DOCUMENT RESUME

ED 078 399 CS 000 638

AUTHOR McConkie, George
TITLE The Study of Organization and Recall With Prose.
PUB DATE Feb 73
NOTE 12p.; Paper presented at the Annual Meeting of the American Educational Research Assn. (New Orleans, Feb 26-Mar 1, 1973)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Cognitive Processes; *College Students; *Learning; *Learning Characteristics; Learning Processes; Memory; Reading; *Reading Processes; Reading Research; *Recall (Psychological); Verbal Learning

ABSTRACT

This paper, presented at the 1973 meeting of the American Education Research Association, discusses some of the studies conducted in the area of learning from prose. The first study dealt with pooling independent sentences into groups of related sentences and preparing passages by stringing these sentences together. College students then read one of the passages three times, producing a written recall after each reading. The main result was that, with blocked presentation, clustering of sentences from related sentence groups rose over trials, but with mixed presentation it did not. The second study attempted to apply the sorting technique developed by Mandler. An analysis of all the data revealed no tendency for subjects to cluster items in recall with other items sorted into the same piles. The third study was an attempt to manipulate the structure of information in a passage in a simple manner. An examination of the results showed that there was no significant difference between groups. The final study identified idea units and then sought to determine the hierarchical set of relationships which the passage established among these. The general conclusion from this study was that the structure obtained from the analysis of the passage seemed to be related to cognitive structure subjects established while reading the passage. (WR)

The Study of Organization and Recall With Prose[1]

George McConkie
Cornell University

A person interested in studying learning from prose tends to see some definite relations between this and recent work involving the free recall of word lists. Both involve the presentation of a large set of units which the person attempts to remember and recall. In this attempt, an important factor is probably how the person organizes the units. This has been demonstrated with word lists (Tulving, 1968), and if the advice of people involved in teaching study skills has validity, it is also true for prose. In recall, we tend to believe that retrieval depends in various ways on the form of that cognitive organization.

We would like to know with prose, as with word lists, what is the nature of the cognitive structure established as a result of a stimulus presentation (or learning attempt), and what influence this structure has on retrieval.

There are two general ways one might approach this investigation. One is to try to pattern the research as closely as possible after the word list studies, and extend it into the study of prose, gradually adding to the complexity of the stimulus materials presented. This might be called the Bottom-up Approach. The other is to begin wrestling with the recall of information from prose directly, dealing with natural prose in all its complexity, and using whatever techniques can be found to yield information about the research questions. This might be called the Start-at-the-top Approach. Today I would like to describe some studies which are examples of each of these approaches which have been conducted at Cornell University.

First, the Bottom-up Approach. Here the first problem is to determine whether the phenomena observed in the free recall of word lists are also found with free recall from prose. There are several well-recognized problems with this type of research which must be dealt with: what type of text to use (generally, how to keep the stimulus materials as closely analogous to that used in word lists studies as possible), what to consider to be units for scoring purposes, and what rules to use to determine whether a unit has been recalled. These problems are not really independent.

The first study I will describe is the master's thesis of Mary Kircher (1971). She constructed a pool of independent sentences, each indicating an event in the life of a young woman. These were grouped around six themes, such as taking an ocean cruise, getting married, and writing a book about

[1]This paper was presented at the 1973 meetings of the American Education Research Association, held in New Orleans, Lousiana.

arts and crafts. Examples of the sentences are found in Table 1. A group of subjects sorted these sentences into piles of related items, and those which were least frequently sorted with other sentences of their own theme were eliminated. This gave her six groups of related sentences (called Related Sentence Groups), each with six sentences. Two passages were prepared by stringing these sentences together into six paragraphs. In one (the Blocked passage) each paragraph contained all the sentences of a Related Sentence Group; in the other (the Mixed Passage), each paragraph contained one sentence from each Related Sentence Group. Two groups of fifty college students each were subjects; each group read one of the passages three times, producing a written recall after each reading. There was also another variable which had little effect and will not be dealt with here. The recall protocols were scored for the number of events recalled.

The level of recall averaged 27% after the first reading and 73% after the third. Recall was better under blocked presentation than under mixed. Of greatest interest here, however, was the finding that with blocked presentation clustering of sentences from related sentence groups rose dramatically over trials, but with mixed presentation it did not. This can be seen in Figure 1. Figures 1a and 1b show data from the Blocked passages; 1c and 1d from the mixed. With mixed presentation, although recall rose over trials, clustering of related sentences did not. In our search for some sort of organization in the Mixed Group, we turned to the Intertrial Repetition (ITR) measure. As Figure 2 shows, the number of intertrial repetitions increases over trials with blocked presentation but not with mixed. Thus, over trials the subjects reading the Mixed passage increase their recall greatly, but there is no evidence of an increase in organization accompanying it, as would be expected from research with word lists.

The second study was carried out by Bruce Dunn (Dunn and McConkie, 1972). He tried to apply the sorting technique developed by Mandler (1967) to the study of learning from prose. Mandler's basic finding is that if subjects are asked to sort words into piles of related items, and repeat this until they can reliably sort the words into the same piles, the number of words they can recall from the set depends on the number of piles used in sorting. Using more piles (at least up to seven) increases recall in a linear manner. This finding I will call the Mandler Effect.

Bruce took passages from instruction units, about 2700 words each, and had judges identify the main points stated in the passages. From this, thirty main points were identified for each passage and statements of them were printed on cards. He assigned subjects to sort these cards into either two or six piles, either after having read the passage from which they were taken or not having read it. They were given three sorting trials and he asked them to try to sort the cards into the same piles on the second and third sorts. They then recalled as many of these main points as possible.

High school students recalled an average of 12 out of the 30 items at an acceptable level. There was no evidence of a Mandler Effect in the data for boys, but some small effect with girls. In addition, sorting into more piles always took substantially more time, thus presumably providing more learning time. In one small pilot study, Bruce did get a fair Mandler Effect with both boys and girls; subjects who sorted the cards into six piles recalled 27% more than those using two piles. In this study, subjects did not read the passage and the statements on the cards had been changed to greatly reduce the interrelationships among them. The statements were from a history passage and originally had many names of people and countries in common (they centered on Queen Mary of England). To reduce the relationships, other names were substituted for people and countries. Thus, it may be that the Mandler Effect is obtained most reliably with a set of units which have a poverty of interrelationships, which is certainly not the case with normal prose.

In addition, analyses of all the data in this study, even that where the Mandler Effect was found, revelaed no tendency for subjects to cluster items in recall with other items sorted into the same piles. No other type of organization in the recall sequence could be found either. Thus, unlike with word lists, the sorting task seemed to neither create a structure for recall nor to reveal aspects of the cognitive structure being used for retrieval.

The third study I would like to describe was an attempt to manipulate the structure of information in a passage in a simple manner. To do this, I first wrote a series of 39 sentences describing events in the life of a young man. I then wrote three versions of this passage by stringing the sentences together and making a minimum number of word changes. The first version had a flat organization; that is, each event was said to follow the previous event in time. In the second version, the events were broken into three sets of 13 each. The passage stated that the person's life was broken into three periods. One event in each set was used to indicate the period (for instance, he went away to college) and the other 12 were said to have occurred during this period. This yielded a two level hierarchy, breaking the events into three groups. For the third version, another level was added to the hierarchy. Each of the sets of 12 events which was said to occur during a period was broken into three subsets of four events each. One of each subset was again taken to indicate a subperiod, with the other three said to have occurred while this event was taking place. The events were mentioned in the same sequence in the three versions of the passage, and the only word changes were those necessary to indicate the temporal relationships among them.

Three groups of college students participated in the study. Each heard one version of the passage three times and produced a written free recall of as many of the events as possible after each.

An examination of the results of this study clearly showed that there was no difference in the number of events recalled by the three groups. In addition, what clustering there was appeared to be based largely on semantic relationships among the units rather than on the temporal sequence built into the passage.

Needless to say, we have tended to become somewhat pessimistic about the application of techniques developed for the study of free recall in word lists and word sets to the study of the effect of organization on learning from prose. What was lacking with this approach seems to me to be the real structure of prose, the semantic relationships among objects and events which are stated in the passage. This sort of structure, highly complex and intricate, and related in complex ways to what we know about the world, is the very essence of natural prose. Thus, we turned to an attempt to take natural prose and reveal the structure among events and objects which is stated in the passage and to try to relate this type of structure to recall. This leads us into the Start-at-the-top Approach to the study of recall from prose.

The study I will now describe was carried out by Bonnie Meyer (1971). She took sections from two passages of quite different character found in the Scientific American magazine and attempted a rather subjective analysis to identify their structure. She first identified "idea units", and then sought to establish the hierarchial set of relationships which the passage established among these. This task turned out to be quite similar to the process of outlining a passage.

Our first question was whether other people would agree with this structure. So Bonnie typed statements of her "idea units" on slips of paper and had two students arrange them to show the structure of the passage. They were given a format for placing the items. Both produced the same general structure Bonnie had, and if fact, placed over 90% of the idea units in exactly the same locations which Bonnie had. Thus, the structure analysis seemed reliable.

Our second question was whether recall was related to this structure. She had three groups of students serve as subjects. One group listened to each passage once producing a written recall after each. The second and third groups were the same expect they heard each passage two or three times prior to their attempt at recalling it.

In relating the frequency with which each item was recalled, to its position in the logical structure of the passage, two indices were used. For one, each idea unit was assigned a number indicating how far down the hierarchy it occurred. For the other, each idea unit was given a number indicating how many items descended from it in the hierarchy. The relationship of these variables to recall are shown in Figures 3 and 4 for one passage. Combining

the two indices, equally weighted, into a single score produced a new score which was related to recall in a manner which seemed to meet the assumptions of linearity and homoscedasticity underlying the correlation coefficient (which the original scores obviously did not). This combined score correlated with the number of people recalling each idea unit .55 for one passage and .42 for the other. These scores, though crude, show a definite relationship between the position of units in the logical structure and their likelihood of being recalled. Bonnie also found that if a given item was recalled, 70% of the time its immediate superior in the logical structure was also recalled. This contrasted with the overall recall level of 23%. The order of recall of units was strongly related to their order in the passage, but this serial order was also related to position in the structure in the passages used in this research. Thus it was not possible to isolate the effect of logical structure on order of recall.

Our general conclusion from this study was that the structure which Bonnie obtained from her analyses of the passage seems to be related to the cognitive structure which subjects establish while reading the passage and as such is related to recall.

This first attempt at discourse analysis was done in a very subjective manner. We have since become acquainted with a linguist at Cornell University, Dr. Joseph Grimes, who is attempting to lay a much more solid foundation for this sort of discourse analysis. His approach is based on case grammar, and he attempts to add to it the relationship categories necessary to handle the super-sentential relationships. We have found his approach, categorizing system, and terminology to be most helpful. We were also pleased to find that an analysis of the passages used in the study just described, using Grimes' approach, yielded a structure quite similar to that which Bonnie had originally obtained.

With these added tools, Bonnie Meyer has now gone further in her research on the relationship between passage structure and recall. She is presently carrying out a rather elaborate study, one part of which I would like to mention here. She has taken a paragraph and embedded it into two different contexts to produce two passages. In one, the information in that paragraph stands near the top of the logical structure of the passage. In the other, it stands near the bottom. Both passages are of the same length and the target paragraph is at the same serial location in both passages. She has had different groups of subjects read and recall each of the two passages and reports that a cursory examination of the data indicates that information from the target paragraph is recalled best when it stands at the top of the logical structure.

The use of this type of discourse analysis opens the door to many interesting variables relating what a person is able to recall to both the basic

structure of the information in the passage and to the particular form in which the information is presented. It also provides a way of analyzing the protocols of subjects who attempt to recall the information from the prose. In this latter role, it can be used to determine which aspects of the passage are and are not recalled, both in terms of units and in terms of relationships.

There is a problem we face, however, and that is the problem of understanding and agreeing on the means of analysis to use. At first I suspected that others, such as Crothers (1972) and Frederickson (unpublished), were simply using slightly different techniques than we were to arrive at the same basic type of logical structure. However, recently we have begun to question that assumption. Bonnie has analyzed passages previously analyzed by Crothers and by Frederickson, and has come up with somewhat different structures than they did. A particularly glaring example is in her re-analysis of Crothers' Nebulae passage (Crothers, 1972). Crothers there attempts to explain why a certain item (location--in, out) is recalled so well when it is low in the structure. He suggests a frequency explanation. In Bonnie's analysis of the structure of this passage, that same information stands near the top of the structure and hence might be expected to be recalled frequently. Actually we have probably only begun the process of attempting to establish standard techniques for this type of discourse analysis. At present, Bonnie Meyer is trying to specify the differences between the methods being used by Crothers, Frederickson, and herself. Her results should be very instructive.

In summary, it appears to us that organization plays an important role in the recall of information from prose. The type of organization of greatest importance, we believe, is that actually stated in (and perhaps that implied by) the passage itself. Techniques are being developed to discover this structure in the passage, so what we might have access to it in our research. These same techniques are useful for discovering the structure of information in subjects' recall protocols. We believe that this new direction in the study of retention of information from prose is likely to have a bright future; but there are problems which must be overcome before we are sure of our path.

Bibliography

Crothers, E.J. Memory structure and the recall of discourse. In J.B. Carroll and Roy O. Freedle (eds.) Language Comprehension and the Acquisition of Knowledge. New York: Winston, 1972.

Dunn, Bruce R. and McConkie, George W. The Effects of a Self-Instructional Curriculum Technique on Retention and Understanding. Final Report, Grant No. OEG-2-70037(509), U.S. Office of Education, May, 1972.

Frederickson, C.H. Representing Logico-semantic Features of Knowledge Acquired from a Discourse. Mimeographed article.

Kircher, Mary C. The Effects of Presentation Order and Repetition on the Free Recall of Prose. Unpublished Master's Thesis, Cornell University, 1971.

Mandler, G. Organization and memory. In K.W. Spence and J.T. Spence (eds.) The Psychology of Learning and Motivation: Advances in Research and Theory, Vol. I. New York: Academic Press, 1967.

Meyer, Bonnie J.F. Idea Units Recalled from Prose in Relation to Their Position in the Logical Structure, Importance, Stability and Order in the Passage. Unpublished Master's Thesis, Cornell University, 1971.

Meyer, Bonnie J.F. and McConkie, George W. What is Recalled After Hearing a Passage? Journal of Educational Psychology, in press.

Tulving, E. Theoretical issues in free recall. In T.R. Dixon and D.L. Horton (eds.) Verbal Behavior and General Behavior Theory. New Jersey: Prentice Hall, 1968.

Table 1 – Some of the sentences used by Kircher (1971) in her study of free recall from prose. The sentences are arranged into related sentence groups. In some conditions the first sentence was the first in a paragraph; in others it was last.

She took an ocean cruise.

She spent a great deal of time getting a suntan.

She was taught how to play shuffleboard.

A friend told her how starts could be used for directions.

She recalled how much she had enjoyed sailing in her youth.

She took some lessons on the meaning of ship's flags.

She wrote a book on arts and crafts.

She discovered that she needed glasses due to eyestrain.

Her typewriter wore out and she had to buy a new one.

She learned how to make hooked rugs.

A dog destroyed part of her manuscript.

She received letters from three publishers.

She bought and started to manage a small restaurant.

She though of visiting a meat processing plant.

She became proficient in balancing accounts.

She noted the opening of a new employment agency and decided to file with them.

She printed some "help wanted" signs.

She listed her number in the yellow pages of the telephone directory.

Figure 1

Maximum Obtained, and Random clustering scores for recall from blocked and mixed presentation of sentences, based on Related Sentence Groups. Data from Kircher, 1971.

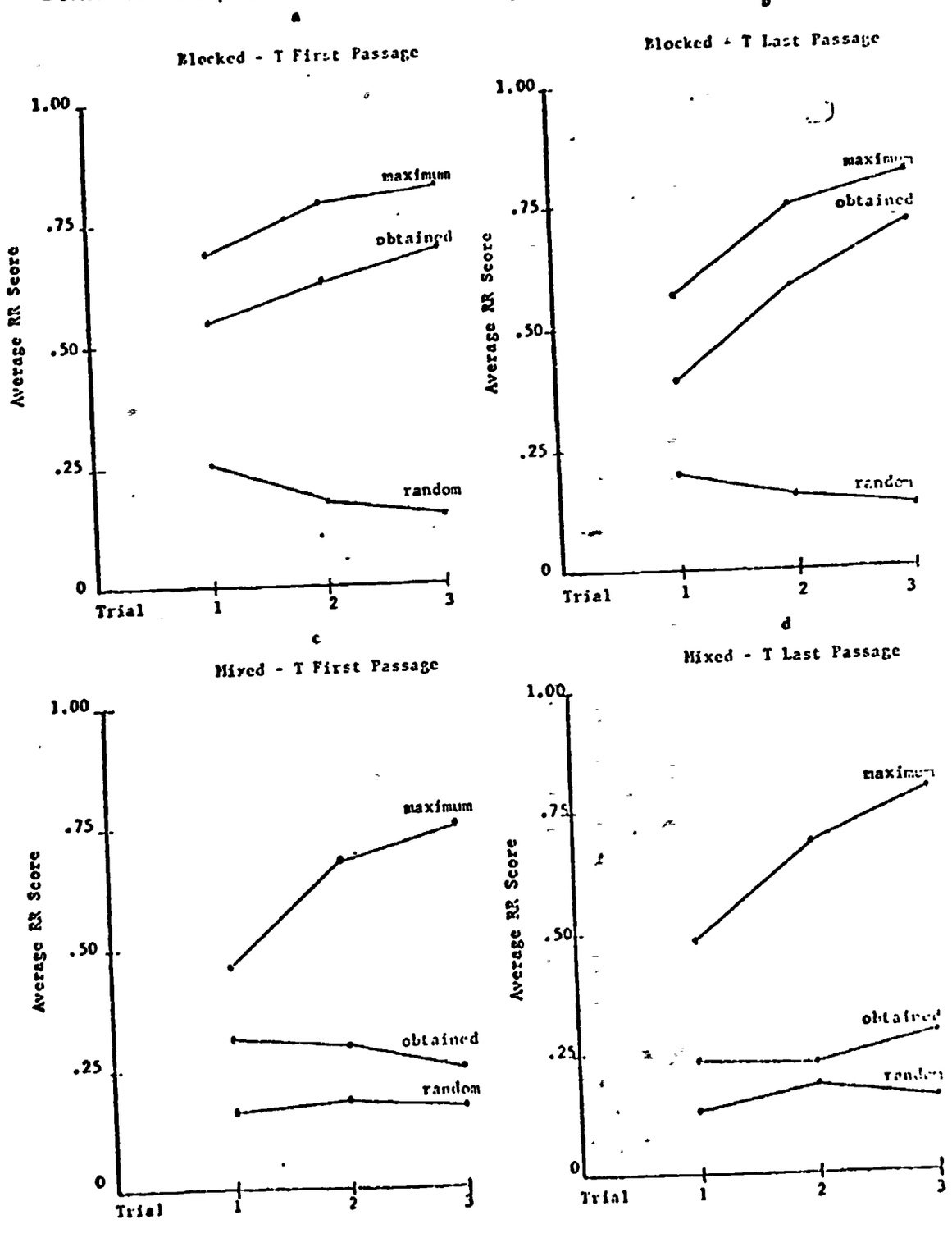

Figure 2

Maximum, Obtained and Random Inter-trial Repetition (ITR) scores for recall after Blocked and Mixed presentation of sentences. Data from Kircher, 1971.

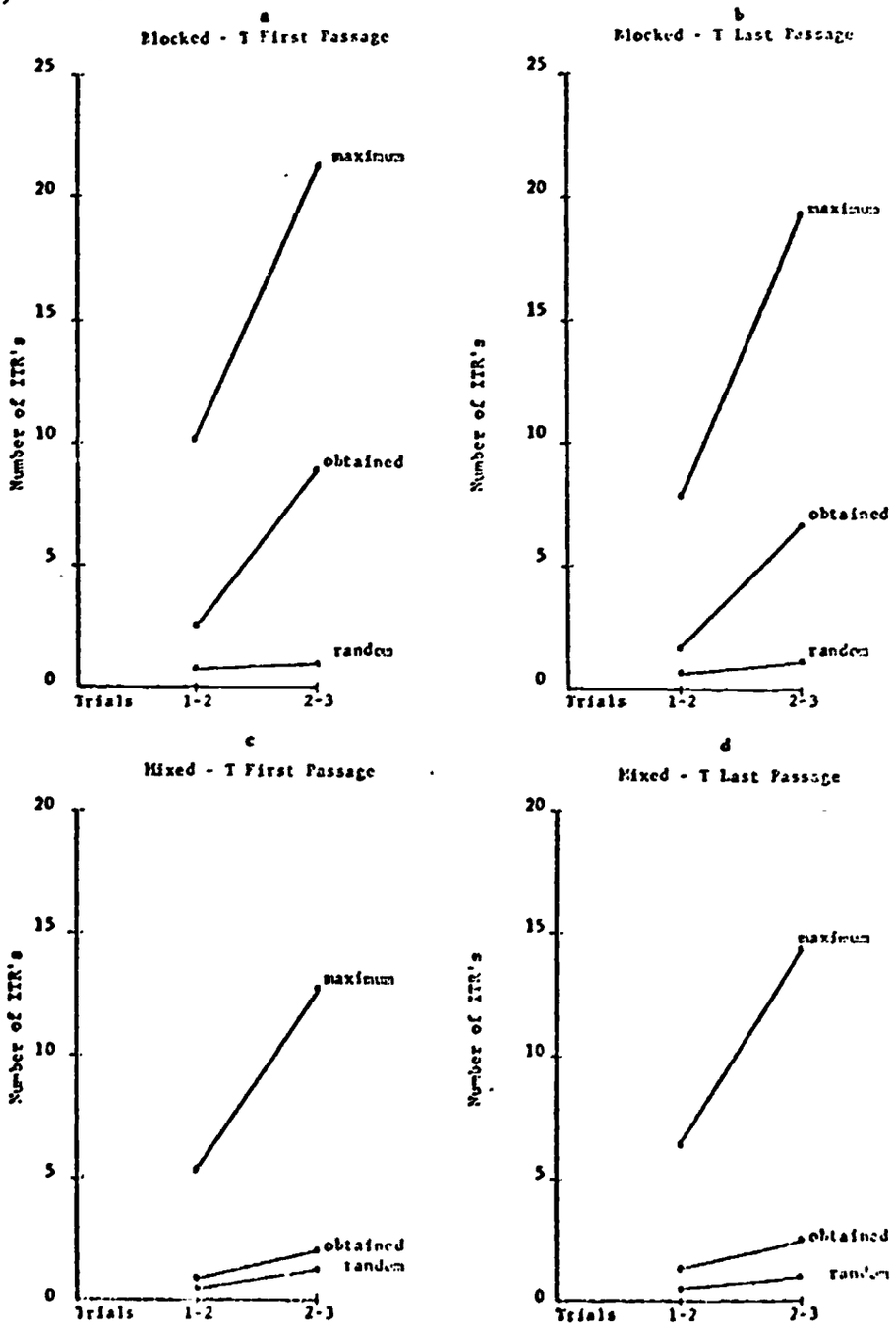

Figure 3

Relationship between Hierarchy Depth Scores of idea units in a passage (an index of the level in the hierarchical structure occupied by each unit) and idea units after hearing the passage once. Data from Meyer, 1971.

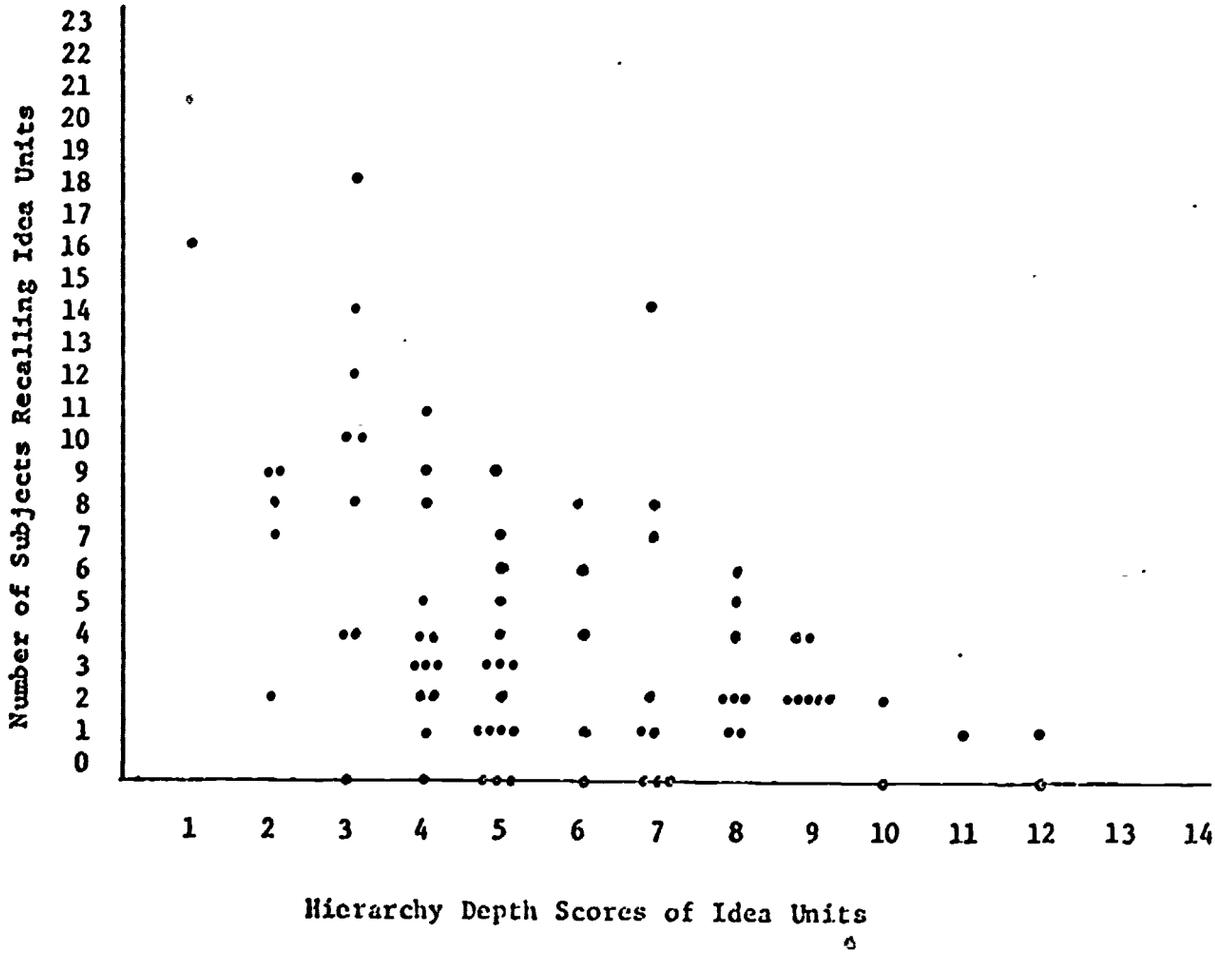

Figure 4

Relationship between Number of Units Beneath Scores of idea units in a passage (the number of direct descendents in the logical structure of the passage) and the number of subjects who recalled those units after hearing the passage once. Data from Meyer, 1971.