

THE EFFECTS OF OUTLINE ORGANIZERS
AND EXPOSITORY ADVANCE ORGANIZERS
AS AIDS TO TWO LEVELS OF
READING COMPREHENSION AT THE
SIXTH GRADE LEVEL

A Thesis
Presented to
the Faculty of the Graduate School
University of Manitoba

In Partial Fulfillment
of the Requirements for the Degree
Master of Education

by
Robert Woroniak
1976



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ROBERT WORONIAK

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ACKNOWLEDGMENTS

The investigator wishes to convey his appreciation to the many people who have provided assistance in the production of this study.

The investigator is principally appreciative of the superb counsel and assistance that Dr. Odarka Trosky provided through the course of the study. Her invaluable guidance and encouragement will long be remembered.

In addition, the investigator is grateful to Dr. Robert L. Hedley and Professor Colin Walley for their thoughtful consideration of the investigator's work.

The investigator wishes to acknowledge the assistance supplied by the principals and staffs of Lord Selkirk and Margaret Scott Schools of the Winnipeg School Division No. 1.

Finally, to his wife Lorraine, the writer wishes to express his utmost appreciation for the love and inspiration that she provided throughout the study.

ABSTRACT

This study was designed to investigate the effects of two types of organizers on the comprehension of written materials: expository advance organizer and outline organizer. In addition, the study considered the effects of instruction in the use of outline organizers as an aid to comprehension. These three treatments were compared with a control group in two areas of reading comprehension, translation and inference.

Eighty subjects at the sixth grade level were randomly placed into the four treatment groups - outline organizer (O), outline organizer with one session of instruction (O1), expository advance organizer (EAO), and control (C). All four groups were initially pretested on a learning passage. Thereafter, once each group was exposed to the treatment sessions, two posttests were administered. The first posttest was given immediately after the treatment sessions while the second posttest was administered one month later. The comprehension questions in all tests consisted of two types - translation and inference.

Analyses of variance were conducted to determine whether any significant differences had occurred between the mean scores of the experimental and control groups on the two comprehension categories. In order to ascertain if the test items were measuring essentially different dimensions of

comprehension, correlation coefficients were calculated for the treatment groups' scores on the translation and inference test items. Further, subjects were randomly selected for open ended interviews to gather additional information regarding the use of each type of organizer in the various testing sessions.

No significant differences were found among the mean scores of the treatment groups at either the translation or inference level of comprehension. The results of the correlations conducted between the groups' scores on the translation and inference test items indicated that the two categories appeared to be measuring generally different dimensions of comprehension.

Though no significant differences were found, non significant trends were noted. The subjects who utilized the outline organizer (O) and expository advance organizer (EAO) made appreciable gains on the translation and inference items from the pretest to the first posttest. This gain was maintained on the inference items through to the second posttest. Those subjects in the outline organizer with instruction (O1) and control (C) groups maintained generally their mean scores throughout the testing sessions. The interviews with several subjects in each of the experimental groups revealed that the expository advance organizer and outline organizer assisted in relating the central ideas in the learning passage. In addition the presence of the two organizers stimulated the subjects' own initiative in processing

factual information. On the other hand, subjects who had the outline organizer with instruction indicated that, while the organizer was equally helpful in relating central ideas and retaining factual information, their attention was exclusively devoted to the material covered by the outline, with all other information being disregarded.

The conclusion from the study was, despite the organizers employed in this investigation demonstrated no significant effects upon the translation and inference dimensions of reading comprehension of sixth grade science material, there was some evidence that the expository advance organizer and the outline organizer were facilitative, particularly at the inferential level of comprehension.

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Chapter I

THE PROBLEM AND DEFINITION OF TERMS

THE PROBLEM

Statement of the Problem

Much has been written regarding aids or strategies that might be employed in order to read materials with fuller comprehension. Nowhere has there been such emphasis demonstrated as at the elementary school level. Manuals, supplementary materials, and workbooks, containing specific suggestions as to the type of activities or questions that might be utilized by learners, have been provided with the intention of facilitating the comprehension of written materials.

More recently, teaching strategies such as advance organizers, sentence outlines, graphic organizers, and study guides have been offered as possible methods to aid comprehension. Numerous investigators, Ausubel,¹ Neisworth,²

¹Ausubel, "The Use of Advance Organizers in the Learning and Retention of Meaningful Learning Material," Journal of Educational Psychology, 51 (1960), 267-272.

²J. T. Neisworth, "Influences of an Advance Organizer on the Verbal Learning and Retention of Educable Mental Retardates; A Comparison of Educable Mentally Retarded and Intellectual Normal Performances," Final Report, (Delaware University, 1968).

Rothkopf,³ and Thelen⁴ have been concerned about various strategies which might be used to facilitate the learning of written material. Inconsistent results from studies on the effectiveness of the various strategies as facilitators, have suggested that additional investigation is required in order to determine conditions in which the strategies may be beneficial for the comprehension of written material.

This study was designed to investigate the effects of outline organizers and expository advance organizers as aids to comprehension at the sixth grade level. In addition, the study considered the effect of instruction in the use of an outline organizer as an aid to comprehension. Comprehension was measured at the translation and inference levels.

Thus, the study investigated the following general question:

Compared with no organizer, will the use of an outline organizer or outline organizer with instruction or an expository advance organizer make a significant difference in the translation and inferential dimensions of reading as determined by criterion test items?

Specifically the questions for the study were:

³E. Rothkopf, "Experiments on Mathemagenic Behavior and the Technology of Written Instruction," Verbal Learning Research and the Technology of Written Instruction, eds. E. Rothkopf and P. Johnson (Columbia University, 1971) pp. 284-303.

⁴J. Thelen, "The Use of Advance Organizers and Guide Material in Viewing Science Motion Pictures in the Ninth Grade" (Doctoral dissertation, Syracuse University, 1970).

1. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect the translation level of comprehension from the pretest to the first posttest?

2. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect the inferential level of comprehension from the pretest to the first posttest?

3. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect the translation level of comprehension from the pretest to the second posttest?

4. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect the inferential level of comprehension from the pretest to the second posttest?

5. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect the translation level of comprehension from the first posttest to the second posttest?

6. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect the inferential level of comprehension from the first posttest to the second posttest?

Significance of the Study

Enormous amounts of information are being conveyed to students each day. In the main this information is

used to aid in developing concepts in the various disciplines. Though various means such as exposition, discussion or questioning are used to develop many concepts, it often occurs that a student must read written materials in order to further develop his knowledge, emphasizing the need for better comprehension of written materials. Consequently, teachers and students alike would benefit if various techniques were available which would aid in the comprehension of written materials. Frase indicated:

...current research partially in response to the immediate practical demands of classroom teaching reflects increased interest in the more general techniques of instructional control. The techniques include the use of summaries or questions which serve as a review or previous function and the use of maps, pictures, charts, and graphs and capitalizing upon the potentially meaningful structure of the learning material. An increasing amount of analysis and research is being devoted to the learning from ordinary prose or textbook passages.⁵

Rothkopf suggested that learning from written materials depends mainly upon the actions of the student during the reading of the written materials.

In most instructional situations, what is learned depends largely on the activities of the student. It therefore behooves those interested in scientific study of instruction to examine these learning activities.⁶

Ausubel has suggested a theory of "meaningful reception learning" which would aid in the comprehension of

⁵L. T. Frase, "Questions as Aids to Reading: Some Research and Theory," American Educational Research Journal, 58 (1968) 319-332.

⁶E. Rothkopf, "The Concept of Mathemagenic Activities," Review of Educational Research, 40 (1970), 325-336.

written materials.⁷ He stated that it is a learner's cognitive structure which is instrumental in determining the acquisition of meaning from written materials. Each learner's cognitive structure is hierarchically organized. Any new information which is read, is subsumed into the existing structure. If one's cognitive structure is clear, stable and organized, then any new learning should be facilitated.

Ausubel,⁸ Ausubel and Fitzgerald,⁹ Ausubel and Fitzgerald,¹⁰ and Ausubel and Youssef¹¹ have provided findings which suggested "the learning and retention of meaningful verbal material can be facilitated by the advance provision to the student of organizers."¹²

⁷D. P. Ausubel, The Psychology of Meaningful Verbal Learning (New York: Greene and Stratton, 1963).

⁸Ausubel, pp. 267-272.

⁹D. P. Ausubel and D. Fitzgerald, "The Role of Discriminability in Meaningful Verbal Learning and Retention," Journal of Educational Psychology, 52 (1961), 266-272.

¹⁰D. P. Ausubel and D. Fitzgerald, "Organizer - General Background and Antecedent Learning Variables in Sequential Verbal Learning," Journal of Educational Psychology, 53 (1962), 243-249.

¹¹D. P. Ausubel and M. Youssef, "The Role of Discriminability in Meaningful Parallel Learning," Journal of Educational Psychology, 54 (1963), 331-336.

¹²M. R. Wong, "Additive Effects of Advance Organizers," (paper presented at the Educational Research Association, Chicago, 1972), p. 1.

Many researchers have conducted investigations with the purpose of providing information about various techniques which might be used to facilitate the learning of written materials.

Written material continues to be a primary source of information as a multitude of published materials are being printed:

...67,000 words of scientific research are being written every minute, the equivalent of enough scientific matter to fill eleven sets of a 30 volume encyclopedia every 24 hours.¹³

It is hoped that this study will contribute to the knowledge of the type of activities useful for elementary students in relation to specific dimensions of reading comprehension.

DEFINITION OF TERMS

Outline Organizers

An outline organizer is designed to give the student an overview of the passage. The outline organizer was basically composed of side headings and sub-headings. The former of the two gave the central thought in each section of the passage, while the sub-heading reflected some of the secondary ideas provided in the learning passage. All

¹³H. L. Herber, Teaching Reading in the Contest Areas (New Jersey: Prentice-Hall Inc., 1970), p. 3.

of the side headings employed in the outline organizer were exactly the same as the headings in the learning passage.

Expository Advance Organizer

The expository advance organizer employed in the study consisted of several paragraphs. Several criteria for the construction of the advance organizer were adapted from those developed by Neisworth. His criteria included the following points:

1. Progressive Differentiation - the concepts embodied in the organizing passage should be sequenced in descending order of generality.

2. Proximity - the initial concepts should be familiar to the learner and thus take advantage of information already processed.

3. Substantive Relevancy - the organizer should function as an overview of the content of the learning passage it introduces.

4. Integrative Reconciliation - the organizer should make explicit comparisons and contrasts between concepts embodied in the material to be learned and similar (potentially confusing) concepts that may already exist in the learner's cognitive structure.

5. Inclusiveness - the organizer should contain concepts around which much of the information in the learning passage can be organized. Accordingly, the central function of the organizing passage should be that of providing generalizations that are useful in understanding the subsequently presented learning material.¹⁴

General Introductory Passage

The general introductory passage consisted of several

¹⁴Neisworth, p. 7.

paragraphs which functioned as a general introduction. When used prior to the reading of a learning passage, they did not serve in any way as an organizer; this was due to the fact that the information in the introduction was not similar to that provided in the learning passage, except that the topic was the same.

The definitions of the two levels of comprehension, translation and inference, employed in the study were based upon those indicated by Trosky.¹⁵

Translation

Trosky has indicated that at the translation level of comprehension:

...the reader is required to render in his own words an accurate construction or version of the word, phrase or sentence found in the textual material. The behavior is at the literal understanding level in that the translator does not have to discover relationships, implications or subtle meanings.¹⁶

Since the test items on the criterion tests were of the multiple choice variety, the subjects were not able to render a reply in their own words. However, if the correct response was an accurate version of a phrase or sentence located in the learning passage, the test item was considered to be at the translation level of comprehension.

¹⁵O. S. Trosky, "Modifications in Teachers' Questioning Behavior in the Development of Reading Comprehension and a Series of Supervisory Conferences" (Doctoral dissertation, University of Toronto 1971).

¹⁶Trosky, p. 38.

Inference

To comprehend at the inference level requires a reader to use the written material in a manner in which he exemplifies a behavior that is beyond a literal understanding level. Trosky has indicated that:

...to be able to infer requires reading "between the lines," seeing relationships between facts, events, and ideas, finding subtle or hidden meanings, and perceiving implications.¹⁷

Consequently, if in answering a criterion test item a reader was required to "read between the lines" in order to note a relationship or hidden meaning, the test item was classified inferential.

Criterion Test

The criterion test, for the purposes of this study, was a multiple choice test, which consisted of ten test items. Each test item had four possible solutions. Of the ten test items, five were of the translation type while the remaining five were inferential.

Instruction Technique

The instruction technique referred to the means that were used to communicate the information on the usage of outlines. The techniques of communication followed a method suggested by Hedley and Wood.¹⁸ Three techniques -

¹⁷Trosky, p. 40.

¹⁸R. L. Hedley and C. C. Wood, A Laboratory in Communication Skills (University of Manitoba 1974).

exposition, questioning and demonstration were used to impart the information on outlines. The exposition simply referred to "telling" the students about outlines and their component parts. Demonstrations involved "showing" or illustrating how an outline may be used. Finally, questioning was implemented in order to guide the student in discovering how the component parts of an outline may be associated with a prose passage.

Instruction

The term instruction as employed in the study related specifically to the controls that the instructor had over certain external events or conditions which were presented during the instructional session. These specific conditions consisted of the stimulus situation, verbal communications and feedback. This definition was based upon Gagné's explanation of instruction. Gagné indicated that:

Instruction thus deals with the manipulation of the conditions of the learning situation - with commanding attention, with presenting essential stimuli and with the nature and sequence of verbal directions given to the learner. The function of instruction is the control of the external conditions of the learning situation.¹⁹

¹⁹R. M. Gagné, "Instruction and the Conditions of Learning," Instruction - Some Contemporary Viewpoints, ed. L. Siegal (San Francisco: Chandler Publishing Company, 1967), p. 295.

LIMITATIONS

The population from which the sample was drawn consisted of the sixth grade students in one elementary school. Since the population was restricted to one school, the generalizations from the study will only refer to the sixth graders in the school.

During the treatment sessions the investigator acted as the experimenter. Thus it is possible that the experimenter's bias may have affected the performance of the various treatment groups on the criterion tests.

Three advance organizers were implemented in the study. Of the three, however, the expository advance organizer was the only type which other investigators used primarily in their studies, whereas outlines as organizers have been seldom examined. Consequently, prior to making any comparisons between this study's findings and other investigations, it will be necessary to give careful consideration to the type of organizers used.

During the initial posttest session, each treatment group was given an organizer to read prior to the learning passage. Though the written instructions explicitly stated that the subjects should read the organizers, no assurance can be given that the subjects did in fact comply with the instructions.

A general written introduction was given to the control group prior to their reading of the learning passage. This was done in order to control for the Hawthorne Effect.

The introduction dealt with information in the same content subject but did not relate directly to the topic in the learning passage. No assurance, however, can be given that the introductory passage did indeed fulfill its purpose of only providing some "buffer" material.

An expository advance organizer (EAO) was constructed for the study. Neisworth's criteria were used for developing the EAO as Ausubel did not specifically elaborate on how one might be constructed. It was assumed that the expository advance organizers employed in the study was a close replication of the type Ausubel used in his research; no assurance can be given however, that the expository advance organizer used in the study was exactly the type Ausubel implemented. Barron gives additional suggestions as to difficulty of replication by stating:

...advance organizers have not been accorded an operational definition. Clearly, what is sufficiently general, abstract and inclusive varies from one situation to another. Thus it has been difficult for teachers and researchers to know whether particular organizers were appropriate for their audience.²⁰

Thus, when the results of this study were compared with others using advance organizers, the investigator took care to select and compare only those investigations which used similar criteria for developing expository organizers.

²⁰R. F. Barron, "The Effects of Advance Organizers and Grade Level Upon the Reception Learning and Retention of General Science Content," Investigations Relating to Mature Reading, ed. F. P. Green, National Reading Conference Twenty-first Yearbook, (Milwaukee: the National Reading Conference, Inc., 1972), p. 6.

The study investigated the effects that an outline organizer and expository advance organizer would have upon the comprehension of written material. However, comprehension was limited to two of the six categories that Trosky has suggested - translation and inference; thus generalizations to the general concept of reading comprehension cannot be made.

TOPICS OF THE SUBSEQUENT CHAPTERS

A review of the research into the usage of various strategies employed to facilitate comprehension is presented in Chapter II. Chapter III contains the design and procedures utilized to gather data for the study, while Chapter IV is devoted to the results of the study. The final chapter contains the summary, discussion, and implications of the study.

Chapter II

REVIEW OF RELATED LITERATURE

Introduction

In order to determine what techniques may be used to facilitate learning, the learning and retention of meaningful materials has been studied by many researchers. Various suggestions as to the means required for facilitation have been proposed; these means, however, have only been based upon theoretical positions.

Ausubel¹ formulated a theory whereby he proposed that meaningful learning occurs when ideas encountered by learners are incorporated into an existing cognitive structure. The incorporation of new ideas is aided by the use of advance organizers which facilitate learning and retention.

Two other approaches have also attempted to explain the facilitation and reception of written materials - the mathemagenic and cybernetic. Both approaches are similar in that each considers the effects of test-like questions as the facilitators of learning.

¹D. P. Ausubel, The Psychology of Meaningful Verbal Learning (New York: Greene and Stratton 1963).

Expository or Prose Organizers

Ausubel was responsible for the formulation of a theory concerning meaningful reception learning which made provision for explaining investigations of various aids facilitating the learning of written material. Ausubel postulated that within one's cognitive structure are concepts which are hierarchally organized. This cognitive structure is organized in terms of highly inclusive conceptual traces under which are subsumed less inclusive concepts and specific informational data. Any new concepts may become part of the cognitive structure, whereupon they are subsumed under concepts which already exist in the present structure.

In order to acquire unfamiliar knowledge, several conditions must be satisfied. Any new information may only be learned to the extent that it is relatable to concepts already existing in one's cognitive structure. If not, then subsumption will greatly be impeded. In addition, Ausubel indicated that the existing cognitive structure must be very clear, stable, and organized if any new acquisition of material is to be facilitated.

Ausubel also postulated the importance of the degree of discrimination the new concepts possessed from those which existed in the cognitive structure: if very little discrimination existed, then ambiguous meanings might emerge in the mind of the learner.

Ausubel also suggested a strategy which would aid meaningful reception learning. This strategy involved the usage of special introductory materials which he termed

"advance organizers." Primarily, the advance organizer attempts to connect concepts which existed in one's cognitive structure with the unfamiliar concepts which might be subsumed. Ausubel and Fitzgerald suggest that the organizers:

...simply provide ideational anchorage or scaffolding. More typically, however, the new learning material is a variant of related previously learned concepts already established in the cognitive structure. Here the role of the organizer is not only to provide optimal anchorage at an optimal level of inclusiveness but also to increase discriminability of the learning passage from analogous and often conflicting ideas in the learner's cognitive structure.²

Ausubel indicated that the advance organizers should be presented immediately prior to the reading of the learning task. Compared to the learning passage, the organizers should be written at a higher level of generality, abstraction and inclusiveness, than the content of the learning passage if the organizer is to be effective in facilitating learning.

In order to determine the effectiveness of the advance organizers, Ausubel conducted several research studies. In 1960, he investigated the effects of expository or prose advance organizers to determine if they facilitated the learning of unfamiliar but meaningful verbal material. The 500 word prose organizer, which was at a higher level of generality and inclusiveness than the 2500 word learning task, was compared to a 500 word historical introduction

²D. P. Ausubel and D. Fitzgerald, "The Role of Discriminability in Meaningful Verbal Learning and Retention," Journal of Educational Psychology, 52 (1961), 266.

organizer. Involved in the study were 120 college students. Ausubel found that the advance organizer treatment groups did significantly better than the control group on a twenty-six item multiple choice test. The results of this investigation appeared to be highly supportive of Ausubel's theory.³

Ausubel and Fitzgerald⁴ conducted more research on advance organizers. Since one of the functions of an organizer is to increase the discriminability of any new information from those concepts which are hierarchally organized in one's cognitive structure, the focus of their study was to determine the effectiveness of advance organizers when the learning task was familiar to the subject. In addition to using an expository advance organizer, they also introduced a comparative organizer as a variable. The subjects were given a learning passage on Christianity, which was prefaced by one of two organizers, depending on the treatment. Included in the comparative organizer was a comparison of Buddhism and Christianity while the advance organizer group was exposed to a prose passage on Christianity but at a high level of inclusiveness,

³D. P. Ausubel, "The Use of Advance Organizers in the Learning and Retention of Meaningful Learning Material," Journal of Educational Psychology, 51 (1960), 267-272.

⁴D. P. Ausubel and D. Fitzgerald, pp. 266-274.

generality and abstraction. Results of the study indicated that the comparative organizer significantly facilitated learning on the initial posttest while both the comparative and advance organizers facilitated learning on the second posttest. Significance however, was attained by students only at the low ability level. Though a comparative organizer was introduced in this study, the findings of this study tended to concur with Ausubel's 1960 study supporting the usage of prose advance organizers.

Similar findings, regarding the use of advance organizers were reported by Ausubel and Fitzgerald⁵ and Ausubel and Youssef.⁶ Though the studies investigated the effect of advance organizers on sequential learning, the evidence was consistent with Ausubel's 1960 and 1961 findings. Thus supportive empirical evidence was established on the effectiveness of advance organizers.

It should be noted however, that in each of the studies cited, the expository or prose organizers were presented prior to the reading of a learning task. The organizers consisted of five hundred word paragraphs written at a high

⁵D. P. Ausubel and D. Fitzgerald, "Organizer-General Background and Antecedent Learning Variables in Sequential Verbal Learning," Journal of Educational Psychology, 53 (1962), 243-249.

⁶D. P. Ausubel and M. Youssef, "The Role of Discriminability in Meaningful Parallel Learning," Journal of Educational Psychology, 54 (1963), 331-336.

level of generality, abstraction and inclusiveness. Further, it must be noted, that in all cases the subjects involved in the studies were at the college level of education. Since Ausubel's work at the college level, other investigators have conducted similar experiments at all levels of education ranging from college to elementary. A search of these investigations revealed two conclusions: there is conflicting evidence as to the effectiveness of organizers, and that there appears to be a "pot pourri" of organizers:

For a number of reasons..., only limited generalizations can be made from the research reviewed. In addition to not operationally defining the term advance organizer, researchers have failed to define procedures for generating advance organizers. The rather loose procedures reported have resulted in a pot pourri of advance organizers.⁷

Organizers at Various Levels of Education

Munford⁸ attempted to replicate Ausubel's 1960 investigation. In addition to the prose advance organizer and control groups, Munford used a third treatment; a prose post-organizer group. The college level subjects' results on the criterion tests were analyzed to determine the effect of the treatments. No significant difference was found.

⁷E. Blanton, "Reception Learning and Advance Organizers: Implications for Reading Research," Investigations Relating to Mature Reading, ed. F. P. Greene, National Reading Conference Twenty-first Yearbook (Milwaukee: National Reading Conference Inc., 1972), p. 6.

⁸P. R. Munford, "Advance Organizers and the Enhancement of Meaningful Verbal Learning and Retention," Dissertation Abstracts International, 32 (1971), 5617A (University of Southern California).

Though Munford attempted to replicate Ausubel's research, it may be that there was a lack of similarity of his prose organizer as compared to Ausubel's. According to Blanton, Ausubel had not operationally defined his prose organizer, thus Munford may have assumed that his was identical.

Groteleuscher⁹ conducted an investigation in order to determine the effect that differently structured introductory materials would have on related learning tasks which are differently sequenced. His findings substantiated Ausubel's findings of 1961 and 1962 that prose organizers were effective facilitators. However, Groteleuscher had provided an additional finding which conflicted with Ausubel's: the significance occurred with the high level of ability college subjects, whereas in Ausubel's research, the organizers were effective with subjects at a lower level of ability.

Scandura and Wells¹⁰ found organizers to be effective aids to learning with college level subjects. Though significant findings were reported, it should be

⁹A. Groteleuscher, "The Effects of Structure and Sequence on Adult Learning" (paper presented at the National Seminar on Adult Education Research, Chicago, 1968).

¹⁰J. M. Scandura and J. N. Wells, "Advance Organizers in Learning Abstract Mathematics," American Educational Research Journal, 4 (1967), 295-301.

noted that the organizer was not an expository organizer, rather it was in a form of a mathematical game.

Triezenberg¹¹ provided evidence which further supported use of organizers. His investigation considered the effects of verbal organizers called sketches and mechanical models as facilitators in learning. The subjects at the grade seven and nine levels using the verbal organizers scored significantly higher than the other treatment groups on the initial posttest. However, this effect was not evident on a delayed posttest; thus its effects tended to be temporary.

Neisworth¹² and Steinbrink¹³ examined organizers at the elementary level and provided additional supportive evidence of organizers as an aid. Neisworth employed one hundred eighty-four elementary subjects in order to investigate the effect a two hundred word expository advance organizer would

¹¹H. J. Triezenberg, "The Use of an Advance Organizer in Teaching Selected Concepts of Ecological Systems," Report from the Science Concept Learning Project, Technical Report No. 42, Research and Development Center for Cognitive Learning (University of Wisconsin, 1968).

¹²J. T. Neisworth, "Influences of an Advance Organizer on the Verbal Learning and Retention of Educable Mental Retardates; A Comparison of Educable Mentally Retarded and Intellectual Normal Performances," Final Report (Delaware University, 1968).

¹³J. E. Steinbrink, "The Effectiveness of Advanced Organizers for Teaching Geography to Disadvantaged Rural Black Elementary Students," Dissertation Abstracts International, 31.(1970), 5949A (University of Georgia).

have on the learning and retention of science material. Results of his study indicated that the experimental group using the prose organizer, scored significantly better than the control group on both the immediate and delayed criterion tests.

Similar findings were reported by Steinbrink; he too provided corroborating evidence which indicated that prose organizers were effective as aids to learning. He hypothesized that subjects utilizing a prose organizer with written materials would learn more than those subjects that would not have the benefit of an organizer. The results of his study indicated that the subjects using the expository advance organizer scored significantly better than the control group on the posttest which was administered. Thus evidence does exist to support the effectiveness of organizers as facilitators at various levels of education.

Initially, it would appear that the studies cited provide conclusive documentation that organizers are truly effective; however, there is considerable evidence that questions their effectiveness. Schulz,¹⁴ Bauman and Glass,¹⁵ Proger et al,¹⁶

¹⁴R. W. Schulz, "The Role of Cognitive Organizers in the Facilitation of Concept Learning in Elementary School Science," Dissertation Abstracts International, 27 (1966) 3748A (Purdue University).

¹⁵D. J. Bauman and G. V. Glass, "The Effects on Learning of the Position of an Organizer" (paper presented to the meeting of the American Educational Research Association, Washington, 1969).

¹⁶B. P. Proger et al, "Conceptual Pre-Structuring for Detailed Verbal Passages," Journal of Educational Research, 64 (1970), 28-34.

Thelen,¹⁷ Peterson,¹⁸ Munford,¹⁹ Barnes,²⁰ Clawson,²¹ Thain,²² and Barron and Stone²³ all investigated the effectiveness of Organizers. In none of these studies cited does evidence exist

¹⁷J. Thelen, "The Use of Advance Organizers and Guide Material in Viewing Science Motion Pictures in the Ninth Grade" (Doctoral dissertation, Syracuse University, 1970).

¹⁸J. C. Peterson, "The Effect of an Advance Organizer A Post Organizer, or Knowledge of Behavioral Objective on the Achievement and Retention of a Mathematical Concept" (paper presented at the Annual Meeting of the American Educational Research Association, New York 1971).

¹⁹Munford, p. 5617A.

²⁰R. B. Barnes, "The Effects of Advance Organizers to Facilitate Learning of Structured Anthropology Materials at the Sixth Grade Level," Anthropology Curriculum Project, 1972 (Georgia University).

²¹E. U. Clawson, "A Comparison of the Effects of Organizers on the Learning of Structured Anthropology Material in the Third Grade," Anthropology Curriculum Project, 1972 (Georgia University).

²²C. Thain, "The Effects of Structured Overviews and Purposeful Questions on the Comprehension of Grade Eight Social Studies Material (unpublished Masters thesis, University of Manitoba, 1972).

²³R. F. Barron and V. Stone, "The Effects of Student-Constructed Graphic Post Organizers Upon Learning Vocabulary Relationships," Interaction: Research and Practice in College-Adult Reading; ed. P. Nacke, Twenty-third Yearbook of the National Reading Conference (Clemson: National Reading Conference, Inc., 1974), 172-175.

to suggest that organizers generally are effective as aids to comprehension.

As a consequence of this conflictive evidence, Estes,²⁴ Barron,²⁵ and Barron and Cooper²⁶ conducted studies in order to determine a point where Ausubel's theory achieved practical utility. Estes²⁷ hypothesized that when a learning passage was within the ability of the subject, the advance organizer would facilitate learning, but his findings did not support this.

Barron²⁸ investigated the effects advance organizers

²⁴T. H. Estes, "The Effects of Advance Organizers Upon the Meaningful Reception Learning and Retention of Social Studies Content," Investigations Relating to Mature Reading, ed. F. P. Greene, National Reading Conference Twenty-first Yearbook (Milwaukee: National Reading Conference, Inc., 1972), 16-22.

²⁵R. F. Barron, "The Effects of Advance Organizers and Grade Level Upon the Reception Learning and Retention of General Science Content," Investigations Relating to Mature Reading, ed., F. P. Greene, National Reading Conference Twenty-first Yearbook (Milwaukee: National Reading Conference, Inc., 1972) 8-15.

²⁶R. F. Barron and R. Cooper, "The Effects of Advance Organizers and Grade Level Upon Information Acquisition from an Instructional Level General Science Passage," Diversity in Mature Reading-Theory and Research ed. P. Nacke, National Reading Conference. Twenty-second Yearbook (Boone: National Reading Conference, Inc., 1973), 78-82.

²⁷Estes, pp. 16-22. ²⁸Barron, pp. 8-15.

would have in relation to grade level placement of the learning passage. A passage with a grade nine readability was read by subjects varying from grade six to twelve. It was hypothesized those students at the ninth grade level would receive benefit from an advance organizer. Again, as in Estes study, the findings were not significant.

Barron, along with Cooper²⁹ then followed up Estes' 1972 work. However, in this study the learning passage provided to the high school subjects was designed so that it was at the instructional reading level for each of the subjects. Results of the criterion test did not indicate that advance organizers were effective as an aid to comprehension. These three investigations were not able to provide information as to the place organizers have in achieving practical utility.

Jerrolds³⁰ undertook another approach; he conducted a study to determine the effectiveness of prose advance organizers in facilitating delayed retention of facts. Also included in his investigation were several other treatments: he provided what he termed, a modified advance organizer (MAO), which basically consisted of a statement of the main

²⁹Barron and Cooper, pp. 78-82.

³⁰B. W. Jerrolds, "The Effects of Advanced Organizers in Reading for the Retention of Specific Facts," Investigations Relating to Mature Reading, ed. F. P. Greene, National Reading Conference, Twenty-first Yearbook (Milwaukee: National Reading Conference, Inc., 1972), 23-29.

idea of the passage. In addition to this treatment, Jerrolds used instruction as a variable. One of the treatments received instruction into the usage of a MAO. No treatment was significantly different from the control. However, the MAO group with instruction scored significantly better than the MAO without instruction. This investigation is unique in that it considered instruction into the use of an organizer as a factor in the facilitating learning.

Mathemagenic Behavior

Like Ausubel, Ernst Rothkopf attempted to explain how meaningful learning and retention was facilitated from a theoretical framework; however, his theory arose as a consequence of the work that he had done on the role of student responses in programmed learning. The conceptual model that he proposed considered verbal learning and written instruction as contrasted to Ausubel who proposed a strategy which would facilitate meaningful learning. Rothkopf's model placed a great deal of stress on student activities.

The activities in which a student engages when confronted with an instructive document determine the character of the effective stimulation that results from this confrontation and so, in turn, determine what will be learned.³¹

To describe the actions of a student during the various

³¹E. Rothkopf, "Some Theoretical and Experimental Approaches to Problems in Written Instruction," Learning and the Educational Process, ed. J. D. Krumboltz (Chicago: 1965), p. 198.

activities, Rothkopf used the term "mathemagenic behavior."

Mathemagenic behaviors are behaviors that give birth to learning. More specifically, the study of mathemagenic activities is the study of actions that are relevant to the achievement of specified instructional objectives. The concept of mathemagenic activity implies that the learner's actions play an important role in determining what is read.³²

Rothkopf suggested that the mathemagenic behaviors include those actions which are observable such as eye movement over a page or head and body movement toward the written materials. He did not discount the many unobservable actions are a part of mathemagenic behavior, however, the functions would include the translation of written symbols into internal speech or the organization of sentences and phrases from the segmentation of internal speech.

Rothkopf is also careful to point out that mathemagenic behavior, though important, is but one of two processes involved in the learning from written material:

The first of these comprises inspection and study activities on the part of the subject. I have called these mathemagenic behavior. The second process is substantive learning, i.e., the acquisition of subject matter skills. The manner in which the first process takes place determines the course of the second process. Mathemagenic behaviors play a critically important role in

³²E. Rothkopf, "The Concept of Mathemagenic Activities," Review of Educational Research, 3 (1966), pp. 325-326.

determining what substantive matter can be learned.³³

The mathemagenic behaviors or inspection activities are affected by various stimuli that Rothkopf terms nominal and effective stimuli. Various items such as sentences, words or letters which are presented to a student are considered nominal stimuli. Effective stimuli however, are basically the results of the effect that the words or sentences had upon the student. It is the effective stimuli which determine the substantive learning, thus the type of nominal stimuli presented is important for substantive learning. "The instructor is in control of the nominal stimuli. In this way he can arrange for potential stimulation of the student."³⁴

A factor which Rothkopf believed determined mathemagenic behaviors was test-like events. Consequently, investigations have been conducted to determine the effect of questions upon the acquisition of information from printed materials: Frase,³⁵

³³E. Rothkopf, "Experiments on Mathemagenic Behavior and the Technology of Written Instruction," Verbal Learning Research and the Technology of Written Instruction, eds. E. Rothkopf and P. Johnson (New York: Teachers College Press, 1971), p. 284.

³⁴R. C. Anderson, "Control of Student Mediating Processes During Verbal Learning and Instruction," Review of Educational Research, 40 (1970), p. 349.

³⁵L. T. Frase, "Learning from Prose Material: Length of Passage, Knowledge of Results and Position of Questions," Journal of Educational Psychology, 58 (1967), 266-267.

Rothkopf,³⁶ and Rothkopf and Bisbicos.³⁷ In all cases it was found that test-like questions placed after the learning passage, significantly affected specific and general facilitation of learning materials. This led Rothkopf to conclude:

The present experiment provides evidence that test-like questions on materials which have just been read - questions which are self administered after approximately 1,000 words of texts - are one of those controls of these inspection behaviors.³⁸

Frase³⁹ followed up the latter investigation on the facilitative effects of post questions by designing a study in which he hoped to determine if the test-like questions in the post position either aided students in acquiring facilitative skills (inspection behavior) or if the questions simply elicited previously learned skills. His findings indicated that the treatment group using questions

³⁶E. Rothkopf, "Learning from Written Instructive Materials: An Exploration of the Control of Inspection Behavior by Test-Like Events," American Educational Research Journal, 3 (1966), 240-249.

³⁷E. Rothkopf and E. Bisbicos, "Selective Facilitative Effects of Interspersed Questions on Learning from Written Materials," Journal of Educational Psychology, 58 (1967), 56-61.

³⁸Rothkopf, "Learning from Written Instructive Materials," p. 38.

³⁹L. T. Frase, "Questions as Aids to Reading: Some Research and Theory," American Educational Research Journal, 58 (1967), 319-332.

in the post position performed significantly better than the pre-question group on the criterion test. Thus, Frase concluded that the posttest-like questions aided in eliciting skills which were present prior to the reading of the written material.

The studies cited, Rothkopf,⁴⁰ Frase,⁴¹ and Rothkopf and Bisbicos⁴² explain their findings using the "mathemagenic approach" for their rationale. It is noted that in all cases the pre-question groups did not aid general facilitation as well as the post-question treatments. This occurrence may be explained using the theory behind the cybernetic approach.

Cybernetic Approach

The cybernetic approach is similar to the mathemagenic approach in that both deal with the effect that questions may have on learning from written information. Both appear to concur with the processes which contribute to the stimulus selection by the learner because it is felt that the stimuli selected by the learner ultimately determines his subsequent responses. Smith and Smith state:

⁴⁰Rothkopf, "Learning from Written Instructive Materials," pp. 240-249.

⁴¹Frase, "Learning from Prose Material," pp. 266-272.

⁴²Rothkopf and Bisbicos, pp. 56-61.

Cybernetic theory, views the individual as a feedback system which generates its own activities in order to detect and control specific stimulus characteristics of the environment.⁴³

It is assumed that the stimuli, which might be an instructional event, occur either prior or during the reading of the written material. The questions or events select the stimulus input which in turn affect information processing. Frase indicated that

...the learner is a guided control system and the pattern of control involves responding discriminately to stimuli with the learner most sensitive to feedback from instructional stimuli which are controlling his behavior.⁴⁴

Consequently, if a student is using a question in order to select stimuli to make discriminations, then it would appear that an immediate knowledge of results after attempting to answer a question would aid in the development of learning.

Hershberger and Terry⁴⁵ using fifty-five six graders conducted an investigation which considered the aspect of the effect that knowledge of results would have on a student's recall. Specifically, they looked at the instructional effectiveness of various intervals of delay between self-

⁴³K. U. Smith and M. F. Smith, Cybernetic Principles of Learning and Educational Design (New York: 1966), p. 7.

⁴⁴Frase, "Questions as Aids to Reading: Some Research and Theory," p. 323.

⁴⁵W. A. Hershberger and D. F. Terry, "Delay of Self-Testing in Three Types of Programmed Texts," Journal of Educational Psychology, 56 (1965), 22-30.

instruction and subsequent self-testing. It was found that the delay interval of feedback was not critical. Thus knowledge of results does not appear to be the most important event which affects the "feedback system." Frase suggested:

...the point at which feedback is critical is the point at which the student is exposed to the verbal material to be manipulated. It is what the student does with the words he reads while he is reading them that determines the efficiency of learning.⁴⁶

Faust and Anderson using forty-eight college students considered the effect that incidental material or irrelevant stimuli might have in the learning of written material. Initially, it would appear that the incidental material might be detrimental to the facilitation of learning as the irrelevant stimuli might interfere with the relevant stimuli. However, results of Faust and Anderson

...support the contention that the addition of incidental material to the copying frame improves performance of some Ss by requiring them to notice the discriminative stimulus before making the response.⁴⁷

The implication can be made that students are able to discriminate between relevant and irrelevant stimuli without directions to do so.

⁴⁶Frase, "Questions as Aids to Reading: Some Research and Theory," p. 322.

⁴⁷G. Faust and R. C. Anderson, "The Effects of Incidental Material in a Programmed Russian Vocabulary Lesson," Journal of Educational Psychology, 58 (1967), p. 9.

Traditional Approach of Direct Instruction

Instruction is an extremely important activity which is primarily designed to bring about learning in an individual. Gagné indicated that "the purpose of instruction is to bring about a change within the learner, a change of the sort, called learning."⁴⁸ Consequently since the role of an organizer is to facilitate learning and the effect of mathe-
magenic behavior is to give birth to learning, consideration of the traditional concept of instruction would appear to be warranted.

In order to bring about learning, Gagné suggested that the instructor must be concerned about two main variables - those within the learner and those existing in a learning situation. The latter were referred to as "external events."⁴⁹

The variables within the learner would involve such items as the learner's motivation and initial capabilities. However, Gagné suggested that "steps can be taken to arrange for the establishment of suitable states of the learner."⁵⁰

Equally important as the internal state of the learner are the external events or conditions that may exist

⁴⁸R. M. Gagné, "Instruction and the Conditions of Learning," Instruction - Some Contemporary Viewpoints, ed. L. Siegal (San Francisco, 1967), p. 292.

⁴⁹R. M. Gagné, The Conditions of Learning, (New York: Holt Rinehart and Winston, 1965), p. 214.

⁵⁰Gagné, The Conditions of Learning, p. 214.

in the learning situation. It is these events that may be controlled by an instructor or as Gagné indicated:

...these are the events that are manipulated by the teacher, the textbook written, designer of films or television lessons, the developer of self instructional programs.⁵¹

Gagné indicated that the controlling of these events by the aforementioned is instruction:

Instruction may be thought of as the institution and arrangement of the external conditions of learning in ways which will optimally interact with the internal capabilities of the learner, so as to bring a change in these capabilities. Instruction thus deals with the manipulation of the conditions of the learning situation - with commanding attention, with presenting essential stimuli and with the nature and sequence of verbal directions given to the learner. The function of instruction is the control of the external conditions of the learning situation.⁵²

According to Gagné, three principal conditions may be controlled by the instructor - the stimulus situation, the verbal communications directed at the learner, and the feedback. The stimulus situation is manipulated by the instructor. Consideration as to the type of learning which will occur is prerequisite to the presentation of the stimuli, since various types of learning such as principle learning, concept learning, chaining and simple stimulus-response relationships require a variety of stimuli.

⁵¹Gagné, The Conditions of Learning, p. 215.

⁵²Gagné, "Instruction and the Conditions of Learning," p. 295.

Gagné indicated that control over verbal communications would allow the instructor to guide the learner's behavior, as the latter would be directed as to what had to be accomplished. The verbally communicated directions could serve several purposes: they may direct attention, convey information about expected performance, and guide discovery.

A third condition, that of feedback, is also an integral part of instruction. Gagné suggested that:

...consideration must be given to the question of how the learner knows he has achieved the objective of a learning act and how such information can be manipulated to bring about reinforcement.⁵³

Feedback may be given during acquisition of new material or simply at the end of the instruction session. In the former situation, the feedback serves to reinforce what the student is learning. An appraisal at the termination of instruction allows the learner to be informed if he has achieved the expected performance level designated prior to learning. In addition the appraisal may serve as a motivational technique to have the student continue learning.

Several investigations, Craig,⁵⁴ Kittell,⁵⁵ and

⁵³Gagné, The Conditions of Learning, p. 215.

⁵⁴R. C. Craig, "Directed Versus Independent Discovery of Established Relations," Journal of Educational Psychology, 47 (1956) 223-234.

⁵⁵J. E. Kittell, "An Experimental Study of the Effect of External Direction During Learning on Transfer and Retention of Principles," Journal of Educational Psychology, 48 (1957), 391-405.

Gagné and Brown,⁵⁶ have considered the effects upon learning that various amounts of control on verbally communicated directions would have. These studies appeared to deal with the effect of directions through experimentation with discovery and guided discovery learning. Kersh and Wittrock have differentiated the two terms.

If the learner completes the task with little or no help, he is said to have learned by discovery... In practice, considerable help from the teacher may be provided and still the learner may be said to have learned by discovery, but in such instances the process is usually qualified and called guided discovery.⁵⁷

Kittell⁵⁸ investigated the effects that varying amounts of direction had on learning and transfer. Sixth grade subjects were randomly placed into three treatment groups - minimum, intermediate, and maximum amounts of direction. The former group learned through a discovery approach as no aid was given by the instructor, while the latter treatment was provided with complete direction. The intermediate treatment subjects were allowed to learn partially through discovery; however, some guidance was given. Results of the investigation indicated that the subjects in the maximum and intermediate treatment groups

⁵⁶R. M. Gagné and L. T. Brown, "Some Factors in the Programming of Conceptual Learning," Journal of Experimental Psychology, 48 (1957), 313-321.

⁵⁷B. Y. Kersh and M. C. Wittrock, "Learning by Discovery," Journal of Teacher Education, 13 (1962), p. 461.

⁵⁸Kittell, 391-405.

were superior to those in the minimum treatment in learning and transferring principles. Thus the findings tend to imply that control over the amount of communicated direction is vital in learning.

Craig's⁵⁹ findings tend to concur with Kittell's. Craig investigated the effect that learning through discovery and guided discovery would have on the learning and retention of material. Results of his investigation indicated that the subjects in the guided discovery treatment performed better than the discovery group on the criterion test. The former treatment could be considered similar to the intermediate group in Kittell's experiment.

Gagné and Brown⁶⁰ have provided additional supportive evidence. Both investigators examined the effects of three instructional approaches - directed, discovery and guided discovery, upon the learning. An analysis of their findings revealed that the guided discovery approach was much more superior than the directed. Though the findings were not significant, the data indicated that the guided discovery treatment was slightly superior than the discovery approach. The results of these investigations tend to denote the implication that a certain amount of guidance or control of verbal communication of directions is generally advantageous

⁵⁹Craig, 223-234.

⁶⁰Gagné and Brown, 313-321.

for learning to occur in an instructional situation. Wittrock and Kersh suggested:

Guided discovery seems to offer a happy medium between independent discovery and highly directed learning. Some of the efficiency of directed learning is maintained along with the benefits of the discovery process, specifically motivation and problem solving skill.⁶¹

Feedback constitutes yet another external condition which an instructor may control in order to facilitate learning. Gagné suggested that feedback may take several forms - feedback of results or simple reinforcement. The latter may be given to a learner during a learning activity when a correct response is made. A simple nod or positive comment may be directed to the learner. Reinforcement may also occur at the termination of a learner's set of responses. In this situation, the act would be known as knowledge of results or as Gagné has termed this condition, "appraisal."⁶²

Van Wegenen and Travers⁶³ have provided supportive evidence concerning the positive effects of reinforcement upon learning through verbal interaction. One hundred

⁶¹Kersh and Wittrock, 468.

⁶²Gagné, The Conditions for Learning, p. 227.

⁶³R. K. Van Wegenen and R. M. W. Travers, "Learning Under Conditions of Direct and Vicarious Reinforcement," Journal of Educational Psychology, 54 (1963), 356-362.

eighty fourth, fifth and sixth grade subjects were assigned to several treatment groups - partial interaction with the experimenter, no verbal interaction, isolation with machine feedback, and isolation with aural as well as machine feedback. The results of the study indicated that those subjects in the initial treatment group produced more learning than in any other of the conditions.

A later study by Travers et al⁶⁴ produced findings which corroborated with the latter investigation. Travers and his associates investigated the effects that various forms of feedback would have upon the learning of fourth, fifth and sixth grade subjects who either interacted with a teacher or who simply learned by observing the interactions in the classroom. The results of the study indicated that those who interacted with the teacher during the feedback of results performed better on the criterion test.

Summary

Though numerous investigations concerning a variety of techniques used to aid in the acquiring of information from printed material have been conducted, the research has been based mainly upon the several positions - Ausubel's

⁶⁴R. M. W. Travers et al, "Learning as a Consequence of the Learner's Task Involvement Under Different Conditions of Feedback," Journal of Educational Psychology, 55 (1964), 167-173.

theoretical framework, Mathemagenic Behavior and the Cybernetic view. Whatever the type of technique investigated or the position used to explain a technique, a common purpose was noted: the provision of information in such a way that learning and retention of written materials are facilitated.

Studies dealing with either the mathemagenic or cybernetic approaches mainly used test-like events or questions in the investigations. Frase indicated:

...without doubt questions are useful tools. They are relatively easy to construct and they can be used with almost any kind of educational material - they are flexible.⁶⁵

Generally the research studies using questions to facilitate learning have been positive: they have aided in the acquisition of material. A majority of the investigations reported that questions in the post-position aid in specific and general facilitation, whereas questions placed before a learning passage tended to aid mainly in specific facilitation.

Many investigations have termed the various aids used to facilitate learning and retention as advance organizers or organizers. Thus in such cases, Ausubel's theoretical framework was used as the rationale to discuss the findings. However, closer inspection revealed that

⁶⁵Frase, "Questions as Aids to Reading: Some Research and Theory," p. 320.

many of the so-called "advance organizers" were not the same as the Ausubelian prose type. Rather they took the form of graphs, charts, sentences or structured overviews. Consequently, it is possible to consider the effects of these organizers using the Rothkopf's mathemagenic approach, as the various organizers may be considered as one of the "environmental controls" affecting a student's mathemagenic behavior. Ausubel provided empirical evidence which indicated that advance organizers were effective as aids to learning. Several investigations conducted since his research have tended to collaborate his findings at the various levels of education, ranging from elementary to post secondary.

Although these findings are generally supportive, consideration must be given to the numerous studies which provide conflicting evidence. In many of these studies either prose advance organizers were compared with other forms of organizers, or the prose organizers were totally ignored in the treatments being replaced by structured overviews, questions, charts, sketches, and models.

No consistent pattern appeared concerning the effectiveness of organizers when a comparison of findings at the various grade levels was made. At each level of education whether it was college, high school, junior high or elementary, there was some evidence which tended to show positive effects, but each level had more investigations with equivocal or negative findings as opposed to those which were supportive. The only exception appeared to be

the college level where the trend was to more supportive evidence.

Since Ausubel's research in the early 1960's, a variety of organizers have been explored. They range from structured overviews, main ideas of passages, games, to graphic items. In some investigations, prose organizers were compared with a variety of types while in other studies, various kinds of organizers such as verbal organizers, games, graphic organizers, and sentence outlines were investigated. The latter situation may have arisen as a consequence of Ausubel's lack of operationally defining his prose organizer, thus resulting in a "pot pourri" of organizers.

Estes,⁶⁶ Barron,⁶⁷ and Barron and Cooper⁶⁸ had attempted to determine a point where Ausubel's theory could achieve practical application. This consideration has not proven worthwhile, as none of these investigations provided any findings suggesting where this point might be.

Consideration must be given to the possible implication of Jerrold's findings.⁶⁹ Though his investigation did not provide conclusive evidence that instruction into the usage of organizers was beneficial in aiding comprehension,

⁶⁶Estes, pp. 16-22. ⁶⁷Barron, pp. 8-15.

⁶⁸Barron and Cooper, pp. 78-82.

⁶⁹Jerrolds, pp. 23-29.

it did indicate that the aspect of instruction might be further studied as the instructed modified advance organizer (MAO) group achieved significantly better results than the MAO group without instruction. The reason for the absence of significant findings supporting the usage of instruction with organizers may have been the lack of the instructor's control upon several of the external conditions which affect learning. Gagné did indicate that "the function of instruction is the control of the external conditions of the learning situation."⁷⁰

Considering Jerrold's latter finding and those of Craig,⁷¹ Kittell,⁷² Gagné and Brown,⁷³ Van Wegenen and Travers,⁷⁴ which did provide evidence indicating beneficial effects of an instructor's control of external events upon learning, this then was the area under investigation in the present study: when compared with no organizer, will the use of an outline organizer, or outline organizer with instruction, or an expository advance organizer, make a significant difference in the translation and inferential dimensions of comprehension.

⁷⁰Gagné, The Conditions of Learning, p. 295.

⁷¹Craig, pp. 223-234. ⁷²Kittell, pp. 391-405.

⁷³Gagné and Brown, pp. 313-321.

⁷⁴Van Wegenen and Travers, pp. 356-362.

Chapter III

DESIGN AND PROCEDURES

The first section of the chapter describes the pilot study which was undertaken in advance of the main study. Thereafter, the procedures and material which were employed to gather data for the actual study are presented.

THE PILOT STUDY

Purpose

The pilot study had as its aim the evaluation of three important components to be used in the main study: the written materials, the criterion test, and the procedures.

Subjects

Sixth grade students enrolled at two Winnipeg schools were selected for the pilot study. These students were selected because they resided in a similar socio-economic area as the subjects who were part of the actual research. Since the students were randomly selected, they were considered representative of the students enrolled in the schools.

Materials

A science passage on life in the past, approximately 800 words in length, taken from Science for Today and Tomorrow,

Book 6 by Herman and Nina Schneider was utilized as the learning passage in the testing session.¹ During the treatment sessions another science passage taken from Science: Measuring Things by Darrell Barnard and Celia Lavatelli was also employed.² Both texts are authorized by the Provincial Department of Education for the sixth grade level. The learning passage from the latter book was adopted with some minor revisions. These revisions were mainly in the deleting of several paragraphs which referred to the photos in the text. The learning passage was then typed, single-spaced.

Two criterion tests comprised of twenty and twenty-two test items were designed to measure comprehension. The test items on the two comprehension tests were a multiple choice type with four choices. On the initial comprehension test, the twenty test items were categorized as literal and interpretative questions while on the latter criterion test, the test items were classified as translation and inference questions. Throughout each respective criterion test, the types of test items were interspersed. In addition the test items were not placed in the same chronological order as the learning material.

¹Herman Schneider and Nina Schneider, Science for Today and Tomorrow (Lexington: D.C. Heath and Co., 1968), 86-94.

²Darrell Barnard and C. B. Lavatelli, Science: Measuring Things (New York: Macmillan, 1966), 277-278.

Organizers were designed to be used prior to the reading of the learning passage. These organizers were of two types; an expository advance organizer (EAO) and an outline organizer (O).

The outline organizer was basically composed of side headings and sub-headings. The side headings of the outline were exactly the same as the headings used throughout the learning passage. The sub-headings however, were comprised of short phrases representing the secondary ideas under each main heading. Since the learning passage consisted of six main headings, the outline organizer likewise had a similar number of side headings.

An expository advance organizer of approximately two hundred words in length was also prepared. It was constructed following the criteria that Neisworth suggested for the composition of an EAO.

In addition to the two organizers mentioned, a general introductory passage was designed for usage by the control group. The passage was similar in length to the EAO. The content of the introductory passage did not directly relate to the ideas in the learning passage.

Prefacing each of the organizers and the general introductory paragraph were a set of directions which indicated the procedures the students should follow in the handling of the materials.

Administration

The pilot study was conducted in two stages.

Initially, one class of sixth grade students were randomly placed in four treatment groups - expository advance organizer, (EAO), outline organizer (O), outline organizer with instruction (O1), and control (C). The treatment sessions were conducted daily for four days during the language arts periods. On the first day, the group (EAO) was presented with a short expository advance organizer to read. Thereafter the group read a learning passage and completed several comprehension questions on the passage. Next day, the group (O) was presented with an outline to read. They too subsequently read a learning passage and completed several test items. On the third day the group (C) was exposed to a general introductory paragraph. Thereafter, they likewise read a learning passage and completed several test items. The group (O1) received its treatment on the fourth day. They were given instruction indicating how an outline might be helpful in learning a passage. After this session, the group (O1) read a learning passage and they also completed test items. In all treatment sessions, the same learning passage and ten test items were used. Each session took approximately forty-five minutes. Once the treatment periods had been completed, a posttest was administered. On the test day, each student was provided with an envelope containing the appropriate materials required for the treatment they were in. The materials consisted of the appropriate organizer which was prefaced by directions, a learning passage, and a twenty question multiple choice

test. The directions did not give a time limit for completing the materials, except that the students were told that all materials would be collected at the end of the class period. The investigator served both as the experimenter and test administrator. No pre-test or delayed posttest was conducted.

The second portion of the pilot study was conducted with a class of sixth grade students in another school. The sole purpose of this portion of the pilot study was to gather test results in order to determine the validity of the test items given to the students. The students in this school were presented with a learning passage to read. Thereafter they were distributed twenty-two test items to complete. The learning passage was exactly the same as the one read by the first class, however, the twenty-two test items were not. They consisted of two categories of questions - translation and inference which were based on Trosky's definitions of these two types.³ None of the class members in the second portion of the pilot study were exposed to treatment sessions.

Evaluation of the Pilot Study

Prior to the administration of the second portion of the pilot study, two students at the graduate level

³O. S. Trosky, "Modifications in Teachers' Questioning Behavior in the Development of Reading Comprehension and a Series of Supervisory Conferences" (Doctoral dissertation, University of Toronto 1971), p. 38.

were given the multiple choice test items in order to determine the reliability of the items. The pair were required to identify the test items either as translation or inference, according to Trosky's definition. A total of twenty-nine test items were submitted to the team. The judges were not aware of the classification of the test items that had been designated by the investigator. If the two judges and investigator's classification agreed, then the test item was accepted. If there was not total agreement, the test item was discarded. Twenty-two test items were retained.

After the administration of the multiple choice test was completed, the test items were item analyzed according to the procedure outlined by Crocker.⁴ From the twenty-two test items which were analyzed, a total of five translation and five inference items were retained for the criterion test.

The content of the written materials, which included the expository advance organizer, outline organizer, general introductory passage, and the learning passage was retained for usage in the testing portion of the major study as each passage appeared to be comprehensible by the subjects involved in the pilot study. However, the organizers and

⁴A. C. Crocker, Statistics for the Teacher (Baltimore: Penguin Books Ltd., 1969), p. 75.

learning passage which were used in the treatment sessions were abbreviated, because the time allowed for the treatment periods was not sufficiently adequate. The abbreviations consisted of deleting several sections of the learning passage. Consequently, portions of the organizers referring to these deletions were eliminated.

The instructions which were provided with the written materials and criterion test were retained because no apparent confusion appeared to be exhibited by the students when they were reading them.

A minor change was made with the method of packaging the materials. Originally, large envelopes were used to contain the materials; however, confusion was visibly evident when the students were requested to take out either the learning material or criterion tests. Thus, the envelopes were replaced by file folders and the confusion was removed.

THE RESEARCH STUDY

Materials

The two learning passages described in the pilot study were adopted for use in the major study. The passage taken from Science: Measuring Things⁵ was abbreviated and adopted for the treatment sessions, while the learning passage in Science Today and Tomorrow⁶ was applied, unchanged, in two

⁵Barnard and Lavatelli, pp. 277-278.

⁶Schneider and Schneider, pp. 86-94.

of the three testing sessions. The former consisted of approximately two hundred words while the latter contained nearly eight hundred.⁷

Organizers were prepared for both the treatment and testing sessions. The organizers used in the treatment sessions were of two types - an expository advance organizer and an outline organizer. The former was prepared according to the criteria that Neisworth⁸ suggested for the construction of an organizer while the outline consisted of a side heading which contained three sub-headings. A brief general introductory paragraph was constructed for the control group.⁹ Similar types of organizers were employed in the testing sessions. However, the expository advance organizer and outline organizers were more lengthy than those used in the treatment sessions. The expository advance organizer was approximately two hundred words in length while the outline organizers were comprised of six side headings and eighteen sub-headings. The general introductory paragraph was also expanded.¹⁰

⁷See Appendixes A and B for samples of the learning passages employed in the treatment and testing sessions.

⁸J. T. Neisworth, "Influences of an Advance Organizer on the Verbal Learning and Retention of Educable Mental Retardates; A Comparison of Educable Mentally Retarded and Intellectual Normal Performances" Final Report, (Delaware University, 1968), p. 7.

⁹See Appendix A for examples of the organizers utilized in the treatment sessions.

¹⁰See Appendix C for examples of the organizers used in the testing session.

Multiple choice test items were used in both the treatment and testing sessions. The multiple choice test employed in the treatment sessions, consisted of only three test items.¹¹ However, the criterion test used for the testing sessions, consisted of 10 items - five translation and five inferential. The test items did not appear in the same chronological order as the information presented in the learning passage.¹²

Directions prefaced: the learning passages, the organizers, and the criterion tests. The directions prefacing the learning passage and organizers simply indicated to the students to read the two sections very carefully, while the test directions explained how the student could reply to the test items.

Subjects

The subjects involved in the study were sixth grade students enrolled at one large urban school in the Winnipeg School Division No. 1. All of the sixth grade population was included in the study. The number of subjects totalled 80.

¹¹See Appendix A for the multiple choice test utilized in the treatment sessions.

¹²See Appendix D for the criterion test employed in the testing sessions.

Procedures

The 80 subjects were randomly placed into four treatment groups - outline organizer no instruction (O), outline organizer with one session of instruction (O1), expository advance organizer (EAO), and control (C).

Each group was pretested on a Friday. The pretest session consisted of the subjects reading the eight hundred word prose passage and thereafter answering 10 multiple choice test items.

Following the pretest, the four groups received their treatments. Four days, Monday through to Thursday, were required for the treatment sessions. Each group received their treatment on a separate day. The sessions occurred at the same time and location. While one group received their treatment, the remaining three continued to work at their regular language arts program. Each group was removed from their regular class situation once. All the treatment sessions consisted of approximately thirty minutes in duration. The day for each group's treatment was determined randomly. The group (C) had their treatment on Monday, (O1) on Tuesday, (EAO) on Wednesday, and (O) on Thursday.¹³

¹³See Appendix E for the treatment schedule employed in the study.

During the treatment sessions, all four groups received identical learning passages for reading and three test items to complete following the reading. Prior to the actual reading of the passage, each group received an organizer which was to be read first. The group (EAO) were given the expository advance organizer. The group (O) were given an outline to read consisting of one side heading and three sub-headings. Subjects in the group (C) simply read a general introductory paragraph prior to the reading of the learning passage. The fourth treatment group (O1) were given an outline which was identical to that of the group (O). In addition to receiving the outline organizer, the group (O1) was instructed on the purpose and usage of outlines as an aid to reading written materials. Several instruction techniques were utilized in the session. Initially, a brief exposition was given by the instructor to explain the purpose of an outline. Subsequently, the subjects were shown the various parts - side heading and sub-headings that comprised an outline. This was accomplished with the aid of an overhead projector. Once the exposition was completed, the instructor used the technique of questioning to guide the subjects in discovering how the component parts of an outline (side heading and sub-headings) could indicate what the content of a written passage might contain. Subsequently, the subjects were given an outline and a learning passage to read. After having read the passage the subjects were requested to indicate any discoveries they may have made

after reading both items. The subjects replied accordingly and thereafter were asked if they could demonstrate how an outline could be used as an aid. Several subjects employing the overhead projector demonstrated how an outline might be put to use by stating that the side heading was similar to the main heading in the learning passage and that the sub-headings contained some suggestion as to the information in the learning passage. After the demonstration, the subjects completed the three item multiple choice test. Hence, subjects corrected the test and thus were made aware of their results. During the scoring of the tests, the instructor interacted with various subjects by reinforcing their correct responses. When the subjects replied incorrectly, the instructor indicated accordingly.

Once the treatment sessions had been completed, the first of two posttests was administered. The initial posttest was given on the Friday which was the day following the last treatment session. All of the subjects were given the same learning passage and criterion test that had been used in the pretest. However, prior to the reading of the learning passage, the subjects were provided with their appropriate organizer depending upon the treatment he or she was in: the group (EAO) received an expository advance organizer, group (C) a general introductory paragraph and both groups (O) and (O1) an outline. Each of the advance materials were identical to those described and used in the pilot study.

One month later, the subjects were given the second posttest. It consisted of the ten item criterion test that was employed in both the pretest and initial posttest.¹⁴

The investigator served as instructor in all of the treatment sessions; however, during the testing sessions, two other teachers assisted in the test administration.

These procedures were utilized to investigate the following general question: Compared with no organizer, will the use of an outline organizer or outline organizer with instruction or an expository advance organizer make a significant difference in the translation and inferential dimensions of reading as determined by criterion test items?

Statement of Hypotheses

Since this study was designed to investigate the effect of outline organizers and expository advance organizers upon the growth of translation and inferential comprehension, and also to consider the effect of instruction in the usage of outline organizers, several null hypotheses were considered:

H₀¹ There will be no significant difference between the experimental and control groups on translation level of comprehension from the pretest to posttest one.

¹⁴See Appendix E for the testing schedule employed in the study.

- H₀2 There will be no significant difference between the experimental and control groups on inferential level of comprehension from the pretest to posttest one.
- H₀3 There will be no significant difference between the experimental and control groups on translation level of comprehension from the posttest one to posttest two.
- H₀4 There will be no significant difference between the experimental and control groups on inferential level of comprehension from the posttest one to posttest two.
- H₀5 There will be no significant difference between the experimental and control groups on translation level of comprehension from the pretest to posttest two.
- H₀6 There will be no significant difference between the experimental and control groups on inferential level of comprehension from the pretest to posttest two.

Method of Analysis

An analysis of variance among the group scores was employed to the test hypotheses. The groups' performances on the translation and inference levels of comprehension

consisted of the mean scores achieved in each of the three testing sessions. A .05 level of significance was necessary before differences were considered statistically significant.

Chapter IV

ANALYSIS OF THE DATA

The chapter contains a presentation of questions for research and an analysis of the data gathered pertaining to the effects of organizer on the comprehension of science material at the translation and inference levels by sixth grade students in an urban school.

Questions for Research

The present study was concerned mainly with the following questions:

1. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect comprehension at the translation level from the pretest to posttest one?
2. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect comprehension at the inference level from the pretest to posttest one?
3. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect comprehension at the translation level from the pretest to posttest two?

4. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect comprehension at the inference level from the pretest to posttest two?

5. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect comprehension at the translation level from posttest one to posttest two?

6. Will the use of an outline organizer or outline organizer with instruction or an expository advance organizer significantly affect comprehension at the inference level from posttest one to posttest two?

Subsequent to obtaining and analyzing the raw data, interviews were conducted with the students. The purpose of these interviews was to secure some insight as to the manner in which the students utilized the various organizers. The interviews are presented according to each organizer used, followed by a general summary.

In order to ascertain if the two categories of reading comprehension - translation and inference, were measuring essentially the same things, an analysis of the test items utilized in the study is also included. The chapter concludes with a summary of the findings.

Method of Analysis

Subsequent to the three testing sessions, each subject received six scores, three of which represented the total number of correct responses to the translation test items

and three which indicated the total correct responses to inferential test items.

The null hypotheses were tested by an analysis of variance¹ for the scores of the groups on the two categories of test items - translation and inference.

Analysis of Data

Six hypotheses were investigated. These hypotheses stated that there would be no significant differences between the experimental and control groups on the translation and inference levels of comprehension; from the pretest to the first posttest, pretest to the second posttest, and the initial posttest to the second posttest. Since no F ratio of any statistical significance ($\alpha = .05$) occurred, the null hypotheses were accepted. Tables 1 and 2 present the results of the analysis. The findings on Tables 1 and 2 also report that none of the treatment groups were differentially affected by the learning strategy employed, as the F Ratio for interaction effect on both the inference and translation levels of comprehension also fell below the values necessary for significance.

¹B. J. Winer, Statistical Principles in Experimental Design, (New York: McGraw-Hill Book Company, 1962), p. 306.

Table 1
 Analysis of Variance for the Groups on the
 Translation Level of Comprehension

Source	df	SS	MS	F
Between subjects	79	231.2913		
A (Strategies)	3	2.2863	0.762	0.253
Subjects within Groups	76	229.005	3.013	
Within subjects	160	115.2		
B	2	2.59377	1.2968	1.778
AB	6	1.7663	0.2944	0.404
Bx Subjects within Groups	152	110.8399	0.7292	

Table 2
 Analysis of Variance for the Groups
 on the Inferential Level of Comprehension

Source	df	SS	MS	F
Between subjects	79	226.80		
A (strategies)	3	1.3095	0.4365	0.1471
Subjects within Groups	76	225.4914	2.967	
Within subjects	160	121.2		
B	2	2.8201	1.41005	1.892
AB	6	6.606	1.101	1.477
Bx Subjects within Groups	152	113.2846	0.7453	

While none of the results disclosed on Tables 1 and 2 were statistically significant, Pearson's product - moment correlations² were conducted with the purpose of determining whether stability existed between the subjects' scores achieved in the testing sessions. Correlation coefficients were calculated; first, between the subjects' scores on the translation items achieved on the pretest and second posttest; second, between the subjects' scores on the inference items achieved on the pretest and second posttest. Tables 3 and 4 present the correlation coefficients for the translation and inference items respectively.

The correlation coefficients shown on both Tables 3 and 4 indicate that the scores obtained by the subjects, generally appeared to be maintained from the pretest to second posttest on both the translation and inference test items. Upon initial inspection several of the coefficients appear to be relatively low: for groups (O1) and (C) at .4 on the inference test items; and groups (EAO) and (O) with coefficients of .3 and .4 respectively on the translation items.

²The formula for Pearson's product moment correlation:

$$r = \frac{\sum xy - \frac{(\sum x)(\sum y)}{N}}{\sqrt{\left[\sum x^2 - \frac{(\sum x)^2}{N} \right] \left[\sum y^2 - \frac{(\sum y)^2}{N} \right]}}$$

where r is the correlation coefficient, \sum is the sum of, x is score for one individual, y is a second score for an individual, N the number of students in the sample.

Table 3

Coefficients of Correlation Between Pretest Translation Scores and Posttest Two Translation Scores

Group	No. of Pupils	r
Expository advance organizer (EAO)	20	.3
Outline organizer (O)	20	.4
Outline organizer with instruction (O1)	20	.5
Control (C)	20	.5

Table 4

Coefficients of Correlation Between Pretest Inference Scores and Posttest Two Inference Scores

Group	No. of pupils	r
Expository advance organizer (EAO)	20	.6
Outline organizer (O)	20	.5
Outline organizer with instruction (O1)	20	.4
Control (C)	20	.4

However, the possible range for scores, 5, was narrow, thus these correlations were accepted as indicators of general stability. Further, if the correlation coefficients suggest reasonable stability, it would then appear that each subject's scores reflected general group behavior rather than the latter resulting from random factors.

In order to ascertain the groups' general behavior when utilizing the various organizers, several interviews were conducted with subjects in each of the experimental groups. The pupils chosen for the interviews were randomly selected, and then they were requested to indicate how they implemented the particular organizer in responding to the inference and translation items on the first and second posttests.³

Interviews with the Outline Organizer Subjects (O)

The subjects questioned in the group (O) indicated that they felt the outline was quite beneficial to them. They stated that it was the side headings which helped them in their reading of the learning passage, and that the side headings gave them some assistance in relating the central ideas to the content of the passage. On the other hand, the sub-headings did not aid them at all; they had no knowledge of how to implement these types of headings.

When asked to show exactly how they used the outline, the subjects stated that they kept the side headings in mind prior to the reading of the learning passage. Thereafter, once they initiated the reading of the learning passage, attempts to recall the side headings were made. With these in their minds, the subjects concentrated upon the learning

³See Appendix F for an example of a student interview.

passage, thinking of it as an article containing several related main ideas: they stated that they then attempted to retain facts or details which were located within these main ideas, and that the facts enabled them to comprehend the main ideas more readily. The subjects gave additional commentary: another reason for retaining the details was for recall purposes; they had expected many factual questions to be asked on the multiple choice test as had been their past experience.

When questioned as to the method in which they implemented the outline for the second posttest, the subjects replied that they again attempted to recall the side headings in order to organize their thoughts about what they had read in the learning passage. While the side headings facilitated the recollection of centrally related thoughts in the passage, extreme difficulty was experienced in recalling many of the specific details; the sub-headings were overlooked for the same reason as in the first posttest. This was evidenced by the following incident revealed after the interview. The investigator showed the pupils how to use the sub-headings. Now several of the subjects realized that these sub-headings were related to some of the details contained in the learning passage. They commented that if the situation ever arose again when they might use an outline, the sub-headings might be utilized to assist them in comprehending the details in a passage.

In summary, the group (0) subjects concluded that

the outline aided them only in relating the central ideas contained in the article.

Interviews with the Expository Advance Organizer Subjects (EAO)

Subjects in group (EAO) were similarly interviewed concerning their thoughts about using an organizer; in their case it was the expository advance organizer and the method in which it was utilized. The subjects stated that they would use an expository advance organizer (EAO) again as it appeared to help them relate the central ideas in the learning passage. When questioned as to how it would help, they replied that the EAO acted as a brief preview of the central ideas that were included in the learning passage. The subjects also stated that the EAO facilitated the recall of related information from past experience. While reading the learning passage, they realized that the topic was similar to the EAO and that the central ideas included in the EAO were somewhat similar in the learning passage. Thus, they concluded that though the EAO united the central ideas, many more details were presented in the passage than in the organizer. While they read the learning passage, the subjects acted similarly to the group (O) subjects regarding the deliberate efforts made to retain facts: these facts were considered as part of the central ideas and most important in replying to test items. They also mentioned that the cause for this was that they had been accustomed to responding to factual test items.

The subjects in the group (EAO) were also requested to indicate how they implemented the EAO for the second posttest. They replied that the organizer aided them in retaining the central ideas involved in the learning passage. It also assisted them in recollecting some other outside information which they had previously experienced. On the other hand, as with group (O), these subjects had difficulty recalling most of the facts that they had read a month earlier. It was their impression that the EAO basically aided them to relate and to retain only the central ideas of the learning passage.

Interviews with the Outline Organizer Subjects (O1)

When the third experimental group which used an outline organizer with instruction (O1) were requested to indicate how they implemented the outline during the second and third testing sessions, they revealed that the outline helped in retaining equally both the specific details and the central ideas in the passage. In addition, the subjects indicated that the instruction into the use of outlines showed them how an outline can serve as an aid while reading a learning passage. Thus during the reading of the outline, they tried to remember the side headings and sub-headings as much as possible. They also stated that while they were reading the learning passage, the side and sub-headings were recalled; the side headings assisted them in relating the central ideas in the passage, while the sub-headings focused upon details which were mentioned in the headings.

Similar procedures were undertaken for the second posttest: instruction into the usage of the sub and side headings appeared to guide the subjects in using the various headings in the same way as in the first posttest. Another observation made by the subjects was that they had concentrated only on the information in the learning passage which was directly related to the outline; all other information was disregarded.

Interviews with the Control Subjects (C)

The subjects in the control treatment were also asked how they utilized the introductory paragraph provided to them. The subjects stated that after reading the paragraph, it was not used again because they did not see the relationship between the learning passage and the introductory paragraph. When asked to describe the manner in which they retained the information that they had read in order to respond to the test items on the first posttest, they indicated that the section headings located throughout the learning passage helped somewhat. Some of the section headings were utilized to retain central ideas and factual information which were located beneath these headings. They further stated that the section headings appeared to be more beneficial in recalling the central ideas than of factual information.

The subjects stated the same procedure was utilized when attempting to recall the information for the second posttest; however, many of the section headings could not be

remembered, thus difficulty was encountered in recalling specific details which were contained in the learning passage.

Summary of the Interviews

The interviews disclosed the manner in which the subjects utilized the various organizers in comprehending the passage. An examination of the groups' mean scores displayed in Figures 1 and 2 lends support to these statements. In both graphic representations of the mean scores, very similar patterns are evident. The groups (EAO) and (O) utilizing the expository advance organizer and outline organizer respectively, disclose appreciable gains from the pretest to the initial posttest on the translation and especially on the inference levels of comprehension whereas the groups (O1) and (C) demonstrate very little growth for the same testing sessions.

The graphs reveal another trend: the same groups (O1) and (C) remained relatively stationary on the delayed or second posttest for both the translation and inference items while the groups (EAO) and (O) showed: that on the inference items, they continued to maintain the appreciable gains achieved on the initial posttest but dropped somewhat on the translation items.

An examination of groups (EAO), (O), and (C) mean scores also indicates that on both the initial and second posttests, the subjects performed generally better on the inferential test items than on the translation items;

Figure 1

GROUP MEAN SCORES
ON THE TRANSLATION ITEMS

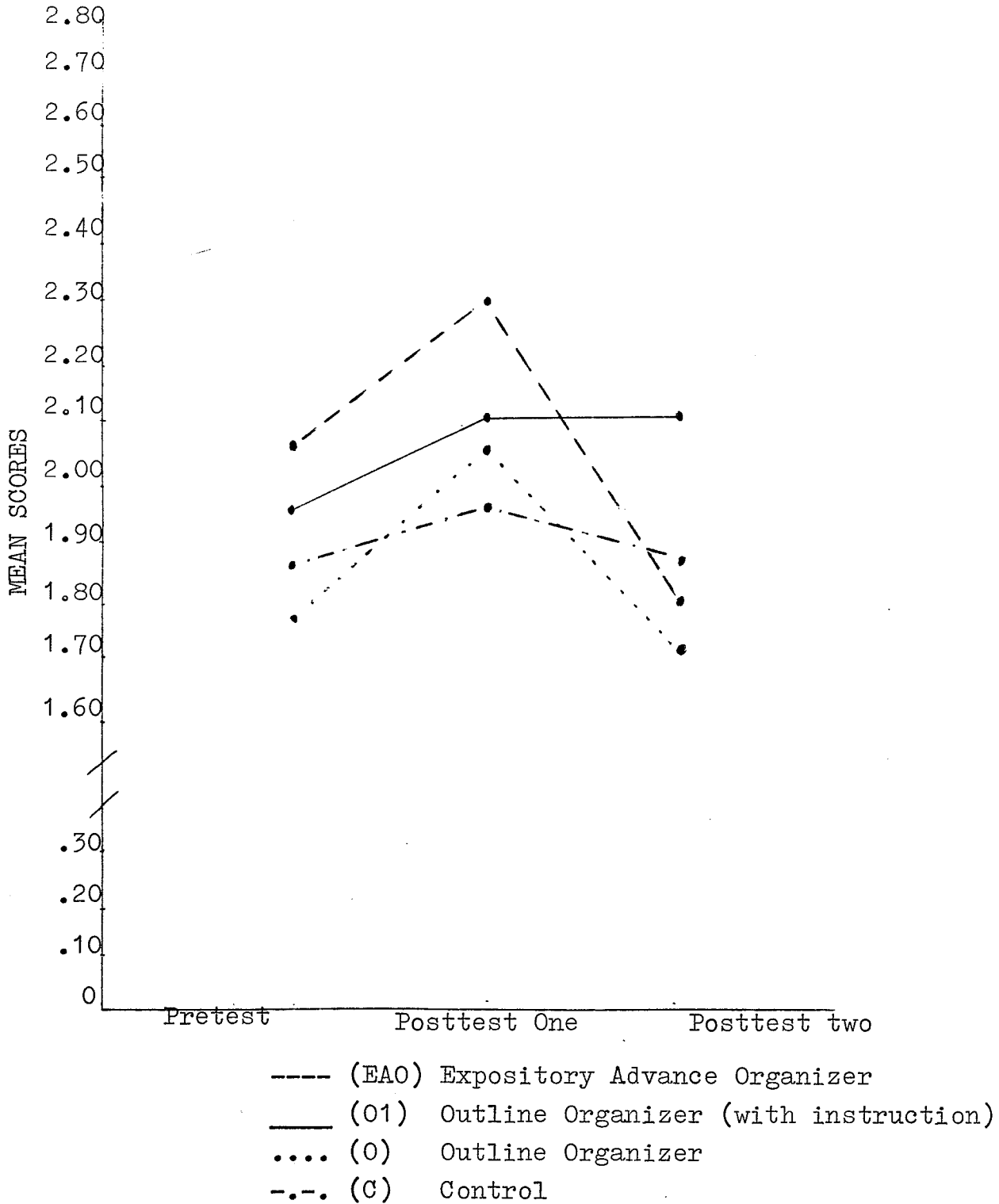
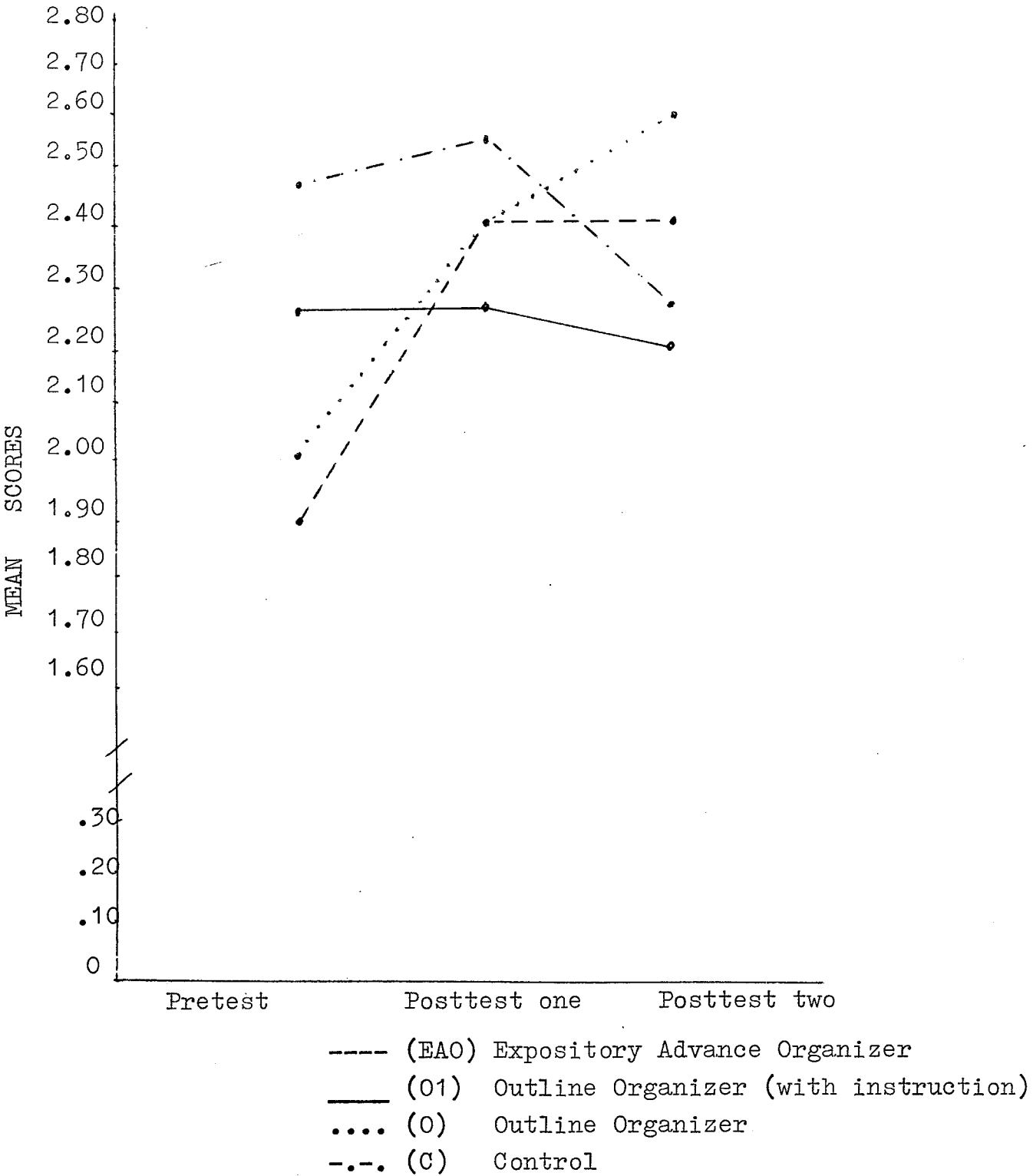


Figure 2

GROUP MEAN SCORES
ON THE INFERENCE ITEMS



whereas group (01) performed quite evenly on both test items.

Thus these trends would suggest that groups (EAO) and (0) benefitted from the presence of their organizers particularly on the inferential items whereas the (01) and (C) subjects did not appear to be affected.

Analysis of Test Items

In order to ascertain if the two categories of reading comprehension as elicited by the test items - translation and inference - were measuring essentially different dimensions, Pearson's product moment correlation was utilized. Correlation coefficients were determined by correlating all of the groups' scores on the translation and inference items. Correlations for these items were calculated for the pretest, first posttest and second posttest. The correlation coefficients for the respective testing sessions were (.45), (.55), and (.55). Thus these coefficients indicated that the two categories of test items were different in respect to what they were measuring: had a coefficient of .85 or higher been obtained, it would have suggested that the two categories were measuring the same things. On the other hand, the coefficients did not approach low levels, thus the aforementioned findings cannot be submitted as evidence that the two categories of test items are measuring totally different abilities: a correlation of .20 and .15 would have been required. It can be concluded then that the translation and inference items did measure abilities

which were in the main quite different.

Summary of the Findings

As the analyses of variance revealed no significant differences among the group test scores, the six null hypotheses were accepted.

Though no significant findings resulted, Pearson's product moment correlations were calculated for each treatment group's scores with respect to each of the two reading comprehension dimensions in the pretest and second posttest. The correlation coefficients revealed that the subjects' scores throughout the two testing sessions were quite stable; thus it can be concluded that the subjects' performance on the criterion tests reflected general group behavior.

Interviews with subjects in each of the treatment groups gave some insights into what this group behavior was and the manner in which the organizers were utilized. The subjects utilizing the expository advance organizer and outline organizer stated that the organizers assisted them in relating the central ideas contained in the learning passage. In addition, attempts were made to retain supporting factual information that had been selected while utilizing the organizers.

Discussions with the subjects who were given instruction in using an outline organizer revealed that the instruction session assisted them only in the implementation of the organizer. The subjects indicated that the outline organizer appeared to be equally helpful in retaining factual

information and in relating central ideas. The subjects also stated that their attention was exclusively devoted to the material covered by the outline, all other information was disregarded.

An inspection of the groups' mean scores appears to support the groups' statements as disclosed in the interviews. Subjects utilizing the expository advance organizer (EAO) and the outline organizer (O) achieved sizeable gains on the translation and inference items from the pretest to the first posttest. This gain was maintained on the inference items through to the second posttest, whereas a slight drop occurred on the translation items. Meanwhile the subjects in the control and outline organizer with instruction groups displayed totally different patterns: they exhibited a pattern which remained stationary throughout the three testing sessions with the mean scores remaining quite static.

Results of the correlations conducted between the groups' scores on the translation and inference test items for each of the testing sessions revealed that the criterion items appeared to be testing generally different abilities. However, since the coefficients .45 for the pretest and .55 for both the first and second posttest were not extremely low, it suggested that these two abilities were not completely and mutually exclusive.

Chapter V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

The chapter summarizes the findings concerning the effects of two types of organizers, an expository advance organizer and an outline organizer, on the comprehension of science material by sixth grade students. The findings are examined in the light of results obtained by other sixth grade students who used an outline with instruction and those students who were identified as the control group. A discussion of these findings and the conclusions of the study are thereafter presented. Subsequent to the conclusions, the implications of the study are set forth. The chapter concludes with suggestions for further research.

Summary

The study was designed to investigate the effects of two types of organizers, expository advance organizer, and outline organizer on two specific dimensions of reading comprehension of written science material by sixth grade students. Further the study considered the effects of instruction on the use of outline organizers as an aid to these two specified comprehension levels. These were compared

against a control group who followed the usual program as recommended for sixth grade teachers in this province.

Specifically, the study sought to ascertain whether, compared with no organizer, will the use of an outline organizer or an outline organizer with instruction or an expository advance organizer, make a significant difference in the translation and inferential dimensions of reading.

The following findings were disclosed by the analysis of the data:

1. There were no significant differences found among the mean scores of the treatment groups at either the translation or inference levels of comprehension from the pretest to posttest one and from posttest one to posttest two.

2. Interviews revealed, on the other hand, the manner in which each of the organizers was utilized. The subjects employing the expository advance organizer (EAO) and outline organizer (O) indicated that their respective organizer assisted in relating the central ideas contained in the learning passage. The interviews also disclosed that these subjects attempted to retain supporting factual information. The subjects who implemented the outline organizer with instruction (O1) indicated that the organizer appeared to be equally helpful in relating central ideas and retaining factual information. The subjects also stated that their attention was exclusively devoted to the material covered by the outline, all other information was disregarded.

3. Several patterns of the groups' mean scores were noted on both the translation and inference test items. Groups (O1) and (C) appeared to maintain generally their mean scores throughout the three testing sessions on both the translation and inference items. Groups (EAO) and (O) showed appreciable gains from the pretest to the first posttest on the translation and inference test items. This growth was maintained on the second posttest for the inference items; on the other hand, there was a drop on the translation items.

4. The results of the correlations conducted between the groups' scores on the translation and inference test items for each of the testing sessions, revealed that the two categories of test items appeared to be testing generally different abilities. However, it was also found that the correlations were not low enough to state conclusively that the test items were measuring totally different abilities.

Conclusions

Since no significant differences were found on the analysis of variance conducted upon the groups' mean scores, the six null hypotheses were accepted. The acceptance of the six null hypotheses results in the conclusion that the outline organizers and the expository advance organizer implemented in this study were not effective as aids in the inferential and translation dimensions of reading comprehension. This conclusion concurs with that of Barnes and

Clawson who reviewed many investigations concerning the facilitative effects of organizers.

The efficacy of advance organizers has not been established. Of the 32 studies reviewed, 12 reported that advance organizers facilitate learning, and 20 reported that they did not...We must conclude from this review that advance organizers, as presently constructed generally do not facilitate learning.¹

Initially it appeared that the strategies utilized in the study were not more effective than the control situation. However, consideration must be given to possible factors not specifically related to the treatments that may have caused the results to be non-significant. Richards has suggested that:

Change is estimated most accurately by techniques that involve difference between the pretest and the post-test, and these techniques seem equally accurate... however, it is important to measure change over the entire course of learning...and not just over the later stages of learning.²

The treatment sessions implemented in this study were brief in nature with each session lasting approximately thirty minutes. Since each treatment group had only one brief session, it may have been the brevity of the treatments that produced the insignificant findings. A much lengthier period of treatment could have possibly provided significant

¹B. R. Barnes and E. U. Clawson, "Do Advance Organizers Facilitate Learning? Recommendations for Further Research Based on an Analysis of 32 Studies," Review of Educational Research, 45 (1975), 651.

²J. M. Richards, Jr., "A Simulation Study of the Use of Change Measures to Compare Educational Programs," American Educational Research Journal, 12 (1975), 305.

findings and thus a more definite conclusion.

The findings to this point have been discussed in terms of statistical significance. Though the differences between the groups were not statistically significant, consideration should be given to the practical difference that emerged when the growth patterns of the treatment groups were analyzed. Helmstader indicated that "practical difference is a value judgement as to how much the result is worth for some particular practical or theoretical use."³ Thus reflection on the practical difference was deemed necessary. An inspection of mean scores achieved on both the translation and inference items revealed that the subjects utilizing the expository advance organizer and outline organizer without instruction implemented their advance material quite adequately as compared to the control and outline organizer with instruction groups. It was noted that the two treatments, expository advance organizer (EAO) and outline organizer (O), made appreciable gains on both the translation and inference test items on the initial posttest whereas the two other groups, outline organizer with instruction (O1) and control (C), demonstrated insignificant changes. On the second posttest, both expository advance

³G. C. Helmstadter, Research Concepts in Human Behavior, as cited in B. R. Barnes and E. U. Clawson, "Do Advance Organizers Facilitate Learning? Recommendations for Further Research Based on an Analysis of 32 Studies," Review of Educational Research, 45 (1975), 651.

organizer and outline organizer without instruction, subjects maintained the advantage achieved on the inference items from the initial posttest whereas the control and outline with instruction scores remained stationary. These two latter groups, though remaining stationary in their pattern of scores for the translation items on the second posttest, performed slightly better than the expository advance organizer and outline organizer without instruction whose scores had dropped. This drop in performance exhibited by the expository advance organizer (EAO) and outline organizer without instruction (O) subjects may have occurred because the test items for translation required a recall of facts and that time may have been a serious factor in memory loss. According to their interviews, the subjects utilizing the expository advance organizer (EAO) and the outline organizer without instruction (O) were motivated by their respective organizers to recall facts for the initial posttest. However, with no further reinforcement from the organizers on the delayed test, the subjects demonstrated a loss of recall, which was evidenced by the drop in scores on the translation items. On the other hand, the groups (EAO) and (O) did not display any decline in their performance on the inference items. Inferencing requires a processing of information, a seeking of relationships, thus it goes beyond a mere recall of facts. This processing would appear then to reduce the amount of memory loss. Because the subjects in groups (EAO) and (O) demonstrated behaviors which were above the literal understanding level, in that they were relating ideas and events,

the result was growth demonstrated on the inference items.

The pattern of growth demonstrated by the subjects utilizing the expository advance organizer and outline organizer without instruction would suggest that these organizers may be of some practical value especially if the purpose of the organizer were to facilitate immediate comprehension at the inference and translation levels. In addition, the growth patterns displayed by these two treatment groups from the initial posttest to the second posttest would suggest recommendation of the expository advance organizer and outline organizer in facilitating delayed inferential comprehension. Examination of the growth pattern of the outline organizer with instruction treatment, revealed that the organizer was stymieing growth at the inference and translation levels as the groups' mean scores remained constant throughout.

Interviews conducted with several of the subjects in the various treatment groups offered some insight upon the practicality of organizers even when significant test findings had not occurred. The subjects utilizing the expository advance organizer apparently implemented their

prose material in the manner Ausubel suggested that learners would: they mentioned that the prose organizer appeared to provide a general overview of the central ideas which existed in the learning passage. In addition the subjects stated that after having read the organizer, they began to recall specific information which they had previously encountered elsewhere. The organizer appeared to assist the students in relating the passage's central ideas. The subjects stated that since the organizer did not assist them in the retention of factual information, they simply decided to try and retain as many of the significant details that pertained to the passage's central ideas. These revelations suggested that the presence of the organizer stimulated the subjects' own initiative in processing the information. Thus it would appear that the expository advance organizer assumed the role of a catalyst in motivating the subjects to develop their own strategies in retaining explicitly stated information.

Interviews with the subjects who utilized the outline organizer without instruction revealed generally that the outline organizer had much the same effect as the expository advance organizer. The side headings assisted the subjects in relating the central ideas which were included in the learning passage. The sub-headings were not utilized because of the high frequency and lack of knowledge regarding their use. Consequently, the subjects relied almost exclusively upon the side headings in retaining some of the

explicitly stated information. Thus the outline organizer and the expository advance organizer encourage students to develop their own strategies for remembering factual information. In addition both organizers appear to have the same facilitative effects upon students' abilities in relating central ideas in a passage.

Differences between the theoretical framework explaining the facilitative effects of the expository advance organizer and outline organizer are also important. The implementation of the outline organizer appears to coincide with Rothkopf's conceptual model of the manner in which learning occurs: "The activities in which a student engages when confronted with an instructive document determine what will be learned."⁴ Rothkopf termed a student's action during these activities, "mathemagenic behavior" - behaviors which give birth to learning. The subjects' usage of the side headings coincide with this action. Rothkopf suggested that the mathemagenic behavior may be affected by nominal stimuli which in turn eventually determine the substantive learning that will occur. The former, he indicated, might include sentences, words or phrases. In the case of the subjects utilizing the outline, the side headings could be

⁴E. Rothkopf, "Some Theoretical and Experimental Approaches to Problems in Written Instruction," Learning and the Educational Process, ed. J. D. Krumboltz, Chicago: Rand McNally (1963), 198.

considered the nominal stimuli. The effect of being exposed to these stimuli apparently caused the subjects to relate the central ideas which consequently provided the subjects with substantive information. It would then appear that the related central ideas and the side headings both acted as nominal stimuli for the subjects processing factual data. In addition to directly facilitating centrally-related ideas, the outline organizer acted as a catalyst in providing for a situation in which the subjects took the initiative in developing their own strategies for retaining factual data.

The subjects in the third experimental group, outline organizer with instruction, did not utilize the outline in exactly the same manner. Interviews with the subjects indicated that the side headings were utilized to relate central ideas while the sub-headings appeared to assist in the retention of factual information included in the learning passage. Though the usage of all aspects of the outline was not exactly similar to the previous outline organizer group discussed, the theory behind Rothkopf's conceptual model seems to apply in this situation: the nominal stimuli which affected the subjects' mathemagenic behaviors were the side and the sub-headings. Both headings appeared to be responsible for learning the centrally-related ideas and the factual information. On the other hand, though these headings affected the substantive learning, consideration must be given to the effect that instruction may have had. Discussions with the subjects revealed that

the training session was of assistance in learning how to implement the side and sub-headings, but, at the same time, it appeared to restrict the retention of retaining information which was referred to in the outline. Considering that the subjects' mean growth on the translation and inference items was relatively negligible, it seems that the effect of instruction prohibited independent learning. It would appear then, that the instructional effect was to constrain any independent strategy development as the subjects relied solely upon the outline in organizing their information.

The statistical results of this study indicated that organizers do not appear to be effective as facilitators. However, consideration should be given to the practical difference in the growth demonstrated by the subjects utilizing the expository advance organizer and outline organizer without instruction at the inferential and translation levels of reading comprehension. Consideration should also be accorded to the apparent effect that the presence of these two organizers had on the strategy development displayed by the subjects utilizing organizers.

Although the outline organizer and expository advance organizers appear to have some practical value with sixth grade students, caution is advised in their use. Educators, curriculum developers, publishers, and classroom teachers, need to be aware of the shortcomings inherent in the implementation of the organizers. These shortcomings

would involve:

...such things as the amount of time it takes to construct and present them to students, how much money it might cost to have someone write and reproduce them and what other tasks cannot be accomplished because the time and money devoted to the construction and presentation of the organizer are no longer available for other uses.⁵

The finding that the two categories of test items, translation and inference, measured generally different abilities is not unexpected. In each case the test items were constructed according to Trosky's definition of the two levels. The abilities required to demonstrate comprehension at the translation level are in the main much different from those necessary to exhibit inferential comprehension. Requisite for the former is a literal understanding of words, phrases or sentences found in a learning passage. On the other hand, in inferential comprehension one must be able to see relationships between facts and ideas. The findings also revealed that the two categories of test items did not measure totally different abilities either: to infer, one must have a grasp of the literal understanding of a written passage in order to be able to relate various ideas or facts. In other words, there is some imbedding of translation within inference.

⁵Barnes and Clawson, "Do Advance Organizers Facilitate Learning?" p. 653.

Implications for the Classroom Teacher

The study has implications for the use of organizers in classroom situations where teachers assign written materials to be read, especially in the area of science.

By showing that the outline organizer and expository advance organizer facilitated the comprehension of written science material, the study indicates the value of providing organizers along with reading assignments. Instead of simply assigning the students to read written materials, the study suggests the teacher provide organizers in advance of the reading assignment.

The study shows that in using the expository advance organizer, the teacher needs only to provide the advance material to the student: other than the requesting the student to read the organizer, no direction as to its implementation is required. The study also suggests the value of using the outline organizer in the reading of science materials. However, the outline requires a particular teaching procedure: the teacher must provide some initial direction in familiarizing the students with the component parts of an outline. The teacher is cautioned, however, not to provide too highly a structured set of instructions thus avoiding over-direction in how the outline could be utilized. If this procedure is followed, then the effect of instruction may be in encouraging the student to learn independently by applying the outline according to his present perceptions and needs.

Implications for the Curriculum Developer

The study has certain implications for curriculum developers in their selection and authorization of science textbook materials if organizers are to be implemented.

The study suggests that when expository advance organizers are to be utilized, the curriculum developer must be certain that the learning materials are written with expressed concern for cognitive structuring, that the curriculum materials must be arranged in a developmental manner. The current study suggests that any new information that is to be learned must be related to the learner's existing body of knowledge because in the main, it is dependent upon specific prior materials. The study also indicates that curriculum developers should select those sets of materials which are accompanied by expository advance organizers. If these are not available, then the curriculum developers should consider the possibility of having these prepared and made available for distribution.

The study also suggests that if outline organizers are to be recommended, the curriculum developer needs only to point out to the classroom practitioner that the latter can include only outlines with the reading materials and that little direct instruction related to the use of the outline will be required.

The study indicates that since the expository advance organizer was more abstract in nature than the outline organizer, sixth grade students may be more comfortable

utilizing the latter even though the effects of the organizers were similar. Hence, curriculum developers may find that selecting science materials with accompanying outline organizers as most suitable at the sixth grade level.

Implications for the Publisher

The study also has specific implications for publishers in their preparation of science materials for classroom use.

As in the use of curriculum developers, the study suggests that science text materials which are accompanied by advanced organizers should be written with the cognitive level of the learner in mind. The publisher must be concerned with the age group of the learners for whom the text book is developed and demand that the authors structure the material according to these levels of cognition. Consequently, publishers must demand that writers produce science materials which are developmental in nature, involving careful sequencing of concepts.

The study also indicates that the organizers which are written for the learning materials, must be at a higher level of generality and abstraction than the materials they preface. Accordingly, the publishers of science materials must concern themselves with this aspect when providing the organizers.

Implications for the Researcher

The current study has certain implications for researchers in their information gathering techniques that might be utilized in future investigations.

The study suggests that in addition to employing criterion tests, the use of interviews is a valuable technique which should be considered when data is being accumulated for a study. The study reveals that the interview is a powerful data gathering device as it allows a researcher to acquire insight into a subject's processing of information whereas the criterion test simply indicates a subject's performance. Moreover, flexibility is accorded to a researcher if an interview approach is employed to gather information; this flexibility allows the researcher to determine the precise line of inquiry that he feels might reveal significant information.

The researcher would be well advised to consider aspects of this study for replication at other grade levels and in other content areas, such as social studies, to determine what aspects if any of this study are transferrable to other grade levels and other content areas.

Limitations

The findings reported concerning the effects of organizers upon comprehension must only be viewed within the restrictions imposed by the comprehension definitions given in the study. Though the emphasis of the study was upon the subject's comprehension of written material, the findings related exclusively to two levels - inference and translation.

The written materials utilized in the learning passage consisted of prose paragraphs adopted from a sixth

grade science text. Though the organizers utilized in this study may be used with various prose materials in the other content areas, the effect of the organizers disclosed in this study is limited to the comprehension of sixth grade science material.

The sample utilized in the study consisted of the total sixth grade student body attending one elementary school. Although the treatment groups were randomly selected from this population, no claim may be made that this sample is representative of sixth graders outside the sample chosen. Consequently, all generalizations from the study may only refer to the sixth graders attending the school from which the sample was selected.

The study was conducted by the investigator. Though effort was made to be as objective as possible throughout the four different treatments, the findings must be considered in the light that there may have been some bias for one or more of the treatments.

The learning passage that was adopted for the study was changed from its original text format in that visual aids and double columns were deleted. The textbook format may have assisted in facilitating the comprehension of the material; by deleting this format, reading comprehension may have been negatively affected. Thus the change in format must be considered a limitation.

Suggestions for Further Research

Though the study's findings report that organizers facilitate comprehension, this should not preclude further investigation. Conversely, it would suggest that additional research is required so that the efficacy of organizers may be established across grade levels and in different content areas.

This investigation considered the effect of the organizers on facilitating comprehension at two levels of comprehension, inference and translation. However, these levels represent but two of the six categories that Trosky has set forth.⁶ As a result, further research should be considered in the effect of the organizers on the other four dimensions of comprehension - recognition, evaluation, explanation and imagining. This examination would not only provide necessary information concerning an organizer's effectiveness on all dimensions of comprehension, but it would also furnish more specific knowledge that other investigations did not appear to have accomplished.

Many of the previous studies utilized criterion tests to determine the amount of learning that occurred as a consequence of an organizer. However, few have given indication concerning specific dimensions of comprehension being affected. Ausubel's four major investigations, Ausubel,⁷ Ausubel and Fitzgerald,⁸ Ausubel and

⁶O. S. Trosky, "Modifications in Teachers' Questioning Behavior in the Development of Reading Comprehension and a Series of Supervisory Conferences." (Doctoral dissertation, University of Toronto 1971).

⁷D. Ausubel, "The Use of Advance Organizers in the Learning and Retention of Meaningful Learning Material," Journal of Educational Psychology, 51 (1960).

⁸D. Ausubel and D. Fitzgerald, "The Role of Discriminability in Meaningful Verbal Learning and Retention," Journal of Educational Psychology, 52 (1961).

Fitzgerald,⁹ and Ausubel and Youssef,¹⁰ provided findings which were supportive of organizers, nonetheless, no criteria for the test item construction were indicated other than that "test items covered principles, facts and applications."¹¹ Consequently, the findings were supportive; but, it is not certain at which level of comprehension the organizers appear to be facilitative.

Since this study was carried on over a brief period of time, further research should be conducted to determine the effects a longer period of treatment would have on the utilization of organizers. The increased period of treatment in addition to providing the subjects with further exposure to the organizers would be most useful.

Though the differences among the treatment groups were not significant, this study found that the group utilizing the outline organizer with instruction did not perform as well as the other experimental groups. In fact, the outline organizer appeared to stymie the subjects' comprehension as growth was negligible throughout the testing sessions. The interviews revealed that the subjects

⁹D. Ausubel and D. Fitzgerald, "Organizer-General Background and Antecedent Learning Variables in Sequential Verbal Learning," Journal of Educational Psychology, 53 (1962).

¹⁰D. Ausubel and M. Youssef, "The Role of Discriminability in Meaningful Parallel Learning," Journal of Educational Psychology, 54 (1963).

¹¹Ausubel and Fitzgerald, "The Role of Discriminability in Meaningful Verbal Learning and Retention," p. 268.

relied solely upon the outline as they believed it contained sufficient context. Possibly the context of the outline fostered total dependence by the subjects on the instructional dimension. Further investigation should be conducted to determine if complexity and length of an outline organizer have an effect on comprehension and/or the accompanying instruction. Jerrolds¹² found that instructing subjects to utilize a modified advance organizer which simply consisted of a brief sentence giving a main idea was effective as an aid; this is worthy of replication.

The subjects utilized in the study were at the age in which they were between the concrete-operational and formal operational developmental periods. More research is required with cognitive abilities before investigating further the effectiveness of abstract organizers.

As this study revealed that instruction or "arrangement of the external conditions of learning,"¹³ in using outline organizers was not generally effective, further investigation should be conducted to ascertain if the manner in which the conditions were arranged has an effect on a subject's implementation of an outline. Research should be considered in relation to the following instructional conditions--the stimulus situation, verbal communications directed at the learner, and type of feedback.

¹²B. W. Jerrolds, "The Effects of Advanced Organizers in Reading for the Retention of Specific Facts," Investigations Relating to Mature Reading, ed. F. P. Greene, National Reading Conference, Twenty-first Yearbook (Milwaukee: National Reading Conference, Inc., 1972), 23-29.

¹³R. M. Gagné, The Conditions of Learning, (New York: Holt Rinehart and Winston, 1965), p. 205.

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APPENDIX

APPENDIX A

TREATMENT SESSION MATERIALS

1. Introductory passage for control group (C).
2. Expository advance organizer for group (EAO).
3. Outline organizer for groups (O) and (O1).
4. Learning passage.
5. Criterion test.

CONSERVING OUR RESOURCES

Humans depend enormously on a great deal of natural resources. Some of these resources include air, soil, minerals, and water. Whether we live on the farm or in the city, it is our responsibility to look forward to the future and to plan so that tomorrow's world will have plentiful resources as we do today.

CONSERVING OUR RESOURCES

Do you know what conservation is? Conservation is the care and protection of our resources. Our natural resources include very many things such as soil, minerals, trees and wildlife.

Many living creatures are cared for and protected by various government departments. These departments have programs which help to preserve such creatures as the buffalo and timberwolf. However, there are also groups of people who also have programs which serve to preserve wildlife.

CONSERVATION

- A. Conserving our Wildlife
1. the whooping crane
 2. the giant condor
 3. program to save the condor

CONSERVATION

Conserving our Wildlife

Many kinds of animals are on the verge of extinction. Many animals, such as the whooping crane, of which there are less than fifty in the world, are being protected from extinction by the government.

The condor is a bird with a wing-spread of over eleven feet. Early pioneers of America, such as those with the Lewis and Clark expedition, called it the "royal vulture." Indians called it the "thunderbird," because they thought that the flapping of its wings made thunder. A hundred years ago there were countless condors. Fifteen years ago there were only sixty. Today there are only forty. The disappearance of the condors is the fault of irresponsible hunters who are killing them faster than they can reproduce.

In 1964 a national effort to save the giant California condor was started by the National Audubon Society. The Society, which helped to save eagles from extinction shortly after 1900 and is currently trying to preserve the few remaining whooping cranes, has set up a five-point program to save the condor.

1. It will try to have present laws against killing condors better enforced.
2. It will employ special condor wardens to patrol the lands on which the condors live.
3. It will start an education program for the public.
4. It will set up protective zones around the lands on which the condors live.
5. It will urge various agencies to avoid the use of chemical pesticides that might kill the birds.

MULTIPLE CHOICE QUESTIONS

Instructions:

Read each question and the answers beneath them. When you have decided which answer is correct, circle the letter of the correct answer.

1. The whooping crane is being protected from extinction by:
 - a careless hunters
 - b Other birds.
 - c the government
 - d the forest

2. "Royal Vulture" and "Thunderbird" are names given to the:
 - a eagle
 - b whooping crane
 - c condor
 - d sparrow

3. The National Audubon Society's program to preserve creatures had:
 - a five points
 - b two points
 - c ten points
 - d eight points

APPENDIX B

PRETEST MATERIALS

1. Directions for the pretest.
2. Learning Passage.
3. Criterion Test.

LIFE IN THE PASTR E A D T H I S P A G E C A R E F U L L Y

You will be reading a passage and then answer a multiple choice test to see if you have remembered the information in the passage. Read the passage very carefully. Once you have finished reading the passage, place it back in the file folder and begin doing the questions. However, do not look back at the learning passage once the questions have been started.

LIFE IN THE PAST

Geological calendar

Just how old is the earth? No scientists are sure. But from a careful study of the evidence of fossils and from carbon and uranium dating, scientists have made a guess.

The theory is that from its beginnings to the time life of any kind may first have appeared, is somewhere around two to four billion years. It's hard to be exact about two billion years. But it's a long, long time. No one is sure when living things first appeared, but scientists think it was probably more than 500 million years ago!

Paleontologists and geologists have divided the history of the earth into very large time groups. They have made a geological calendar to help us think about time and history.

The geological calendar has large time divisions. They are so vast that we don't really get an exact idea from them. But the calendar can help us get an idea about the development of life on earth.

These different eras are described more fully on the next few paragraphs.

The Precambrian Era

Even though this period covers more than three-quarters of the earth's history, very few fossils have been found in rocks of this era.

Because so few fossils have been found in these rocks, scientists conclude that forms of life in this era did not have bones or other hard parts. The first simple soft-bodied living things are believed to have developed in the Precambrian era. There is also some evidence of a few algae.

This earliest era lasted billions of years!

The Paleozoic Era

Many different kinds of sea creatures lived and grew and increased in numbers. It was during the Paleozoic era