DOCUMENT RESUME

ED 046 679 RE 003 307

AUTHOR Frase, Lawrence T.; Washington, Ernest D.
TITLE Children's Ability to Comprehend Text.
INSTITUTION Bell Telephone Labs., Inc., Murray Hill, N.J. Learning and Instructional Processes.
PUB DATE 70
NOTE 13p.

EDRS PRICE EDRS Price MF-$0.65 HC-$3.29
DESCRIPTORS *Comprehension, Elementary School Students, Perception, *Reading Comprehension, *Reading Processes, *Reading Research, Sentence Structure, *Syntax

ABSTRACT

The perception of proximal relationships (directly stated in a sentence) or remote relationships (requiring sentences to be combined) in reading materials was studied to see whether children have the same difficulties in detecting the relationships as do adults. The subjects were 22 children from grades 2, 4, and 5 who were given stories to read and then were asked to answer five problem statements about the stories. It was found that children do indeed have difficulties similar to those of adults, that errors increased sharply if more than one sentence had to be processed, that ability to detect both proximal and remote relationships increased with age, and that textual organization made comprehension of relationships easier. References are included. (MS)

Childrens' Ability to Comprehend Text

Lawrence T. Frase
Bell Telephone Laboratories
and
Ernest D. Washington
Rutgers University (New Brunswick)

ABSTRACT

Learning complex verbal structures depends upon the ability to perceive relations between items in a text. A relationship might be proximal (i.e., stated directly in a sentence), or it might be remote (i.e., sentences have to be combined to yield a relationship between two items). Adults have difficulty perceiving and learning relationships if they are remote or if the text is not well organized. Short-term processing limitations can account for these problems in comprehension.

The present study determined that primary school children have similar difficulties. Children in Grades 2, 4 and 5 verified statements by reading stories that were organized in different ways. The problem sentences stated a relationship between two items, and the children affirmed or denied the statements by reading. The statements could be verified by processing one, two or three sentences.

Ability to detect proximal and remote relationships increased with grade. Even in Grade 5, however, 41% of the children erred on statements involving just two sentences. Children in all grades could verify relationships that required only one sentence, but errors increased sharply if more than one sentence had to be processed. Relationships were easier to verify if the text was organized in some way, even if the sentences that had to be processed were not consecutive in the text. For 2nd graders (unlike 4th and 5th graders), the ability to detect a relationship involving three sentences was especially low if statements involving one sentence had been verified first.

These relational activities are of special interest for text learning, for the quality and extent of such activities during reading determines the level of knowledge that a person attains. Factors such as syntactic and semantic transformations can be explored in terms of whether they facilitate or inhibit the perception of a remote relationship.

Childrens' Ability to Comprehend Text

Lawrence T. Frase

Bell Telephone Laboratories

and

Ernest D. Washington

Rutgers University (New Brunswick)

For adults, the ability to detect a relationship between two items in a text depends upon the number of sentences that must be combined to determine that relationship (Frase, 1969b). The organization of sentences also determines whether adults will perceive remote relationships (Frase, 1970) and how rapidly a text will be learned (Frase, 1969a). The purpose of this study was to determine if primary school children are subject to similar organizational and structural constraints, and if not, how they differ from adults.

Levels of reading comprehension can be defined by the number of items needed to specify a relationship between two items, i.e., by the number of items that mediate the relationship. The levels investigated in this study involved detecting relationships within sentences (in which no mediator was needed), or between two or three sentences (in which one or two items mediated a relationship). For instance, consider the following sentences. "The red thing was a bag. The bag was full of money." To answer the question, "Was the red thing a bag?" requires one sentence. To answer, "Was the red thing full of money?" requires two sentences. Both questions

require that the reader qualify the concept "red thing" according to the information in the text, but for the latter question the relationship between "red thing" and "full of money" is mediated by "bag". Combining information in this way is an important intellectual act. If organized knowledge results from the interweaving of remote relationships within a text, then the quality and extent of such relational activities must in part determine the elaboration of complex cognitive structures.

Method

Subjects

The Ss were 22 public school children from the 2nd, 4th and 5th grades in New Brunswick, N. J.[1]

Materials

Three different stories were constructed, each describing two concepts. There were four binary attributes. For example; "Tommy found a big thing. The big thing was green. The green thing was a box. The box was empty. He found a small thing. The small thing was red. The red thing was a bag. The bag was full of money." In this example, the attributes are size, color, object and content.

Organization of sentences.--The stories were typed on separate sheets of 8 1/2" x 11" paper. The sentences were sequenced in the following three ways: Concept organization (as in

the text example above); Attribute organization ("Tommy found a big thing. He found a small thing. The big thing was green. The small thing was red." etc.); and Scrambled organization (in which the order of sentences favored neither the Attribute nor the Concept organization, i.e., the sentences were not organized consistently. Brief incidental introductory material was typed at the beginning of each story.

Level of problem.--Five problem statements were typed below each story. The responses "yes" and "no" were typed to the right of each statement. The Ss were to circle the appropriate answer depending upon whether the statement corresponded to the information in the story. Of these five statements, the second and fourth were false filler items. In order to confirm the three test statements, different numbers of sentences were required; One sentence (e.g., "The big thing was green."), Two sentences (e.g., "The big thing was a box."), or Three sentences (e.g., "The big thing was empty.") The sentences relevant to these problem statements were surrounded by other sentences so that Ss could not answer a question by looking at the first or last part of the text. The true problem statements always related to one of the two concepts described in the text.

Order of problems.--The problems were typed in a Forward order (One, filler item, Two, filler item, Three) or a Backward

order (Three, filler item, Two, filler item, One). In the Forward order, the easiest problems occurred first.

Procedure

The task was presented as a reading game in class. The Ss were instructed to find the answers to the questions in the stories. They were told that some of the stories were harder to understand than others. Three examples of how to respond to the questions were given on the blackboard. The examples were confined to simple response demonstrations with only one sentence.

All Ss read the three passages, but each passage was organized differently (Concept, Attribute or Scrambled). The Ss were allowed 8 min on each passage and they were told when to proceed to the next passage. They were instructed not to guess if they could not solve a problem. Before proceeding to the next passage, E verbally confirmed that all Ss had attempted each problem.

In each grade, 11 Ss received the Forward order of problems and 11 Ss received the Backward order. Organization was to be completely counterbalanced twice within each group of Ss. Since 11 Ss were available for each group, one of the six counterbalancing orders could not be repeated.

Design

The ANOVA of correct responses was a 3 (Grade) X 2 (Order of Problems) X 3 (Organization of Sentences) X 3 (Level of

Problem), with repeated measures on the last two factors. The Newman-Keuls test was used for multiple comparisons at the .05 level.

Results

Percent of correct responses for Grades 2, 4 and 5 was 52%, 66% and 73%, respectively; $F(2,60)=4.1$, $p < .025$.

Percent of correct responses for Concept, Attribute and Scrambled organizations was 68%, 67% and 56%, respectively; $F(2,120)=4.99$, $p < .01$. The Scrambled organization differed from the other two organizations.

Percent of correct responses for problems requiring one, two and three sentences was 79%, 53% and 59%, respectively; $F(2,120)=16.7$, $p < .001$. Level One problems differed from the other two levels.

The order of problems was not significant, but order interacted with grade and level of problem (Table 1); $F(4,120)=2.64$, $p < .05$.

Insert Table 1 about here

A salient characteristic of Table 1 is the low score for 2nd graders on questions requiring three sentences with the Forward order of problems (i.e., when the more difficult problems were preceded by the easier problems.)

Discussion and Summary

Asking children to confirm or deny brief statements by reading can provide useful data concerning comprehension. As low as Grade 2, the ability to detect relationships was facilitated by organizing the sentences in some way. As in the case of adults (Frase, 1969a), the mode of organization (whether Concept or Attribute) made little difference. Since problem related sentences were not sequentially contiguous in the attribute organization, improved performance may have been due to the improved comprehensibility of the topic in general, and not simply to the ease of locating related sentences (which may have been the case with the Concept organization).

The data also showed an abrupt drop in the ability to detect relationships when sentences had to be related to each other. The primary distinction, as for adults (Frase, 1969b), was between the comprehension of relationships that were stated explicitly in the text, and those that had to be constructed by combining two or more sentences. It may be useful to explore factors that inhibit the perception of remote relationships, such as syntactic variations in sentences and semantic transformations of the items to be related. The data suggest that an explicit statement of a relationship is desirable if knowledge of that relationship is an objective of instruction.

The development of the ability to detect explicit and remote relationships increased from 52% in Grade 2 to 73% in Grade 5. Even in Grade 5, however, with a well organized (Concept) text, 50% of the students made errors on problems involving more than one sentence.

Data showed that the 2nd graders were unlikely to solve a problem involving three sentences if they had first encountered a problem that could be solved with one or two sentences. Although order of problems made little difference if one or two sentences were involved in a problem, performance on three sentence problems was depressed over 50% with the Forward order. One explanation is that early questions cued Ss to the level of behaviors expected in the task. An inability easily to confirm or deny a later difficult problem statement might suggest to S that the statement did not follow from the text. A correlated hypothesis is that, for students with weak reading skills, problem difficulty interacts with sequential position because higher level skills deteriorate before lower level skills. Ability to detect a relationship by locating one sentence would be relatively easy, even on later problems when attention began to wane. But errors would be expected to occur almost immediately on difficult problems if fatigue or lack of attention set in. The data indicated that 2nd graders had attempted to answer the last problems in the series. In

addition, E had questioned Ss to insure that they all had time to finish the task, hence the effect of the order of problems upon 2nd grade performance does not reflect an inability to complete the task.

References

Frase, L. T. Paragraph organization of written materials: the influence of conceptual clustering upon the level and organization of recall. Journal of Educational Psychology, 1969, 60, 394-401. (a)

Frase, L. T. Structural analysis of the knowledge that results from thinking about text. Journal of Educational Psychology, 1969, 60, Mongr. Suppl. No. 6. (b)

Frase, L. T. Influence of sentence order and amount of higher level text processing upon reproductive and productive memory. American Educational Research Journal, 1970, in press.

Footnote

1. The authors wish to thank Henry B. Daniels, Principal of Lord Sterling School, for making these classes available. The cooperation of the teachers is also appreciated.

TABLE 1

Percent Correct Solutions as a Function of Grade Level, Order of Questions and Level of Question

Grade	Question Order	Sentences Required		
		One	Two	Three
2nd	Forward	66.7	45.5	27.3
	Backward	60.6	45.5	66.7
4th	Forward	87.9	48.5	57.6
	Backward	66.6	60.6	69.7
5th	Forward	93.9	54.5	72.7
	Backward	93.9	63.6	60.6