered prior to introduction of the experimental tasks. Each of the twenty words from the appropriate grade sample were shown briefly (approximately a two-second presentation). Students mispronouncing more than two items were eliminated from the sample and excused from the testing session after a brief exposure to the treatment materials.

The study was introduced as a developmental investigation of reading skills, using subjects from the three grade levels. It was explained that there would be a number of different segments; the sequence of events was subsequently described, followed by a more detailed explanation of the reverse digit span task and the recall instructions, stressing the need for recall of all ideas from the story. Subjects were instructed to retell the story as completely as possible using their own words, or phrases from the story itself.

Participants were then told that there would first be a warm-up trial
on which to practice the different steps in the procedure. For this, the
practice story was recorded on tape; subjects were instructed to listen
carefully so that they could retell the story later. They were also informed
that there would be some time (fifteen seconds) between the end of the story
and the digit task; they were to use this time to think about what happened
in the passage.

The reversed digit span task was used as an interpolated task between
story presentation and recall to disrupt rehearsal of the stories' surface
structure. The subjects listened to a string of digits and then attempted
to repeat them in reverse order. Following each story, subjects heard three
digit strings of different lengths, increasing by one digit per string.
They attempted to repeat the numbers in reverse order immediately after
having heard each string. For second and fifth grade subjects, the first
string was three digits, while college subjects began with four digits.

Story recall began immediately after the third digit set. Subjects
were allowed as much time as they needed to recall the story. When it
appeared that they had completed their statements, the experimenter prompted
them twice with the following statement: "See if you can remember anything
else about the story." (Pause to let the child respond.) "Can you think of
anything else about the story?"

Subjects were assigned to one of four treatment sets as they entered
the study. These sets counterbalanced the sequence of treatment and story
x treatment combinations. Prior to each recall segment, the experimenter

presented orienting instructions for the appropriate condition. When a secondary orienting task was involved, subjects were shown a sentence with two target sites and asked to perform the secondary task; corrective feedback was given, if necessary.

Just prior to presentation of the target story, subjects were again reminded that they would have to retell the story later; participants read each story orally, pausing when necessary to perform the secondary task. The experimenter corrected misreadings or incorrect responses. Upon completion of the story the text was removed, and the remainder of the segment completed as described above.

Results

Two parallel sets of analyses were conducted. The first set deals with recall at the level of ideas expressed in the stories, while the second examines recall of individual words that comprise the target sites of the secondary orienting tasks. Both levels of analysis explore the effects of the orienting instructions on recall.

Idea Units

Idea unit scores were obtained by comparing subjects' free recall protocols to a pre-established idea structure for each passage. A rater judged whether or not each unit in the idea structure appeared in the subject's protocol; any approximation of a unit was accepted. A second rater scored a random sample of 20% of the subjects at each grade level.

A correlation of the scores assigned to each story in this sample yielded an interrater reliability of .87.

The main issue of the analysis was the pattern of scores obtained across treatment conditions--Normal Reading, Word Choice, Reversed Reading, and Letter Match. The means and standard deviations for these conditions at each grade level are shown in Table 2. The left half of Figures 1 to 3 graphically present these patterns of results across tasks for college, fifth, and second grade groups, respectively.

Insert Table 2 and Figures 1 to 3 about here.

An analysis of variance based on the Greco-Latin square design (Winer, 1962) was conducted at each grade level. The analyses included the four levels of treatments, stories and trials (first to fourth) as within-subjects variation and also the between-groups effect. Only for college subjects did any of these interaction effects approach significance, with a residual within-subjects value of $F(3,108) = 2.7$, $p < .10$.

At each grade level there was a significant treatment effect, $p < .001$, and $F(3,108)$ values of 15.0, 6.2, and 7.4 for college, fifth, and second grades, respectively. There were also significant variations in story difficulty, $p < .001$, $F(3,108) = 20.1$, 26.0, 32.7, using the same sequence of grades. The trial effect was significant for second grade and college subjects with $F(3,108) = 4.3$, $p < .01$, and $F(3,108) = 9.4$, $p < .001$, respectively, and reflects increased recall in later trials. The means for trials (first to fourth) were 8.4, 9.1, 9.5, 10.0 and 5.8, 8.0, 8.4, 8.8 for second grade and college subjects, respectively.

The means of the four treatment conditions shown in Table 2 were subjected to Newman-Keuls tests. Results indicated that for college subjects the means were ranked as follows: normal reading > reversed reading > letter match, p < .05. The word choice scores fall between the means for normal and reversed reading but do not differ significantly from either.

For both fifth and second grade subjects the only significant treatment effect occurred between the letter match group and the other three conditions, the letter match task resulting in less idea unit recall.

The contrasts which proved significant at the .05 level are indicated above the graphs on the left side of Figures 1 to 3. Treatments underlined by a common line do not differ from each other; treatments not underlined by a common line do differ.

Target Words

To further investigate the effects of different orienting instructions, the subjects' recall data were rescored in order to obtain a count of the number of target words which were utilized in retelling the story. Credit was given for variations on the target words, such as pluralization or verb tense change.

As in the idea unit analysis, the primary concern was the pattern of results across treatment conditions. The focus on target words should reflect local effects of treatment conditions similar to word memory results in the level of processing literature (Craik & Tulving, 1975). The means and standard deviations of the number of target words recalled are presented by grade level and treatment condition in Table 3. The right half of

Figures 1 to 3 illustrate the pattern of means across tasks for college,

fifth, and second grade groups, respectively.

Insert Table 3 about here.

As in the previous analysis, there are no significant interaction

effects. Story variation is significant at each grade level, p < .001,

and $F(3,108)$ = 30.8, 10.7, 22.0, for college, fifth, and second grades,

respectively. For second grade subjects there is a strong effect due to

trials, $F(3,108)$ = 5.55, p < .001. The means per trial are 3.0, 3.6, 4.0,

and 3.8 for trials 1 to 4 respectively. Similarly, for college subjects

the trials effect is significant, $F(3,108)$ = 4.09, p < .01; the means per

trial were 3.4, 3.4, 4.4, and 3.6, respectively for trials 1 to 4. The

treatment effects are significant for each grade level with p < .005 and

$F(3,108)$ = 15.9, 6.2, and 4.6 for college, fifth, and second grades,

respectively.

The Newman-Keuls procedure was used to test for significant differences

in treatment means. For college students the pattern of results was word

choice = reversed reading > normal reading > letter match, p < .05. That

is, relative to the normal reading condition, where the target words receive

no special emphasis, subjects recall more of these words in the tasks which

center on the words and fewer when focusing on the letters of the word.

For fifth grade subjects only the word choice condition exceeds scores

from normal reading. Both the word choice and the reversed reading condition

exceed the letter match task; normal reading does not.

For second grade subjects none of the treatment conditions differs

significantly from normal reading; however, scores on the reversed reading

and word choice tasks do exceed those from the letter match task, $p < .05$.

Again, the contrasts which proved significant at the .05 level are

indicated above the graphs on the right side of Figures 1 to 3. Treatments

underlined by a common line do not differ from each other; treatments not

underlined by a common line do differ.

Discussion

The present experiment showed that for adult fluent readers--and to

a lesser extent, for children--attentional orienting tasks affect the amount

and type of information recalled from reading a paragraph. In order to

interpret these findings, the results will be discussed in terms of the

levels-of-processing conceptual framework and issues related to the

development of strategic behavior. A summary section will reconsider

the initial speculation about models of reading fluency and suggest impli-

cations for instruction geared toward the development of fluent processing.

Levels of Processing

The orienting tasks have their clearest effect on recall by fluent

adult readers. As shown in Figure 1, a college subject's idea unit recall

tends to vary as a function of the treatment condition. The treatments

differ both in the level at which criterion decisions are required and the

extent of semantic analysis involved in the decision. While these two

factors are closely related, they are not identical. The criterion level

represents the application of attentional processing to reach a decision at a particular code level. Semantic processing generates one source of information that may contribute to the criterion decision.

Both the word choice and the reversed reading tasks require criterion decisions at the word level; however, they differ to the extent that the decisions depend on semantic analysis. The word choice task presents two relatively familiar, and therefore easily decodable words, with the selection of the appropriate item solely dependent on semantic, top-down processing of the words in context. The reversed reading manipulation is similar to the recognition of an unfamiliar word in context. Cues are available from the previous semantic and syntactic information, with the reversal of letter sequence creating a more difficult orthographic analysis. Different combinations of top-down and bottom-up information can produce an appropriate decision, but overall, this condition is less dependent on semantic information than is the word choice decision.

For adults, this difference in the extent of semantic analysis involved in word level decisions results in a slightly better (though not statistically significant) idea unit recall for the word choice task. This difference is also reflected in the fact that the normal reading condition resulted in significantly better (p < .05) idea unit recall than the reversed reading task, but was statistically equivalent to word choice performance on this measure.

The superiority of idea unit recall by adults in the normal reading format is attributed to processing centered on criterion decisions at a thematic level. That is, processing of letters, words, and phrases are subordinate to decisions related to idea structure of the passage. While this optimum mode of processing may be somewhat hampered by competing attentional demands within the experiment (e.g., articulation required for oral reading), the absences of secondary orienting activities should facilitate this type of semantic analysis. It is likely that different types of semantic processing can constitute the criterion decision at this level. Imagery, elaboration, and inferencing are some of the possible candidates, but the current research provides no way of distinguishing among them. Thieman (1976) demonstrates that such distinctions at the semantic level can affect memory for lexical items.

If the difference between criterion decisions at the word level and those at the thematic level were only a quantitative shift in the amount of semantic analysis, then it would not be necessary to differentiate criterion levels. However, the results of the target word analysis suggest a qualitative difference in the recalls resulting from the initial orientation (Figure 1).

In retelling the stories, adults mention significantly more target words when the initial processing was under word choice or reversed reading conditions than the normal reading mode. Subjects were not specifically asked to recall the target word, but rather to use words or phrases from the story when possible in retelling the ideas from the story. Thus,

the greater use of target words when criterion decisions were made at the word level suggests that these words form a type of scaffolding about which the idea structure is formed. This interpretation is consistent with the view expressed by Soviet psychologists--that the head remembers what the head does (Meacham, 1972; Brown, 1978b). The use of contextual information to make word decisions creates an incidental semantic representation of the text.

This effect is not due simply to the highlighting of target words by the orienting task, since the letter match condition attentuates both idea unit and target word recall. The criterion decisions at the orthographic level required in this task apparently disrupt processing of the idea structure. Whether or not the orthographic analysis yields a strong memory trace for the target words, these words were not included in the subjects' recall. This suggests that they were not integrated with a representation of thematic information. To summarize: for adult fluent readers, recall depends both on the level at which criterion decisions are made while processing text, and the contribution of semantic processing to that criterion decision.

For younger subjects, the pattern of results across orienting tasks is less differentiated. The only difference in idea unit recall results from the disruption caused by the letter match task. This shift to criterion decisions at the letter level interferes with processing of thematic information as it did for college subjects.

It was initially hypothesized that for the youngest group, the word choice task would induce greater semantic analysis than they typically

engage in during normal reading. The expected increase in idea unit recall, however, was not obtained. Instead, it appears that these beginning readers normally function in a manner similar to that induced by the word choice and reversed reading conditions. In other words, they focus attention on making word level decisions. This orientation toward the word level does not mean that children are insensitive to syntactic or semantic information. Several studies have indicated that these code levels are used in reaching word recognition decisions (Klein, Klein, & Bertino, 1974; Neville & Pugh, 1976; Weber, 1970). The critical difference between beginning and fluent readers appears to be the level at which criterion decisions are focused.

This difference is further illustrated by the target word analysis. As shown in Figure 3, the second grade subjects do not mention significantly more target words in recall under word choice or reversed reading orientations than in the normal reading condition. While the subjects are able to make the appropriate responses to the orienting task, it does not appear that the target words represent sites for any type of unique processing. For adults, the word level decisions enhance recall of these items; for second graders, the processing of each word (or many of the words) requires similar use of information to make word decisions, so no local facilitation of target word recall is obtained. Fifth grade subjects show signs of a transition toward adult patterns of performance. For them, the word choice task resulted in greater target word recall than in the normal reading condition.

As reading skill develops, the processing of written codes should

become more differentiated, thus allowing the criterion focus to be estab-

lished at the thematic level. As hypothesized for adults on the word level

tasks, younger subjects' idea level representations of the stories are

an incidental outcome of using contextual information to make word recog-

nition decisions. This type of incidental representation may be sufficient

for comprehension of simple stories that match well with the reader's

knowledge of the world (Stein & Glenn, 1978), but for more complex or

unfamiliar material, strategic elaboration of the idea unit structure may

become more important.

Implications for Instructional Issues

The debate over bottom-up versus top-down models of information pro-

cessing in reading has generally been conceded to an interactive view.

Rumelhart's (1976) model provides a nice illustration of what this inter-

active process might involve in fluent reading. Independent knowledge

sources operate in parallel on the various information codes available

in written text. The intermediate results of these analyses are coordinated

by a central decision processor which evaluates the probability of incoming

hypotheses and provides feedback which directs further processing.

The major instructional issues raised by this description are: (a) how

would one foster the development of an interactive system, and (b) what

factors can account for the variations in performance that are observed

among students? While these are extremely complex questions, the perspective

derived from the current research attempts to address these issues. The

illustration that differences exist in the level at which interactive

processing can occur suggests that intermediate levels of instruction might

foster the coordination of information around different criterion levels.

Indeed, the interactive use of information at the word level appears to be

a major objective of many primary level basal programs. For example, in

the third grade workbook accompanying the Houghton-Mifflin reading series

(Durr, LePere, & Brown, 1974), 44% of the exercises deal specifically with

word level decisions, while only 26% require criterion decisions about

larger units.

What appears to be necessary are more and better techniques for inducing

students to subordinate word level decisions to meaning acquisition. Again,

this is where the level-of-processing concepts intersect issues arising

from the consideration of strategic behavior. In a report of interview

data concerning the goal of school-related reading, Canney & Winograd (1979)

indicated that a sizeable proportion of poor readers from second to eighth

grades, in contrast with above average readers, did not conceptualize

reading in terms of meaning acquisition; rather, they focused on lower level

constituent codes, mainly word recognition. This lack of metacognitive

awareness of the goal of reading would prevent any movement interactive

processing at a thematic level.

This issue is closely related to the skill hierarchy approach to

reading instruction. To the extent that the subskill becomes the criterion

focus for attention, it will distract from comprehension; this is

demonstrated by the adult subjects' performance in the reversed reading

and letter match conditions. To promote integration of the subskill with

existing comprehension processes, it should be introduced in the context

of a meaningful activity (Meacham, 1972; Brown, 1978b). Furthermore, it

would be advantageous to utilize content materials from an area in which

the student is familiar. By working on skill development in individually-

selected content fields, one can insure that students have top-down strategies

available and thus will be better able to subordinate lower level criterion

decisions to meaning. Practice in this type of situation should most

rapidly integrate subskills into the interactive system which defines

reading fluency.

It is premature to elaborate instructional procedures based on present

perspectives concerned with the development of reading fluency. However,

the issue is clearly relevant to instructional practices and therefore

further research in this area is warranted.

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Table 1

Form of Orienting Tasks

Example from one sentence in a fifth grade story:

Normal Reading

The long day without rest and the running after the deer was too

much for Warner's strength.

Word Choice

The $\frac{long}{other}$ day without rest and the running $\frac{after}{from}$ the deer was too

much for Warner's $\frac{clothes}{strength}$.

Reverse Reading

The $\frac{gnol}{}$ day without rest and the running $\frac{retfa}{}$ the deer was too

much for Warner's $\frac{htgnerts}{}$.

Letter Match

The $\frac{long}{ziol}$ day without rest and the running $\frac{after}{hafor}$ the deer was too

much for Warner's $\frac{strength}{nesadjiu}$.

Table 2

Means and Standard Deviations of Number of Idea Units Recalled

Group		Treatments			
		Normal Reading	Word Choice	Reversed	Letter Match
Second	M	10.2	9.5	9.4	8.0
	SD	4.2	2.8	3.4	3.7
Fifth	M	11.8	11.3	11.3	9.4
	SD	4.3	4.6	4.2	4.7
College	M	9.6	8.5	7.4	5.6
	SD	4.1	4.4	4.6	4.0

Table 3

Means and Standard Deviations of Target Words Recalled

Grade		Treatments			
		Normal Reading	Word Choice	Reversed	Letter Match
Second	M	3.5	3.8	4.0	3.1
	SD	1.9	1.2	1.9	1.6
Fifth	M	4.8	5.6	5.0	4.2
	SD	2.0	2.1	1.7	2.4
College	M	3.4	4.8	4.2	2.6
	SD	2.3	2.8	2.2	1.8

Figure Captions

Figure 1. Recall as a function of orienting task: college subjects. (Treatments above graphs underlined by a common line do not differ from each other; treatments not underlined by a common line do differ, $p < .05$.)

Figure 2. Recall as a function of orienting task: fifth grade subjects. (Treatments above graphs underlined by a common line do not differ from each other; treatments not underlined by a common line do differ, $p < .05$.)
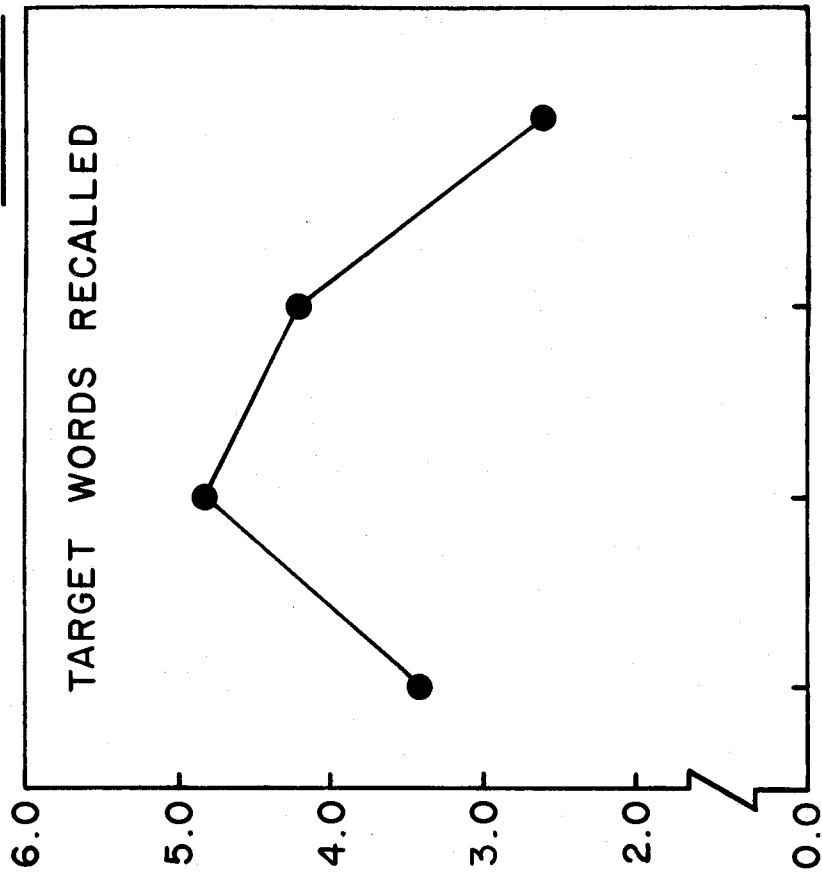
Figure 3. Recall as a function of orienting task: second grade subjects. (Treatments above graphs underlined by a common line do not differ from each other; treatments not underlined by a common line do differ, $p < .05$.)

TARGET WORDS RECALLED
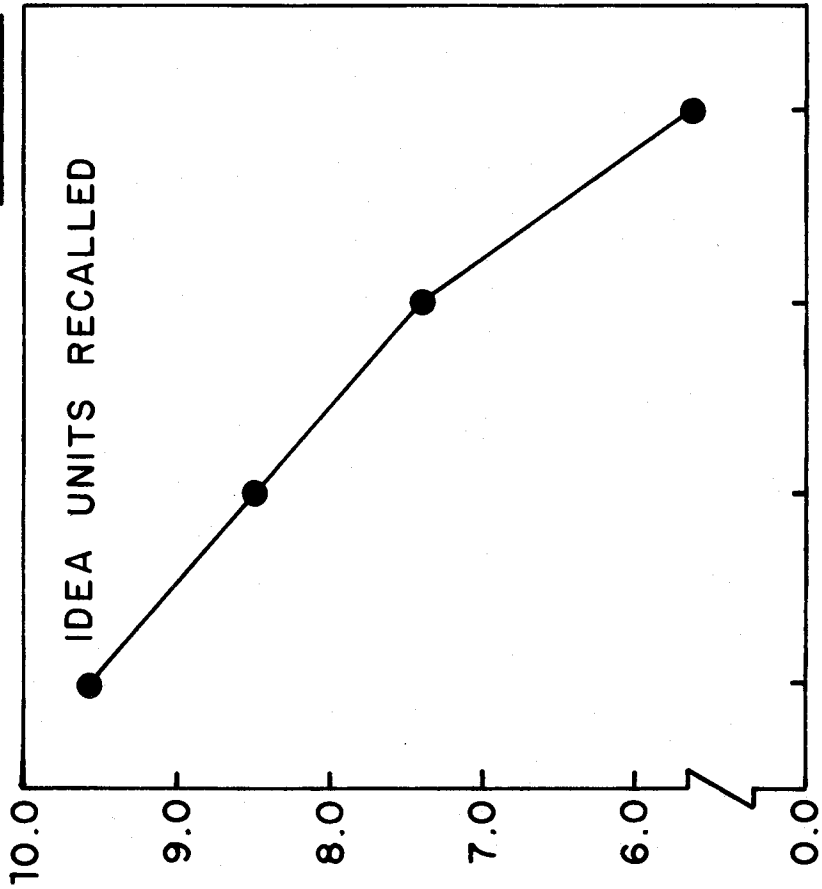
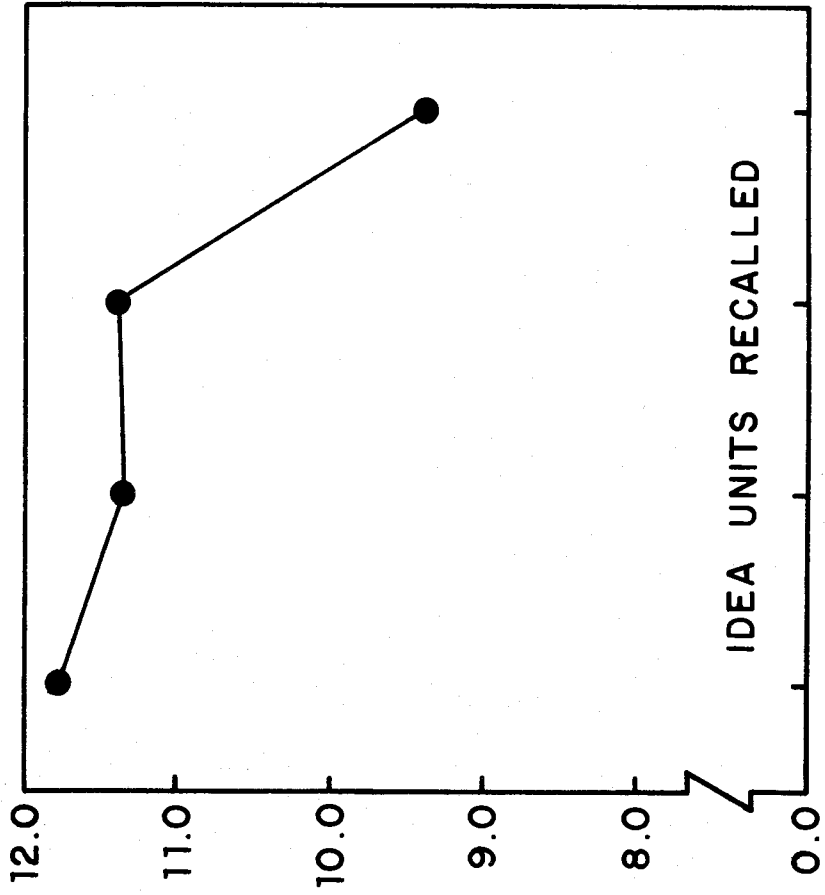Word Choice   Reverse Reading   Normal Reading   Letter Match

6.0
5.0
4.0
3.0
2.0
0.0

NORMAL READING   WORD CHOICE   REVERSE READING   LETTER MATCH

IDEA UNITS RECALLED

Normal Reading   Word Choice   Reverse Reading   Letter Match

10.0
9.0
8.0
7.0
6.0
0.0

NORMAL READING   WORD CHOICE   REVERSE READING   LETTER MATCH

TARGET WORDS RECALLED

IDEA UNITS RECALLED

TARGET WORDS RECALLED

y-axis: 6.0, 5.0, 4.0, 3.0, 2.0, 0.0
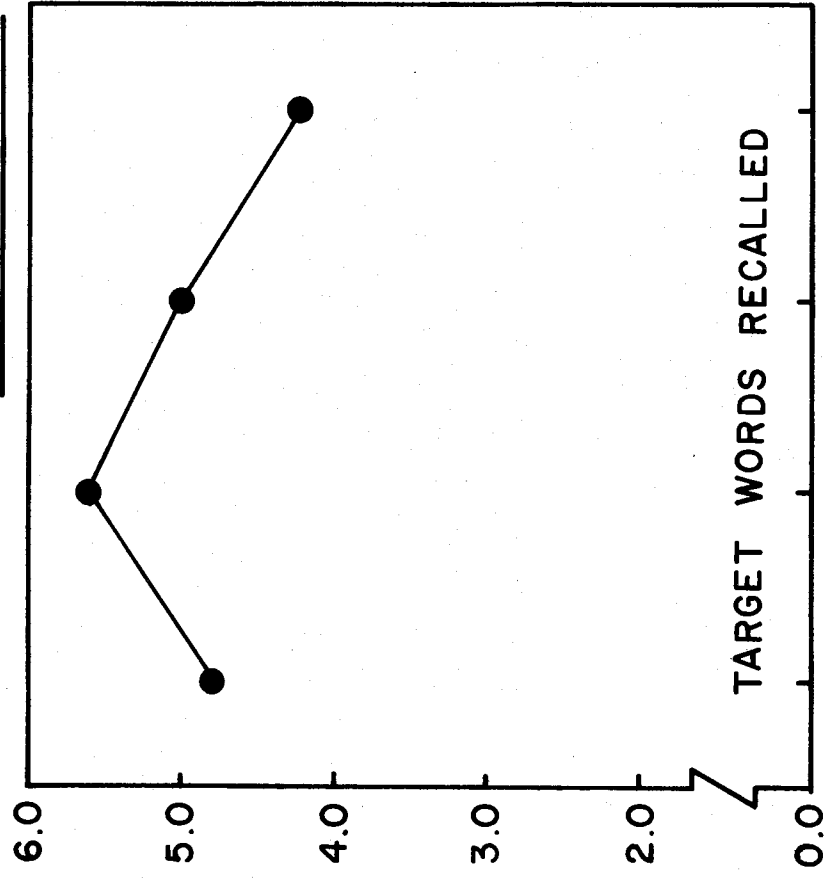
x-axis: NORMAL READING, WORD CHOICE, REVERSE READING, LETTER MATCH
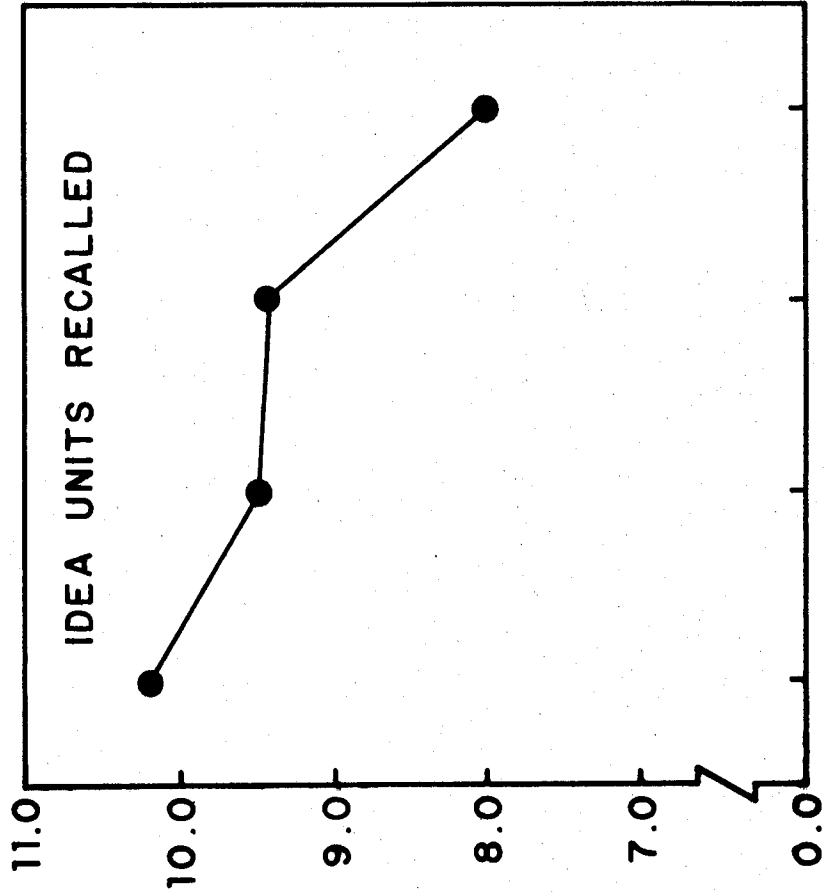
Top labels: Reverse Reading, Word Choice, Normal Reading, Letter Match

IDEA UNITS RECALLED

y-axis: 11.0, 10.0, 9.0, 8.0, 7.0, 0.0

x-axis: NORMAL READING, WORD CHOICE, REVERSE READING, LETTER MATCH

Top labels: Normal Reading, Word Choice, Reverse Reading, Letter Match
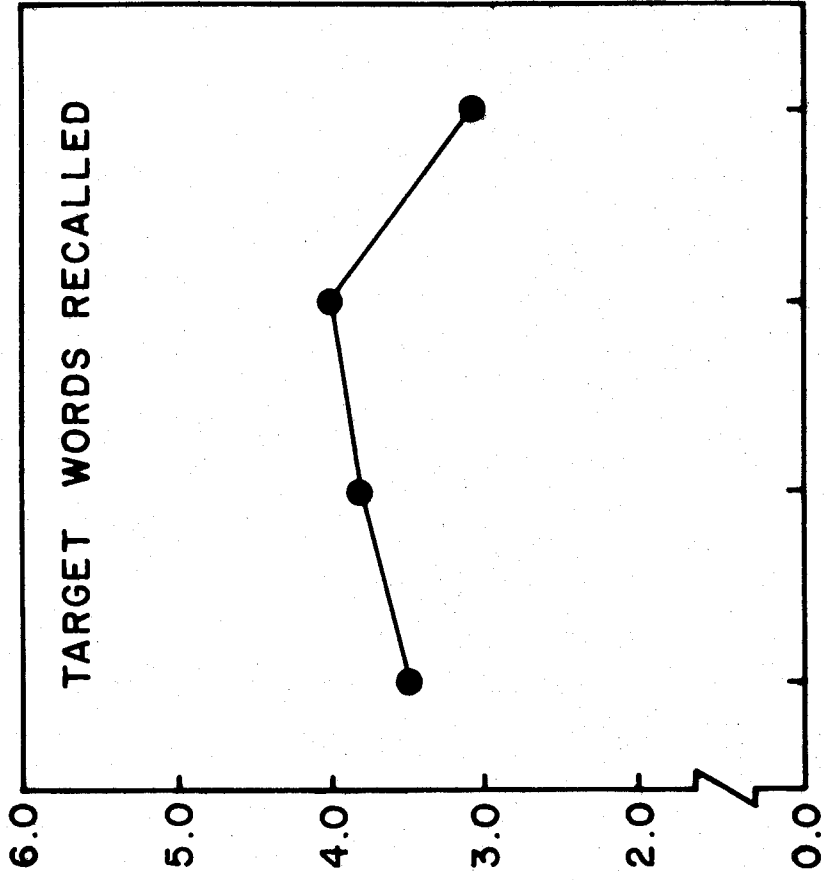
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