

ACKNOWLEDGEMENTS

I would like to express my appreciation to several individuals who have helped in the successful completion of this thesis.

To Dr. Bob Bernard, my thesis supervisor, who was very helpful and always ready to give guidance, I am very grateful. In addition, I would like to thank Dr. Chris Peterson, Dr. Gary Boyd, and Prof. Frances Friedman for their valuable help.

Also, I would like to thank the entire Educational Technology faculty, who have contributed to my successful completion of the program.

Finally, special thanks to Aleema and Javed for their cooperation and consideration.

TABLE OF CONTENTS

Chapter		Page
1	Introduction	1
	Advance Organizers	1
	Alternative Forms of Advance Organizers	4
	Cognitive Style and Advance Organizer	5
	Statement of the Problem	6
2	Literature Review	7
	Structure of Memory and Prose	7
	Structure of memory	7
	Relation of prose and memory structure	8
	Construction of Advance Organizers	10
	Learning materials	10
	Type of advance organizer	10
	Testing	13
	Studies Supporting Advance Organizer	13
	Studies Not Supporting Advance Organizer	17
	Alternative Forms of Advance Organizer	20
	Cognitive Style and Use of Advance Organizer	22
	Summary of Hypotheses	24
3	Method	26
	Sample	26
	Experimental Design	26
	Instrumentation	29

Chapter		Page
	Measure of cognitive style	29
	Recognition test	30
	Materials	30
	Passage selection	30
	Passage familiarity	31
	Organizer construction	31
	Assembly of materials	33
	Procedure	33
4	Results	35
	Introduction and Hypotheses	35
	Covariate Predictor	35
	Analysis of Repeated Measures	36
	Immediate Recognition Test	36
	Delayed Recognition Test	36
	Post hoc Analysis	36
	Questionnaire Data	42
	Summary of Results	42
5	Discussion	50
	Cognitive style	50
	Advance Organizer vs. No Advance Organizer	51
	Prose vs. Pictorial Advance Organizer	53
	Educational Implications	53
	Conclusion	54
	References	56
	Appendix A	69
	Appendix B	71

Chapter	Page
Appendix C	78
Appendix D	80
Appendix E	83
Appendix F	87
Appendix G	93
Appendix H	99

LIST OF TABLES

Table		Page
1	Absolute and Relative Frequencies for Sex of Subjects	27
2	Absolute and Relative Frequencies for Age Level of Subjects	28
3	Means and Standard Deviations for Groups on Immediate and Delayed Test	37
4	Summary of the Analysis of Variance for Immediate and Delayed Test	39
5	Absolute and Relative Frequencies for Field of Study of Subjects	44
6	Absolute and Relative Frequencies for Subjects Completing Familiarity Question	45
7	Absolute and Relative Frequencies for Degree of Concentration Question	46
8	Absolute and Relative Frequencies for Amount of Time Question	47
9	Absolute and Relative Frequencies for Difficulty Question	48
10	Absolute and Relative Frequencies for Interest Question	49

LIST OF FIGURES

Figure		Page
1	Comparison of Mean Scores and Time of Testing by Group Number	38
2	Comparison of Mean Scores on the Immediate Recognition Test by Group Number	40
3	Comparison of Mean Scores on Delayed Test by Group Number	41

CHAPTER 1

Introduction

At present, a large percentage of the knowledge that a student acquires comes through reading prose materials. In an effort to improve prose learning, researchers have investigated the effects of different types of adjunct aids on learning from prose. Examples of these are: the use of pre-, inserted, and post-questions (Fraser, 1967, 1968, 1970; Richards & Divesta, 1974; Rothkopf, 1966, 1970; Rothkopf & Bisbicos, 1967), the use of behavioral objectives (Huck & Long, 1973; Lawson, 1973), and the use of overviews (Reynolds, 1966). Among these theorists is Ausubel (1960, 1963, 1968), who proposed the use of advance organizers in the learning and retention of meaningful materials. Advance organizers are defined as short introductory passages stated at a higher level of abstraction, generality and inclusiveness than the learning material (Ausubel, 1963).

Advance Organizers

One of the unique aspects of the advance organizer is that this prose learning device is derived from a particular view of cognition. Ausubel (1968) views the storage of information in the brain as being highly organized, with linkages formed between various older and newer elements leading to a conceptual hierarchy, in which minor elements of knowledge are linked with (subsumed under) larger, more general, and more inclusive concepts.

Recently, Mayer (1979) has explained Ausubel's theory of advance organizers in terms of "assimilation theory", which states that learning

involves relating new, potentially meaningful material to existing cognitive structures. According to assimilation theory, advance organizers will have an effect if the learner possesses a cognitive structure for integrating the new material prior to learning. Moreover, the learner must actively use this structure during learning to integrate the new information with existing cognitive structures. Only under these conditions will advance organizers show a positive effect.

Assimilation theory predicts that the degree of effectiveness of an advance organizer will depend on certain factors related to the learning material, the organizer itself, and the learner. If the learning material contains built-in organizers then the advance organizer will not be effective. For example, spiral learning which presents and builds on key concepts or a mastery-remedial sequence that provides background information to the learners who need it, is self-contained and needs no advance organizers. Also, if the advance organizer does not provide relevant subsumers to which new materials can be related, it will not be effective. And if the learner has prior knowledge of the intended learning passage, and uses this knowledge in the learning process, then the advance organizer will not be effective (Mayer, 1979).

According to Ausubel (1968), advance organizers should not be confused with overviews, which are presented at the same level of abstraction, generality, and inclusiveness as the learning passage and are merely the repetition and condensation of important concepts in the passage. Advance organizers do not contain any material that is directly related to the learning passage and as such serve to supplement rather than reiterate the passage materials.

Advance organizers can be of two types, expository and comparative (Ausubel, Novak, & Hanesian, 1978). Expository organizers are used when the new learning material is completely new to the learner. In this case the advance organizer simply provides inclusive subsumers in cognitive structure to relate to the new material. By contrast, comparative advance organizers are used when the learning material is somewhat familiar or relatable to an existing cognitive structure. The aim of the comparative organizer is to provide discriminability of the new ideas and previously learned ideas by pointing out explicitly the principal similarities and differences between them (Ausubel et al., 1978). However, the number of subsumers available in existing cognitive structure will determine the type of advance organizer that is required.

Ausubel (1960), noted that the effectiveness of an advance organizer depends upon how well the learning material is organized. In other words, when a learning passage is arranged in a conceptual hierarchy, the materials at the top of the hierarchy act as advance organizers. These high-level ideas function as cues for the recall of units below them (Meyer & McConkie, 1973). Thus, in reading a prose passage the learner first acquires the more abstract ideas of the passage, then uses these to form a structure into which the specific details are incorporated (Meyer, 1971). If, however, the learning material simply provides isolated facts that lack any systematic overall structure, then an advance organizer cannot be constructed.

In summary, advance organizers are instructionally advantageous and can be used in the regular classroom if (a) relevant subsumers are not available in the learners' cognitive structure when new potentially

meaningful material is presented and (b) if relevant subsumers are available, but their relevance is not recognized by the learner. In both cases it is preferable to introduce suitable organizers in the form of introductory materials at a higher level of abstraction, generality, and inclusiveness (Ausubel & Robinson, 1969). Under these conditions, claims Ausubel (1968), not only is the new material rendered familiar and potentially more meaningful, but the most relevant subsumers in cognitive structure are also selected and utilized in integrated fashion. Thus, the use of advance organizers can eliminate much of the rote memorization to which students often resort because they are required to learn unfamiliar materials before having available appropriate subsumers in cognitive structure. Therefore, an advance organizer acts as a cognitive bridge and the main function is to relate what the learner already knows to the new learning material.

Alternative Forms of Advance Organizers

Ausubel (1960) argues that only language can accommodate the general, abstract, and inclusive concepts contained in an advance organizer. However, it has also been shown (Royer & Cable, 1975, 1976; Weisberg, 1970) that concrete (pictures) introductory materials can be as helpful in learning new concepts as abstract materials. This suggests that in certain situations, concrete advance organizers may provide an advantage or at least perform equally well as an abstract equivalent. This is precisely the point made by Mayer and Bromage (1980) who define advance organizer as:

a stimulus that (a) is presented prior to learning and (b) contains a system for logically organizing the incoming information into a unified structure. The advance organizer may be abstract (such as giving a list of general rules and principles) or concrete (such as physical analogy), but it must serve to logically integrate the new information. (p. 211)

This recent conceptualization of advance organizers seems to allow for alternative forms even though their facilitative effects have not been consistently demonstrated (Weisberg, 1970; Barron, 1971). It is argued here that due to methodological difficulties in studies of alternative forms, the effectiveness of this potential extension of the original form has not been adequately evaluated.

Cognitive Style and Advance Organizer

The term "cognitive style" has been defined in many different ways. Ausubel, Novak, and Hanesian (1978) refer to cognitive style as differences in personality organization as well as cognitive functioning and organization. Kagan, Moss, and Sigel (1963) see cognitive style as individual preferences in modes of perceptual organization and conceptual categorization of the external environment. However, Messick (1969) refers to cognitive style as information processing habits which represent the learner's typical mode of perceiving, thinking, problem-solving, and remembering.

Witkin (1965), in his studies on cognitive style, has emphasized that knowledge of a learner's cognitive style is potentially capable of suggesting effective ways whereby the learner may be taught. In the past years, several dimensions of individual differences in the performance of cognitive tasks have been investigated. These dimensions have been referred to as cognitive styles, and represent a person's typical mode of perceiving, remembering, thinking, and problem-solving. When stimuli are perceived, they are not acted upon in their raw form, but are processed according to the cognitive style of the individual. These processed stimuli are then used in comprehension and problem-solving, since differences in cognitive style

indicate differences in process rather than ability (Ausburn & Ausburn, 1977).

The area of cognitive style that has been investigated in greatest detail is field-independence and field-dependence (Witkin, 1976; Witkin, Dyk, Fateron, Goodenough, & Karp, 1974; Witkin, Lewis, Hertzman, Machover, Meissner, & Wapner, 1972). Witkin et al. (1962) defined the dimension of field-independence versus field-dependence as an analytical, in contrast to a global, way of perceiving items as discrete from their backgrounds and reflects an individual's ability to overcome the influence of an embedding context. When materials lack inherent structure, field-independent learners are more likely to provide their own structure whereas field-dependent learners are likely to have difficulty in learning such material (Witkin, Moore, Goodenough, & Cox, 1977). Therefore, in reading from prose, field-dependent learners are more likely to benefit more from advance organizers than field-independent learners.

Statement of the Problem

The main purpose of this study was to investigate the effect of no advance organizer, a prose advance organizer, and an alternative form of advance organizer (pictorial) on the immediate and delayed retention of prose materials. In addition, the relationship of cognitive style to prose learning was included in the investigation since this learner variable may partly account for the effectiveness of advance organizer types.

CHAPTER 2

Literature Review

Structure of Memory and Prose

Structure of Memory. The concept of assimilation-to-schema was first investigated by Bartlett (1932), who proposed that "schema refers to an active organization of past reaction or of past experiences. Without some general setting or label... no material can be either assimilated or remembered" (p. 172). Recently, researchers have tried to verify or extend Bartlett's theory by studying cognitive processes in learning (Bower, 1970; Bransford & Franks, 1971), cognitive structure in memory (Collins & Quillian, 1972; Kintsch, 1972; Rumelhart et al., 1972), and the role of meaning in verbal learning (Johnson, 1975; Martin, 1968). Among these is Ausubel (1963, 1968), who extended the assimilation-to-schema theory by proposing his theory of meaningful verbal learning.

Ausubel's (1963) subsumption theory of learning proposes identifying a superordinate set of concepts already in memory to facilitate the assimilation of new material. These concepts assist the learner by providing schemata, or frames, which aid in the integration of new information into existing cognitive structure. The importance of this structure or schema to learning is explained in the following statement by Royer (1979):

Schema theory suggests that during the learning process a particular schema is activated and serves as structure for representing information and as a source of hypothesis about what kind of information to expect. One way to think of a schema is as a structure with a series of slots waiting to be filled by the incoming information. As long as the incoming information matches up to one of the slots in the schema, learning proceeds smoothly and easily. However in the event that a bit of information is encountered that does not match up to a slot, or information is encountered that does not match up to any of the available schemata, learning becomes difficult and arduous. (p. 15)

Therefore, meaningful learning involves the activation of a previously acquired schema when a new learning situation is encountered. This is consistent with Ausubel (1968), who states that meaningful learning is a process in which new information is related to existing relevant aspects of an individual's knowledge structure. Ausubel argues that the acquisition of new information is highly dependent on the relevant ideas already in cognitive structure and meaningful learning occurs through the interaction of new information with relevant existing ideas in cognitive structure. This interaction results in the assimilation of new ideas into existing cognitive structure to form a more highly differentiated cognitive structure.

From the preceding discussion it is evident that the facilitation of new learning is dependent, not only on the learner's cognitive structure, but also on the structure of the material to be learned. The introduction of new information to a learner who has no schema to accommodate it will undoubtedly result in either short-term memorization or severe learning deficits.

Relation of Prose and Memory Structure. Meyer (1977) contends that subjects tend to recall high-level passage information better than low-level information in a passage. These higher level concepts, which are similar to Ausubel's advance organizer, enable subjects to better store and maintain subordinate information in memory. This view is supported by Greeno and Noreen (1974), who investigated the importance of structure to comprehension. They arranged two passages in hierarchies, one top-down and one bottom-up. It took two thirds of the time to read low-level sentences in the hierarchy if they were preceded by high-level ones. Greeno and Noreen suggested that this result occurred because relationships involved in low-level sentences

are consistent with the more general ones given in the higher-level statements. Subjects were able to process these lower sentences faster because part of the conceptual structure had already been built.

However, many prose materials which students are asked to read and remember do not contain both high- and low-level structures, or the superordinate structures do not adequately match that of the learner's. In such cases, studies (Schmid & Kulhavy, 1980; Dooling & Mullet, 1973) have shown that recall of prose material increases when the learner has access to appropriate prerequisite statements. A study by Bransford and Johnson (1972) illustrates this point. It was hypothesized that subjects who received the appropriate prerequisite knowledge would be able to comprehend the learning passage quite easily and would better recall the passage information. Subjects who did not receive the prerequisite knowledge would have difficulty understanding and recalling passage information. Results showed that the presentation of the appropriate prerequisite knowledge had a marked effect on comprehension and recall. Comprehension ratings and recall were relatively low when subjects did not receive the prerequisite knowledge. Therefore, in order to facilitate comprehension and recall of a passage, the learner should be provided with the prerequisite knowledge to which the new knowledge can be related. This is the intent of an advance organizer.

The question of what kinds of prerequisite materials to give students prior to reading an unfamiliar passage has been the primary focus of Ausubel's work. The following section summarizes the major points made by Ausubel for the construction of functional advance organizers.

Construction of Advance Organizers

The major problem in advance organizer studies is the construction of the advance organizer. In any organizer study the following guidelines should be taken into consideration.

Learning Materials. The best test of an advance organizer occurs when the learning material is unfamiliar, technical, or otherwise difficult to relate to past experience. Most advance organizer studies have used scientific materials because such materials are often unfamiliar and have a rich conceptual basis. Examples of learning material used in organizer are the following. Ausubel (1960), used a passage dealing with the metallurgical properties of plain carbon steel with subjects majoring in psychology. Ausubel and Fitzgerald used a passage based on the endocrinology of pubescence with subjects majoring in psychology. Mayer and Bromage (1980) used computer programming lessons as the learning material with psychology students serving as subjects. However, the learners' degree of familiarity with the learning passage will determine the type of advance organizer that is required.

Type of Advance Organizer. The amount of subsumers a learner possesses before encountering the learning material will determine the type of advance organizer that is required to integrate the new information. Ausubel (1968) outlined the use of an expository advance organizer when the learning material is unfamiliar to the learner. In this case the expository advance organizer provides the relevant subsumers to which the new information can be related, hence resulting in better integration. On the other hand, a comparative advance organizer is used when the learner possesses subsumers that are similar to the new learning material. The comparative organizer helps the learner to discriminate between existing knowledge and the new learning material.

Ausubel (1960) compared an expository advance organizer with a control group. The learning material was based on metallurgy and subjects were education students. The degree of unfamiliarity was determined by giving the retention test to a comparable group of subjects who did not study the learning passage. Scores on the test were only slightly, but not significantly, better than chance. Therefore, an expository advance organizer was used in the study. The difference between the means of the experimental and control groups was almost significant at the .01 level.

Comparative advance organizers seem to be as effective as expository advance organizers when used appropriately. Fitzgerald and Ausubel (1963) compared the effectiveness of a comparative advance organizer with a control introductory passage. They hypothesized that the learning and retention of controversial material is pro-actively facilitated by the introduction of a relevant comparative advance organizer. Subjects were 264 junior high school students who were familiar with the Northern interpretation of the Civil War in American history and the learning passage dealt with the Southern interpretation of the causes of the Civil War. The comparative advance organizer explicitly pointed out the principal differences between the Northern and Southern positions on the causes of the Civil War. Results indicated that the comparative organizer was significantly effective in facilitating learning and retention of controversial material.

Similar results were obtained by Royer and Cable (1975, 1976), who used an initial passage before a second passage to relate new information to information already possessed by the learner. The second passage was based on heat flow and the initial passage dealt with the internal structure of metals and drew an analogy between metallic structure and a familiar

real-world event. Results showed a significant difference favoring the group that received a concrete initial passage as compared with a control initial passage. The initial passage used in this study was similar to Ausubel's comparative advance organizer but was presented in concrete terms.

Ausubel and Fitzgerald (1961) compared the effectiveness of an expository advance organizer, a comparative advance organizer, and a control ~~introductory~~ passage. Subjects were undergraduate psychology students and the learning material dealt with Buddhism. The comparative organizer outlined the principal similarities and differences between Buddhist and Christian doctrines while the expository organizer presented the principal Buddhist doctrines without making any reference to Christianity. Results on a test given three days after the treatment showed that only the comparative advance organizer was effective in facilitating retention of the Buddhism material. However, on a test given ten days later, the expository and comparative advance organizer groups were significantly better than the control group. The difference between the expository and comparative organizer groups was negligible. Ausubel and Fitzgerald maintained that the expository organizer was not effective on the three-day test, but was effective on the ten-day test because "only over the longer time interval was the natural retention loss sufficiently great to provide scope for the limited facilitating influencing of the scaffolding effects available from the expository organizer" (p. 270).

Therefore, in the construction of an advance organizer, the amount of relevant subsumers in the learners' cognitive structure should be determined in deciding which of the two types of advance organizer is required for integration of the new learning material.

Testing. According to Ausubel (1968), the use of advance organizers should result in meaningful learning, thus reducing the need, on the part of the student, for rote memorization. However, in a study which employs organizer and no-organizer groups, it is likely that on an immediate post-test there will be no differences due to the freshness of the information and the "cramming" abilities of the subjects. Therefore, advance organizer studies should include a delayed retention test as well as an immediate test. Ausubel (1960) gave a test three days after the treatment conditions and found facilitative effect of advance organizers. Ausubel and Fitzgerald (1962) administered two delayed tests, one three days and the other ten days after the learning passage. Results indicated a significant difference favoring the advance organizer groups.

Studies on advance organizer, however, have not always produced the desired positive results, and in fact, the theory has received extensive criticism. One of Ausubel's (1978) chief defences is that organizer researchers have not followed his prescription for an advance organizer. Studies which support and fail to support advance organizers will be reviewed in the following two sections.

Studies Supporting Advance Organizer

According to Ausubel (1963), the presence of an organizer before a learning passage will facilitate learning and retention more than a passage with no organizer. This was confirmed in his studies which are briefly outlined below.

In his first study, Ausubel (1960) hypothesized that the learning and retention of unfamiliar but meaningful verbal material can be facilitated by

the advance introduction of relevant subsuming concepts (advance organizers). The learning material was based on chemistry and two groups were used, one that received the advance organizer, and one with no advance organizer (control group). The control group received a short historical passage to control for time. Due to the fact that the subjects had no prior knowledge of the learning material, an expository advance organizer was used. The expository advance organizer was presented at a higher level of abstraction, generality and inclusiveness than the learning passage itself and was designed to serve as an organizing or anchoring focus for the learning material and to related it to existing cognitive structure. The control historical passage contained no conceptual material that could serve as an ideational framework for organizing the particular substantive body of more detailed ideas, facts and relationships in the learning passage. Results on a post-test given three days after the treatment showed that the difference between the means of the experimental and control groups was significant, favoring the organizer group. Ausubel concluded that advance organizers facilitate learning in two ways:

- (a) the selective mobilization of the most relevant existing concepts in the learner's cognitive structure for integrative use as part of the subsuming focus for the new learning task, thereby increasing the task's familiarity and meaningfulness and (b) the provision of optimal anchorage for the new learning material in the form of relevant and appropriate subsuming concepts at a proximate level of inclusiveness. (p. 271)

In another study, Ausubel and Fitzgerald (1962) compared an expository advance organizer group with a control group. Subjects were undergraduate psychology students and the learning material was based on biology. The advance organizer and control introductory passage did not contain any information that could help in answering post-test questions. The control

introductory passage was used deliberately to show that any difference in retention outcomes between the experimental and control group was attributed to the organizing properties of the advance organizer rather than to its presence. Comparison of the mean scores for the two groups showed that the advance organizer did facilitate learning and retention.

In addition to the studies by Ausubel and his associates (Ausubel, 1960; Ausubel & Fitzgerald, 1961; Ausubel & Youssef, 1963; Fitzgerald & Ausubel, 1963), other studies have supported Ausubel's theory of advance organizer. Merrill and Stolurow (1966), using college students as subjects, compared an advance organizer with a control treatment. The learning material was based on an imaginary science, and the advance organizer consisted of statements of basic underlying principles in an imaginary science, while the control group received no introductory materials. Results showed that the advance organizer group performed better on the test than the control group.

Kuhn and Novak (1971) compared an advance organizer with a control introductory passage. The subjects were college students and the learning passage was based on temperature control and hormones. The advance organizer was an 800-word passage plus a diagram on homeostasis, while the control introductory passage was an 800-word historical passage on homeostasis. Results indicated that the advance organizer groups performed significantly better than the control group.

In the above studies and other studies that reported results in favor of advance organizer, the facilitative effect of advance organizers is seen best when the learning material is unfamiliar, technical or scientific. Scandura and Wells (1967), using a passage dealing with mathematics, found

that the organizer group performed significantly better on tests and time to learn the material. Mayer (1975, 1976) reported facilitative effects of advance organizers especially on transfer questions, when computer programming materials were used. West and Fensham (1976), using lessons on the principles of equilibrium as the learning task, reported the facilitative effects of advance organizers, especially for subjects lacking prior knowledge of the learning material. In this current study, a topic in biology was used as the learning passage, with education students as subjects. This was important to ensure that there were no existing subsumers in cognitive structure so that any facilitative effects would be due to the presence of the advance organizer. Also, this ensured that all subjects started from the same content baseline.

Another precaution taken in the organizer studies above was to make sure that the advance organizer was carefully constructed so as not to contain any information that would help in answering post-test questions. This was necessary to show that any difference in post-test scores between the organizer group and the control group was due to the organizing properties of the organizer and not simply its presence.

In most organizer studies, an introductory non-advance organizer passage was given to the control group. However, recent studies (Mayer, 1975, 1976; Proger, Carter, Mann, Taylor, Bayuk, Morris & Reckless, 1973; Schumacher, Liebert & Fass, 1975) did not use a control introductory passage—the control group received no advance organizer. They claimed that the control introductory passage resulted in distraction. Therefore, the present study did not include a control introductory passage for the control group.

In addition to the studies described above, other studies (Groteluescher, & Sjogren, 1968; Kahle & Rastovak, 1976; Lawton, 1977; Mayer, 1975, 1976; Proger et al., 1973; Scandura & Wells, 1967; Schumacher et al., 1975; Smith & Hesse, 1969; Weisberg, 1970; West & Farnham, 1976) have reported facilitative effect of advance organizers. Recently, in a review, Luiten, Ames and Ackerson (1980) analyzed 135 advance organizer studies to determine the size of the effect of advance organizers on learning and retention. From this analysis they concluded that advance organizers do have a facilitative effect on learning and retention, and the effectiveness of the advance organizers tend to increase with time.

Studies Not Supporting Advance Organizers

Although many studies have shown the facilitative effect of advance organizers, other studies have not reported this. One reason for this, Ausubel (1978) says, is that these studies have not followed the proper procedure for conducting an organizer study. Some examples of these studies are described below.

Kahle and Norland (1975), using 293 college students as subjects, investigated the effectiveness of an advance organizer. The treatment was a one-month audio-tutorial science course with mastery procedure and individual remediation. The advance organizer was a 500-word tape and demonstration which lasted for ten minutes. The control group received no advance organizer. The result showed no facilitative effects of the advance organizer. There are two major problems with this study. First, one ten-minute advance organizer was used for a one-month course. According to Ausubel (1968), an advance organizer may be required for every unit or lesson in a course. Second, there was remediation during the course, and

this may have provided relevant subsumers, which could eliminate the effect of the advance organizer.

Schulz (1966) compared a group that received two advance organizers and a control group that received no advance organizer. The subjects were sixth-grade students, and the learning material was scientific in nature. The two advance organizers were used for a 20-week treatment lesson with one organizer at the beginning of the lesson and the other twelve weeks later. There was no significant difference in immediate and delayed post-test scores for the experimental and control groups. The non-significant result may have occurred because the treatment was too long for the advance organizers to be effective. Also, all subjects in this study were above-average students. Ausubel (1968) has claimed that advance organizers work better with low-ability students than high-ability students.

Some studies used overviews as advance organizers. Santiesteban and Koran (1977), using tenth-grade students as subjects, compared an advance organizer group with a control group. The learning passage dealt with human population biology and the advance organizer was an overview of important concepts in the learning passage. An overview cannot provide the subsumptive context needed to integrate the learning material.

Barnes and Clawson (1975) reviewed 32 advance organizer studies and concluded that "advance organizers, as presently constructed, do not facilitate learning" (p. 651). One of the major problems with this review, according to Ausubel (1978), is that the authors judged the studies based on their results, without evaluating the methods or the advance organizer used. Mayer (1979), in a reply to Barnes and Clawson, concluded that the review was limited, since Barnes and Clawson did not specify the conditions

under which advance organizers should have an effect, they did not present data that adequately analyzed the nature of the learning outcomes, and they did not adequately discuss the problem of experimental control in the studies they cited. In many of the studies cited, it is possible to point to methodological or other flaws which may have prevented the advance organizer from working. It is, of course, impossible to determine whether changes in the designs of these studies would have produced positive results. However, there are enough studies which have supported the use of advance organizers and Ausubel's ideas, to keep the question open.

Based on this review, the following features or controls were built into the current study to improve the likelihood of obtaining a positive result:

1. Subjects were pre-tested to determine their level of prior knowledge of the prose content.
2. A passage was selected which was unfamiliar to the subjects and for which a subsuming structure could be constructed.
3. An appropriate type of advance organizer was chosen based on the prior knowledge of the subjects.
4. The advance organizer was constructed to mediate between the conceptual structure of the subjects and the details of the learning passage.
5. Both immediate and delayed tests were included.
6. Two control groups were used, a no-organizer control and a true control (placebo passage) so that the relative effects of the organizer groups could be determined and test-retest practice effects could be controlled.

In all of the studies reviewed thus far, the advance organizers used have been constructed in prose form. This is probably due to the fact that Ausubel utilized prose advance organizers in his studies and because prose is an excellent medium for transmitting higher level concepts and ideas. However, an array of alternative media are potentially available for this same purpose. The following section reviews the limited number of studies which have attempted to broaden the range of advance organizer forms.

Alternative Forms of Advance Organizer

Only two studies have investigated the possibility of using alternative forms of advance organizer. Weisberg (1970) compared two types of visual advance organizers with a verbal advance organizer and a control group who received no advance organizer. The verbal organizer was a verbal description of the ocean floor, while one of the visual advance organizers was a map of the North Atlantic Ocean Floor and the other was the Heezen-Thary Physiographic Diagram of the North Atlantic Ocean Floor. The reading passage was a verbal description of the features of the North Atlantic Ocean Floor as illustration of the Theory of Continental Drift, with no maps and diagrams. Results showed that there was a significant difference between the two visual organizer groups and the control group but not between the prose advance organizer and control group. Weisberg concluded that "more valuable media are available for the organization of learning than the highly abstract verbal media used as advance organizers" (p. 165).

Barron (1971) investigated the effectiveness of prose and graphic advance organizers using a learning passage based on astronomy. The prose

advance organizer was a comparative passage describing the similarities and differences in the physical properties of stars and people. The graphic advance organizer was black and white line drawings with labels showing the similarities and differences in physical properties of stars and people. Subjects were students in grades six to twelve, with all grades receiving the same treatment. Results showed no significant difference between the prose and graphic advance organizers for all grade levels when compared to the control group. However, this non-significant result may have been obtained because this study did not follow all of the criteria for an advance organizer study.

Although the facilitative effects of alternative forms of advance organizers have not yet been shown, the following studies suggest that an advance organizer, constructed in pictorial form and to the same strict specifications as a prose organizer, may produce the same or superior learning outcomes.

Holliday (1976) conducted an experiment comparing two diagrams, one containing pictorial representations (line drawings) and the other containing the same information in flow-type block form, with a text describing the same relationships. Combinations of the variables, block diagram plus text and picture and text, were also tested. Both diagrams used flow lines to show the processes involved and were appropriately labeled. Two analyses were conducted and in both cases the results favored the diagrams alone over the text alone or the combination of the two. However, in both analyses, text plus diagram (block and pictorial) performed significantly superior to text alone, and the results are explained in terms of the "organizing" properties of the diagrams. In this experiment, diagrams and text were at the same structural level. However, Royer and Cable (1976) found that fine

line drawings inserted between abstract passages significantly facilitated transfer of learning from one passage to the other. Taken together, these experiments suggest that pictorial representations can not only portray certain information as well as prose, but can also serve to mediate between prose material and the student.

Cognitive Style and Use of Advance Organizer

Cognitive style has been defined as information processing habits which represent the learner's typical mode of perceiving, thinking, problem-solving, and remembering (Messick, 1969).

Since cognitive style was identified as a construct, little research has been conducted to determine the relationship of cognitive style to instructional techniques and presentation systems (Ausburn & Ausburn, 1977). In the past it was believed that low academic performance was a learner-based problem. However, it is now recognized that part of the problem is instruction-based and consequently, there is a need to design appropriate instruction to help learners deal with tasks that are causing difficulty.

The area of cognitive style that has been investigated in greatest detail is field-independence and field-dependence. Witkin et al. (1962) referred to field-independence as an analytical, in contrast to a global, way of perceiving the world which entails a tendency to experience items as discrete from their backgrounds and reflects abilities to overcome the influence of an embedding context. Recently, Witkin (1977) made a distinction between field-independence and field-dependence: "A relatively field-independent person is likely to overcome the organization of the field, or to reconstruct it, when presented with a field having a dominant organization, whereas the relatively field-dependent person tends to adhere to the organization of the

field as given" (p. 7). Therefore, relatively field-independent learners tend to impose structure spontaneously on stimulus material which lacks it, whereas relatively field-dependent learners are more likely to attempt to deal with the material as it is presented (Nebelkopf & Dreyer, 1970; Witken et al., 1974). According to this theory, a relationship should exist between cognitive style (field-dependence/independence) and the use of advance organizers, since the organizer serves to provide an organizational strategy into which specific materials are incorporated. The following study describes an attempt to establish this relationship.

Although individual difference is an important variable to be considered in instruction, only one study (Satterly & Telfer, 1979) has investigated the relationship between cognitive style and advance organizers. In this study, a relationship was hypothesized between advance organizer and field-independent cognitive style. Also, a significant relationship was predicted between cognitive style and treatments, where organizers were expected to enhance the performance of field-dependent rather than field-independent subjects. Subjects were 180 high school students, and the cognitive style measure was the Embedded Figures Test. There were three treatment conditions: (a) two lessons on word structure which served as control; (b) advance organizer plus two lessons on word structure; and (c) advance organizer plus two lessons on word structure plus references to emphasize the presence of the advance organizer. The learning material was based on the meaning of words and the advance organizer was designed to facilitate assimilation of ideas by explaining the concept of meaning and the way in which the meaning of sentences are obtained from their structure. Also, the organizer provided an overall framework into which the

material on the subordinate structure of words could easily be filled. Repeated measures analysis of variance on recall scores revealed a significant difference for cognitive style.

The current study extended the research of Satterly and Telfer by investigating the relationship between cognitive style and the use of prose and pictorial advance organizers.

Summary of Hypotheses

This experiment examined the effects of prose and pictorial advance organizers on the retention of prose materials. Also, the relationship between cognitive styles and the use of advance organizers was examined. The following hypotheses were generated from the literature to guide the experiment:

- H₁: A measure of field-dependence/independence will function as a significant predictor of success on an immediate post-test and a delayed post-test of prose learning. This cognitive style variable was included in the current study primarily for exploratory purposes, since only one advance organizer study has shown a positive relationship.
- H₂: There will be a significant interaction between Time of Testing (immediate and delayed) and the independent variable, Prose Conditions (Prose and Pictorial Organizer, No Organizer, and Placebo Control). This hypothesis was derived from the studies which have shown that the facilitative effects of advance organizers as compared to no organizer is best seen on a test of delayed retention. As many studies have shown, organizer and control conditions are frequently equivalent on immediate tests of recognition.

due possibly to the fact that for short-term retention, memorization or the activation of other memory strategies (Dooling & Christiaansen, 1977) may work as well as the activation of appropriate schema. For delayed recall, however, some stable structure is apparently required. Advance organizers were expected to activate or create such a structure, thus resulting in superior performances on a delayed test.

H₃: There will be a significant main effect across the independent variable, Prose Conditions, on an immediate post-test.

H₄: There will be a significant main effect across the independent variable, Prose Conditions, on a delayed post-test.

These hypotheses were formulated to determine the source of the interaction hypothesized in H₂. Post hoc analysis was planned in the event that hypotheses were accepted.

CHAPTER 3

MethodSample

The experimental sample for the immediate post-test consisted of 104 (see Table 1) undergraduate students enrolled in education courses at Concordia University in Montréal. However, this number was reduced to 88 on the delayed post-test. This was due to subjects' absence on the second testing session. Subjects ranged in age from 18 to 38 years, with a mean age of 24 years (see Table 2).

Experimental Design

The study utilized a post-test only control group design with four groups each consisting of 26 subjects on the immediate post-test and 22 subjects on the delayed post-test.

Group 1 - Prose advance organizer plus learning passage.

Group 2 - Pictorial advance organizer plus learning passage.

Group 3 - Learning passage only (control group).

Group 4 - No learning passage (placebo passage).

The experimental materials were prepared and randomly distributed to the 104 subjects who participated in the study. The following diagram (Campbell & Stanley, 1973) shows the design of the experiment.

C	R	X	L	IRT	DRT
C	R	Y	L	IRT	DRT
C	R		L	IRT	DRT
C	R		P	IRT	DRT

Table 1
Absolute and Relative Frequencies for Sex of Subjects

Sex	Absolute Frequency	Relative Frequency (%)
Male	20	19.2
Female	84	80.8

Table 2
 Absolute and Relative Frequencies for Age Level
 of Subjects

Age Level (Years)	Scale	Absolute Frequency	Relative Frequency (%)
0-18	1	0	0
18-22	2	44	42.3
23-26	3	30	28.8
27-30	4	9	8.7
31-34	5	9	8.7
35-38	6	2	1.9
39-over	7	7	6.7
No response		3	2.9

Key

- C - Hidden Figures Test.
- R - random assignment of subjects.
- X - prose advance organizer.
- Y - pictorial advance organizer.
- L - reading passage.
- P - placebo passage.
- IRT - immediate post-test.
- DRT - delayed post-test.

The level of significance for this experiment was set at .05.

Instrumentation

Measure of Cognitive Style. All subjects were given the Hidden Figures Test (HFT) from the battery of tests of cognitive factors by French, Ekstrom, and Price (1963). The HFT was used because it is suitable for large group testing and studies (Gruenfeld, 1972; Jackson, Messick, & Myers, 1964; Weissenberg, 1966, 1967; Witkin, Dyk, Faterson, Goodenough, & Karp, 1961) have shown a median correlation of .51 between the HFT and other tests (Rod and Frame Test and Individual Embedded Figures Test) that measure psychological differentiation.

The HFT presented five simple figures at the top of each page and complex figures drawn below. The subjects were directed to determine which of the simple figures was hidden within the embedding context of the complex pattern. The test consisted of two sections, each containing 16 questions (Appendix B). Subjects were given 20 minutes to complete the test.

Recognition Test. The learning passage was evaluated by a multiple choice recognition test in the immediate (IRT) and delayed (DRT) conditions. The multiple-choice recognition test was constructed by selecting a pool of 34 questions that seemed to best evaluate the learning passage. The 34-item pool was given to three educators with instructions to choose the questions that were best for evaluating the learning passage. From the pool of 34 questions, 18 were selected and used in this study. The reading passage and test were given to an equivalent group of subjects who attained scores slightly below the 50 percent level. Also, the test, without the reading passage, was given to an equivalent group of students who scored only slightly better than chance. Coefficient alpha for the test was .76. The same test was used on the immediate (IRT) and delayed (DRT) conditions (Appendix G). A true control group (placebo condition) was used to control for test-retest effects.

In addition, a questionnaire was included to determine the subjects' opinion of the experiment, the effectiveness of the learning materials and the background knowledge of the subjects. Subject opinions were rated on a seven-point Likert scale and subjects were directed to circle the number which best represented their opinion on each question (Appendix H).

Materials

Passage Selection. The learning material consisted of an 800-word prose passage taken from Scientific American (Geschwind, 1979). The title of the passage was "Language and the Brain", and it dealt with the two types of aphasia and their effects on language production (Appendix E). This material was chosen because it was considered to be unfamiliar to education students but simple enough to be comprehensible and interesting to students

with no background in the scientific field. The criterion of unfamiliarity was very important since the study intended to investigate whether the use of advance organizers could facilitate learning of new materials. Also, the use of unfamiliar material ensured that all subjects started from approximately the same baseline in studying the material (Ausubel, 1960).

A placebo passage entitled "Conversation with a Gorilla" was taken from National Geographic (Patterson, 1978); this was used to control for practice effects on the immediate and delayed tests.

Passage Familiarity. The subjects' degree of familiarity with the learning content was determined by interviewing a randomly chosen sample of subjects (Ausubel, note 1). This was possible since the experimenter was a teaching assistant for the subjects and had tutorial sessions three times per week with the students. Examples of questions asked in the interview were: Did you ever study the brain? Do you know how the brain processes language? What is your major field of study? Care was taken not to ask questions that would help in answering post-test questions. Also, subjects were not told that they would be taking part in a study.

From the interviews it was determined that subjects did not have substantive prior knowledge of the learning passage. This was confirmed from the responses on the questionnaire in which the mean response was 5 on a 1-7 scale favoring unfamiliarity. Also, the questionnaire indicated that none of the subjects were majoring in biology and only two subjects in science. Subjects' familiarity with the learning passage was important in the construction of the organizer.

Organizer Construction. Since the learning material was found to be unfamiliar, it was decided to use an expository advance organizer. In this

study an advance organizer is defined as introductory prose or visual materials presented before the learning task that: (a) does not contain any material that is directly related to the learning task, (b) has a superordinate relationship to the concepts in the learning passage, (c) does not contain information that could help in answering post-test questions, and (d) is presented in more general and inclusive terms than the concepts in the learning passage. In this particular study the advance organizer dealt with the brain and its role in language production. The learning material consisted of a passage giving specific details of the two types of aphasia and how they affect language production in the brain.

The experimenter analyzed the learning passage carefully and the advance organizer was constructed so as to serve as an organizing element in cognitive structure (Ausubel, 1960). The advance organizer consisted of concepts that were considered at the highest level in a hierarchy when the learning passage was arranged from general to specific. The general concepts served to incorporate the more specific details in the passage. The prose advance organizer outlined the regions of the brain in which speech disorders occur and the path that stimulus in speech takes while being transmitted to the brain (Appendix C). The pictorial advance organizer was constructed from the prose organizer and consisted of black and white line drawings of the brain, illustrating the regions in which speech disorders occur. Arrows were used to illustrate the path that stimulus in speech takes while being transmitted to the brain and various sections were labelled appropriately (Appendix D). Hence, the advance organizers provided the general framework of the brain into which the specific details of the passage on aphasias were incorporated. The advance organizer

was constructed in such a way as not to contain any information that would help in answering post-test questions. This was tested empirically by giving the test to an equivalent group of subjects, who scored only slightly better than chance.

Assembling of Materials. The materials were placed in 120 packages, arranged in four groups. Each group of packages contained one of these combinations of materials:

1. Prose Advance Organizer Group - 30 packages each contained the instruction sheet, the HFT and answer sheet, prose advance organizer, reading passage, immediate post-test, and questionnaire.
2. Pictorial Advance Organizer Group - 30 packages each contained the instruction sheet, the HFT and answer sheet, pictorial advance organizer, reading passage, immediate post-test, and questionnaire.
3. No Advance Organizer Group - 30 packages each contained the instruction sheet, the HFT and answer sheet, reading passage, immediate post-test, and questionnaire.
4. Placebo Group - 30 packages each contained the instruction sheet, the HFT and answer sheet, placebo passage, immediate post-test, and questionnaire.

After assemblage, the packages were randomized by assigning each package a number selected by random drawing. The packages were arranged in ascending numerical order according to the random number assigned.

Procedure

The experiment was carried out during regular class time. Subjects did not know that they were participating in an experiment until they were told immediately prior to the experimental session. Upon entering the room the experimenter announced to the subjects that an experiment was about to be

conducted to investigate how people learn from prose and that their fullest cooperation would be appreciated. Subjects were asked to follow all instructions as carefully as possible. A total of 107 subjects took part in the experiment, but three were excluded because they did not follow instructions during the experiment.

The randomized packages were distributed to the subjects and they were asked not to open the packages until directed to do so. The experimenter outlined the experimental procedure and subjects were asked to remove the instruction sheet from their package and read it very carefully. Subjects were then asked to take out the HFT and answer sheet. Five minutes were given to read the instructions for the HFT, which included several sample figures. At the end of five minutes, subjects were told to begin the first part of the HFT. After 10 minutes, subjects were told to stop and to begin work on the second part of the HFT. When ten minutes had elapsed the subjects were told to stop working on the HFT. They were then directed to study the packet of papers containing the passage (including organizers in two cases) for ten minutes. At the end of ten minutes, subjects were told to put away the passage and start the multiple-choice test. After eight minutes, subjects were instructed to stop working on the test and complete the questionnaire. At the end of the experiment students were thanked for their cooperation and were told that they could obtain the result of their tests by contacting the experimenter.

Exactly two weeks later, an unannounced delayed test was given. This test was administered in exactly the same manner as the immediate test.

CHAPTER 4

ResultsIntroduction and Hypotheses

The purpose of this study was to determine the relative effectiveness of prose and pictorial advance organizers on learning from prose, using the HFT as a predictor variable. The following hypotheses were tested relative to the purpose of the study:

H₁ - The cognitive style measure (HFT) will function as a significant predictor of success on the IRT and DRT.

H₂ - There will be a significant interaction between Time of Testing (T₁ and T₂) and the independent variable, Prose Conditions. Depending on the result of H₁, it was planned that the HFT would either be used as a covariate in the analysis or dropped from the experiment.

H₃ - There will be a significant main effect at T₁ on the IRT across the independent variable, Prose Conditions. The HFT would be used as a covariate depending on H₁.

H₄ - There will be a significant main effect at T₂ on the DRT across the independent variable, Prose Conditions. The HFT would be used as a covariate depending on H₁.

Covariate Predictor (H₁)

Regression analysis was used to test the strength of the HFT as a predictor of IRT and DRT scores. The HFT was a significant predictor of IRT scores, $F(1,102) = 4.48$, $p < .05$, and accounted for four percent of the variance on the IRT.

The HFT was not a significant predictor of DRT scores, $F(1,86) = 1.77$,

$p > .05$, and accounted for two percent of the variance on the DRT.

Even though the regression analysis was a significant predictor on the IRT, the variance accounted for (r^2) by the HFT was not great enough for the HFT to be considered a viable covariate in the primary analysis. The HFT failed to significantly predict DRT scores. Therefore, H_1 was rejected, and the HFT was not used as a covariate in the subsequent analysis.

Analysis of Repeated Measures (H_2)

Multivariate ANOVA with repeated measures was used to test H_2 . Table 3 shows the means and standard deviations for the four groups on the IRT and DRT. The results indicated a significant interaction, $F(3,100) = 28.02$, $p < .0001$, between Time of Testing (T_1 and T_2) and Prose Conditions. Figure 1 shows the interaction of testing time and the four levels of the independent variable, Prose Conditions. Therefore, H_2 was accepted.

Analysis of T_1

One-way ANOVA was used to test H_3 and yielded a significant main effect, $F(3,100) = 28.98$, $p < .0001$. This analysis is summarized in Table 4, and Figure 2 presents a graphical representation of the means for each group. As a result, H_3 was accepted.

Analysis of T_2

One-way ANOVA was used to test H_4 and yielded a significant main effect, $F(3,84) = 22.36$, $p < .0001$ (Table 4). Figure 3 presents a graphical representation of the means for each group. Therefore, H_4 was accepted.

Post hoc Analysis

T_1 : Post hoc Scheffé test yielded a significant difference between the placebo and the other three conditions (prose organizer = pictorial organizer = no organizer > placebo). No differences were found among the two organizer conditions and the no organizer group.

Table 3
Means and Standard Deviations for Groups on
Immediate and Delayed Test

Groups	Immediate Test ^a		Delayed Test ^b	
	M	SD	M	SD
Prose Organizer	10.65	2.51	9.22	2.22
Pictorial Organizer	10.30	2.88	9.13	1.83
No Organizer	9.80	2.82	6.45	1.56
Placebo	4.26	3.15	4.81	2.73

^a n = 26 for each group

^b n = 22 for each group

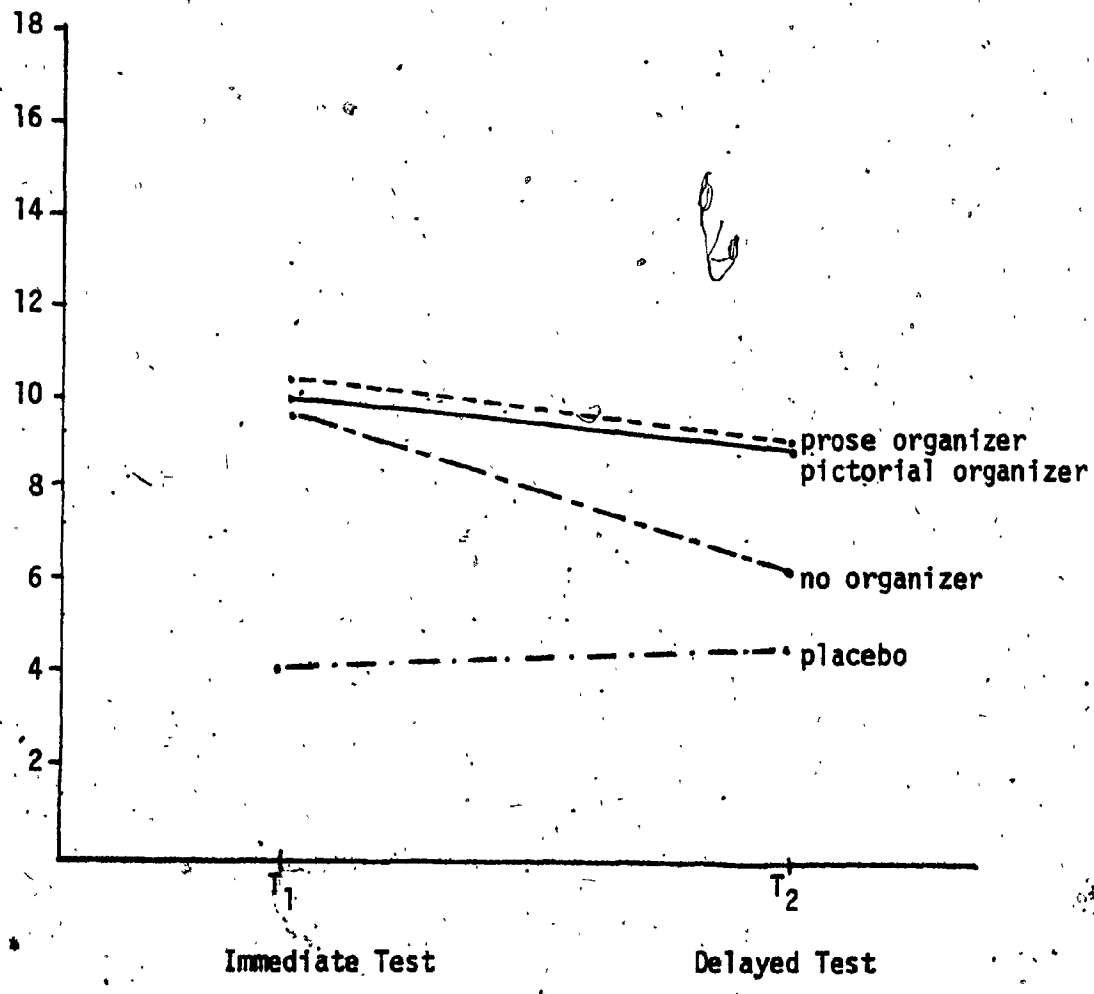
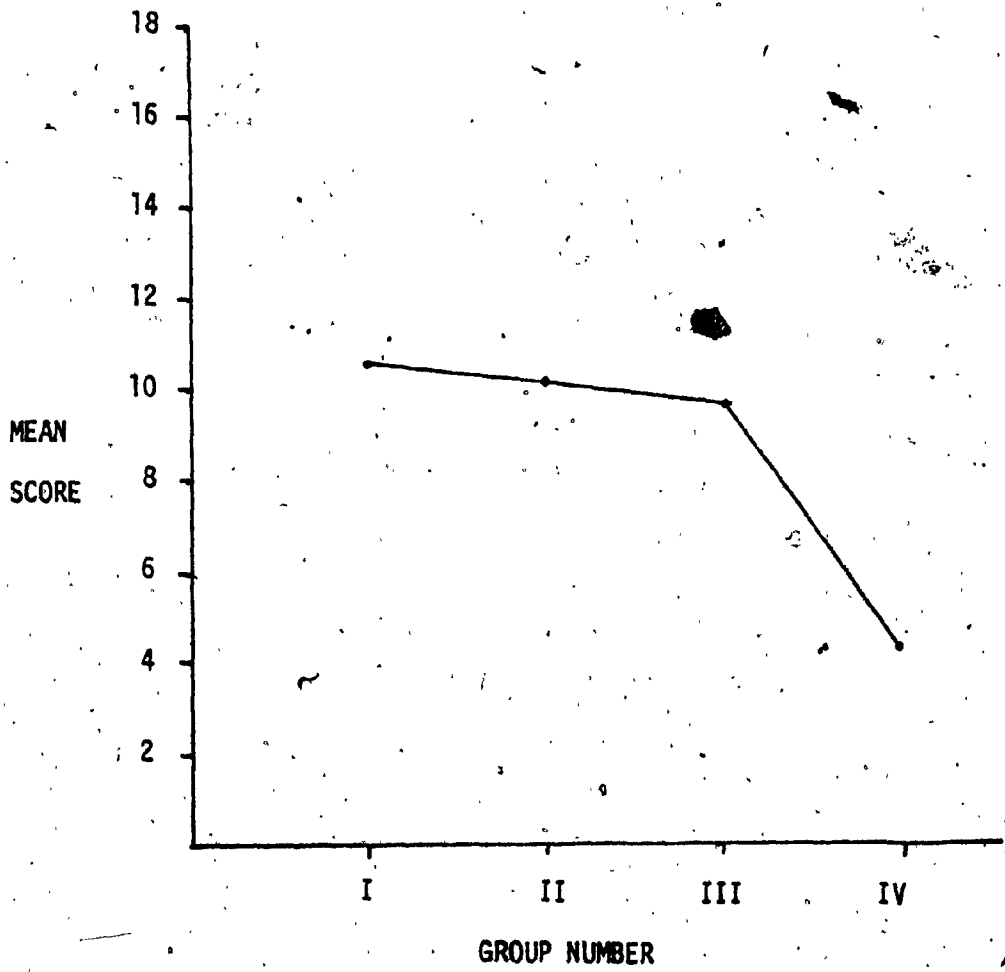


Figure 1. Comparison of mean scores and time of testing by group number

Table 4
 Summary of the Analysis of Variance for
 Immediate and Delayed Test

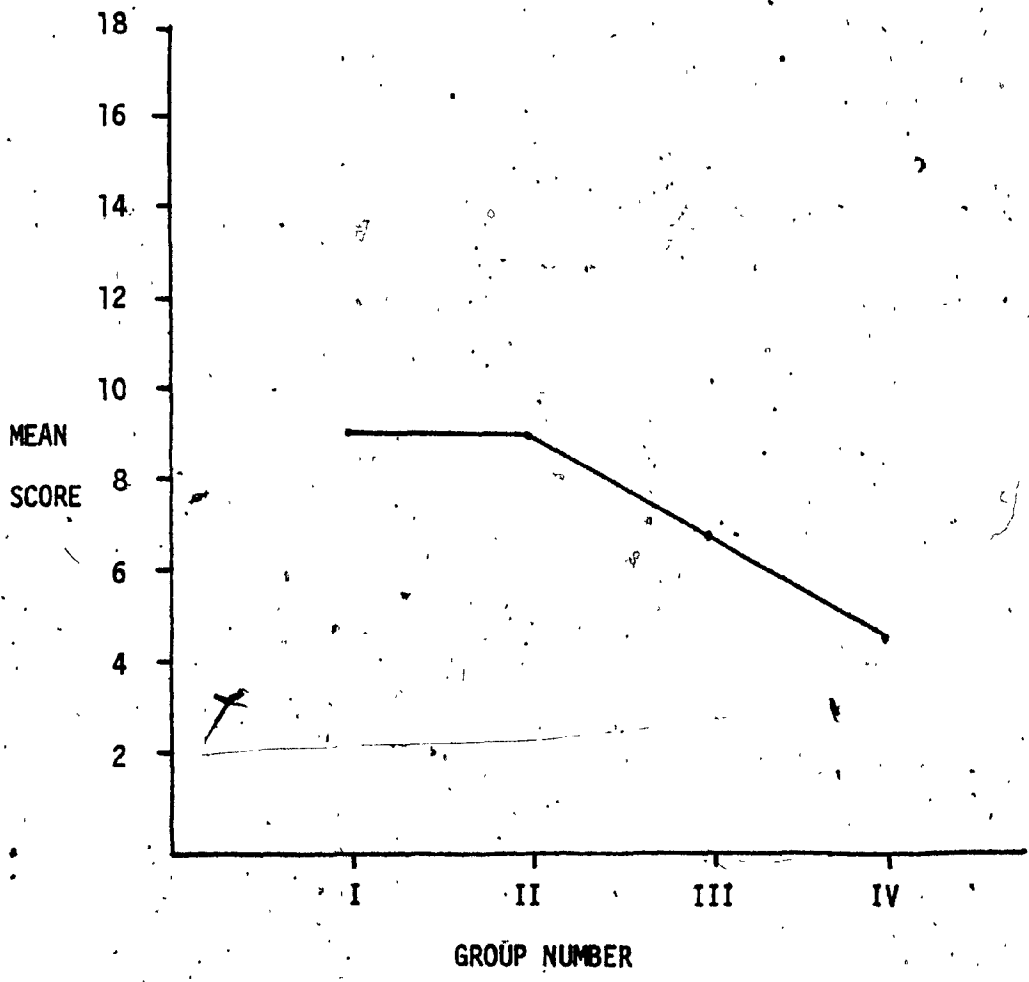
Variables	Source	ss	df	MS	F
Immediate	Between	708.41	3	236.13	28.98*
Recognition	Within	814.57	100	8.14	
Test	Total	1522.98	103		
Delayed	Between	306.09	3	102.03	22.36*
Recognition	Within	383.18	84	4.56	
Test	Total	689.27	87		

* $p < .0001$



- Group I = prose organizer
- Group II = pictorial organizer
- Group III = no organizer
- Group IV = placebo

Figure.2. Comparison of mean scores on immediate recognition test by group number



- Group I = prose organizer
- Group II = pictorial organizer
- Group III = no organizer
- Group IV = placebo

Figure 3. Comparison of mean scores on delayed test by group number

T₂: Post hoc Scheffé test revealed a significant difference between organizer groups and the control groups but not between prose organizer and pictorial organizer conditions (prose organizer = pictorial organizer > no organizer = placebo).

Questionnaire Data

The questionnaire revealed many important data which are important in organizer studies. Analysis showed that (a) the majority of subjects were majoring in education and that no one indicated a biology major (Table 5); (b) the reading passage was not familiar ($\bar{X} = 5.01$, $SD = 1.93$, see Table 6); (c) the degree of concentration on the passage was high ($\bar{X} = 3.56$, $SD = 1.65$, see Table 7); (d) the amount of time to read the passage was sufficient ($\bar{X} = 4.04$, $SD = 2.13$, see Table 8); (e) the reading passage was slightly difficult ($\bar{X} = 3.91$, $SD = 1.79$, see Table 9); and (f) interest in the reading passage was high ($\bar{X} = 3.24$, $SD = 1.73$, see Table 10).

The results from the questionnaire indicated that the reading passage met all the criteria for an organizer study. A very important point drawn from the questionnaire response was the unfamiliarity of the passage, since the purpose of this study was to investigate the effectiveness of advance organizers on new materials. The result on the questionnaire concerning the familiarity of the passage was in general agreement with the conclusions drawn from the interviews and the performance of the placebo control group who received no relevant passage.

Summary of Results

The cognitive style measure was not a significant predictor of test scores. Therefore, the HFT was not used as a covariate. There was a significant interaction between Time of Testing and Prose Conditions.

On the immediate test there was no significant difference between the organizer groups and the no organizer group. However, on the delayed test there was a significant difference favoring the organizer groups. The next chapter will discuss these findings.

Table 5
Absolute and Relative Frequencies for Field of
Study of Subjects

Field of Study	Absolute Frequency	Relative Frequency (%)
Education	58	55.8
Biology	0	0
Science	2	1.9
Arts	29	27.9
Other	12	11.5
No Response	3	2.9

Table 6

Absolute and Relative Frequencies for Subjects
Completing Familiarity Question

Scale		Absolute Frequency	Relative Frequency (%)
Familiar	1	1	1.0
	2	10	9.6
	3	12	11.5
	4	12	11.5
	5	10	9.6
	6	26	25.0
Not Familiar	7	30	28.8
No Response		3	2.9

Table 7
Absolute and Relative Frequencies for Degree
of Concentration Question

Scale		Absolute Frequency	Relative Frequency (%)
High Concentration	1	9	8.7
	2	16	15.4
	3	26	25.0
	4	24	23.1
	5	10	9.6
	6	13	12.5
Low Concentration	7	4	3.8
No Response		2	1.9

Table 8
Absolute and Relative Frequencies for Amount
of Time Question

Scale		Absolute Frequency	Relative Frequency (%)
Sufficient	1	11	10.6
	2	20	19.2
	3	9	8.7
	4	12	11.5
	5	17	16.3
	6	14	13.5
Not Sufficient	7	18	17.3
No Response		3	2.9

Table 9

Absolute and Relative Frequencies for Difficulty Question

Scale		Absolute Frequency	Relative Frequency (%)
Difficult	1	9	8.7
	2	15	14.4
	3	14	13.5
	4	23	22.1
	5	21	20.2
	6	11	10.6
Not Difficult	7	9	8.7
No Response		2	1.9

Table 10
Absolute and Relative Frequencies for
Interest Question

Scale		Absolute Frequency	Relative Frequency (%)
Interesting	1	15	14.4
	2	23	22.1
	3	22	21.2
	4	18	17.3
	5	11	10.6
	6	8	7.7
Not Interesting	7	5	4.8
No Response		2	1.9

CHAPTER 5

Discussion

The notion that certain cognitive structures may be a prerequisite for efficient knowledge acquisition (Arnheim, 1971; Ausubel, 1960; Gombrich, 1961) is supported by this study. It is assumed that the use of advance organizers will enhance learning and retention by providing relevant subsumers to which new ideas are incorporated. The advance organizer provides the necessary prior knowledge which serves as a context for the passage. As a result, the new material is relatable to existing knowledge and the amount retained is increased (McConkie, 1977). The results of the present study support this assumption.

Cognitive Style

Numerous research studies have shown that cognitive style is directly related to what is learned from a passage (David & Klansmeier, 1970; Lee, Kagan & Rabson, 1963; Ohnmacht, 1966). When new material in a passage is encountered, different learners provide their own organizational aid. Therefore, it was hypothesized that the cognitive style measure (HFT) will be a significant predictor on the immediate and delayed tests. However, this hypothesis was rejected since the HFT did not predict scores on both the immediate and delayed tests.

This non-significant prediction may be because there was not an equal distribution of field-dependent and field-independent subjects in the sample. Results in this study showed that the majority of subjects were relatively field-dependent, since 80 percent of the subjects were female (see Table 1), and it has been shown that females have a tendency to be field-dependent

(Witkin, Lewis, Hertzman, Machover, Meissner, & Wapner, 1954). This tendency was seen on the HFT scores, which were very low ($\bar{X} = 6.990$, $SD = 4.892$), with 92 percent of the subjects scoring less than 50 percent and 62 percent scoring less than 25 percent. Also, the questionnaire indicated that 95 percent of the subjects were majoring in Education and Arts (see Table 5) and it is known that persons majoring in these areas tend to be field-dependent (Barrett & Thornton, 1967). Hence, one could conclude that a majority of subjects in this study were field-dependent and therefore it is no surprise that this minimal variability in scores did not predict post-test reading scores.

Although results from this study did not indicate a relationship between individual differences and use of advance organizers, other studies (Allen, 1970; Proger, Taylor, Mann, Coulson, & Baynk, 1973) have shown this relationship. Therefore, future studies should investigate the relationship between cognitive style and the use of advance organizers utilizing a sample that consists of an equal mixture of males and females, who are majoring in both Arts and Sciences.

Advance Organizer vs. No Advance Organizer

According to Ausubel (1960), the use of an advance organizer will enhance learning and retention by providing optimal anchorage to incorporate new learning materials and provide ideational scaffolding which helps to relate existing knowledge to the new learning material. Based on this theory, it was hypothesized that by providing advance organizers before a passage, performance on immediate and delayed tests would be improved. In this study, this theory was supported on the delayed test but not on the immediate test.

The non-significant result on the immediate test may have resulted because

subjects in the control group relied on predeveloped retention strategies (memorization) which functioned for short-term learning as efficiently as the organizing qualities of the other treatments. When students know they are being tested, they generally take great care to deliberately remember relevant bits of passage information. The significant difference on the delayed test was in favor of the organizer groups, since the advance organizers served as an anchorage to which the learning material was integrated, hence increasing retention of the learning material. There was a greater loss for the control group on the delayed test because only over the time interval was the retention loss great enough to make use of the organizing properties available from the prose and pictorial advance organizers. In other words, subjects were provided with a structure which made possible more stable retention of information.

In this study, the most general and inclusive ideas of the brain were introduced in the advance organizer and the ideas were progressively differentiated in terms of detail and specificity. This is consistent with Ausubel's view that the internal structure of an individual consists of a hierarchical structure in which the most inclusive concepts occupy a position at the apex of the structure and subsume progressively less inclusive and more highly differentiated concepts and factual data.

Organizer studies that used both immediate and delayed tests did not include a true control group to test if increased performance on tests is due to practice effect or to the organizing properties of the organizer. This present study included a group that did not receive the advance organizer or the learning passage—a placebo passage was used.

Critics of this study might argue that the advance organizer groups

received more information than the no-organizer group, and hence will perform better on tests. However, this was proven wrong in this study, since on the immediate test there was no significant difference between the advance organizer groups and the control group, but there was a difference on the delayed test. Therefore, one could conclude that the advance organizers did not help in answering test questions and the difference was due to the organizing properties of the advance organizers.

Prose vs. Pictorial Advance Organizer

Ausubel (1968), in his theory of meaningful verbal learning, outlined the use of prose materials as advance organizers. This current study showed that pictorial advance organizers could produce the same result as prose advance organizers. The pictorial advance organizer, which was constructed from the prose advance organizer, simply gives the information required to incorporate the material in the passage. Hence, the pictorial advance organizer had the same organizing properties as the prose advance organizer. However, since both prose and pictures are effective as advance organizers, an interesting question is "How effective is prose plus pictures as advance organizers?", and future research should investigate this.

Educational Implications

In most subject areas, students are required to learn new and unfamiliar materials before they have acquired an adequate body of relevant subsumers at an appropriate level of inclusiveness. Therefore, curriculum developers and instructional designers should provide the necessary instructional aids to help students integrate new learning material. One such aid is the advance organizer, which could result in increased meaningful learning.

Results from this study indicated that providing a short introductory

passage (advance organizer) before new learning material should facilitate learning of the new materials. However, care should be taken in the construction of the advance organizer, since an organizer that works for one group of students may not work for another group.

In the construction of an advance organizer, instructional designers should taken advantage of the organizing properties of pictures as demonstrated in this study. The pictorial advance organizer functions by providing relevant subsumers required for the integration of the new learning material. Therefore, this current study extends Ausubel's finding that organizers can only take the prose form by showing that pictures can be as effective as prose for the advance organization of relevant subsumers.

In future instruction, advance organizers could be used so that students never encounter materials for which they are not prepared. In this case, the advance organizers will function in such a way that the new information is related to existing cognitive structure.

Conclusion

The results of this study indicate that advance organizers work only under certain conditions. Firstly, learners should be pre-tested to determine if an advance organizer is required. If there is a need for an advance organizer, the degree of familiarity of the learning passage will determine which type of organizer, expository or comparative, is required to integrate the new learning material. If the learning material is completely unfamiliar, then an expository advance organizer should be used. In this study, an expository advance organizer was used since the learning passage was unfamiliar to the subjects. This was determined by interviewing a random sample

of subjects before the experiment. The unfamiliarity of the learning passage was confirmed from the response on the questionnaire (see Table 6) and the placebo group, in which the mean score on the immediate and delayed tests was only slightly better than chance (see Table 3). Secondly, the learning material must be learnable to make sure that learners can use it to integrate the new material. An advance organizer that is not learnable is useless (Ausubel, Note 1). In this study, learnability was tested by giving the advance organizer alone to an equivalent group of subjects. These subjects were asked to answer questions based on the organizer. Results showed that the organizer was easily learnable. Thirdly, the advance organizer should not contain any information that could help in answering test questions. This would make sure that any difference is due to the organizing properties of the advance organizer rather than its mere presence. In this study, the advance organizer and test question were given to an equivalent group of subjects, who scored slightly less than the chance score. This was confirmed by the placebo group, which scored only slightly better than chance. Lastly, the learning material must be unfamiliar to ensure that learners do not possess the relevant subsumers required to integrate the new learning material.

The results from this study indicate that (a) advance organizers do facilitate retention if constructed properly, and (b) pictures can be as effective as prose for advance organizer construction. However, future researchers could extend this study by investigating (a) the relationship between cognitive style and advance organizers using subjects of different sex and academic field, (b) the effectiveness of prose plus pictorial materials as advance organizers, and (c) the effectiveness of graphic materials as advance organizers.

REFERENCES

REFERENCE NOTES

1. Ausubel, D.P. Personal communication, December 18, 1979.

REFERENCES

- Allen, D.I. Some effects of advance organizers and level of question on the learning and retention of written social studies material. Journal of Educational Psychology, 1970, 61, 333-339.
- Arnheim, R. Visual Thinking. Berkeley: University of California Press, 1971.
- Ausburn, L.J., & Ausburn, F.B. Cognitive styles: Some information and implications for instructional design. Educational Communication and Technology: A Journal of Theory, Research, and Development, 1978, 26, 337-354.
- Ausubel, D.P. The use of advance organizers in the learning and retention of meaningful verbal material. Journal of Educational Psychology, 1960, 51, 267-272.
- Ausubel, D.P. The Psychology of Meaningful Verbal Learning. New York: Grune and Stratton, 1963.
- Ausubel, D.P. Educational Psychology: A Cognitive View. New York: Holt, Rinehart and Winston, 1968.
- Ausubel, D.P. In defence of advance organizers: A reply to the critics. Review of Educational Research, 1978, 48, 251-257.
- Ausubel, D.P., & Fitzgerald, D. The role of discriminability in meaningful parallel learning and retention. Journal of Educational Psychology, 1961, 52, 266-274.
- Ausubel, D.P., & Fitzgerald, D. Organizer, general background, and antecedent learning variables in sequential verbal learning. Journal of Educational Psychology, 1962, 53, 243-249.

- Ausubel, D.P., Novak, J., & Hanesian, H. Educational Psychology: A Cognitive View. New York: Holt, Rinehart and Winston, 1978.
- Ausubel, D.P., & Robinson, F.G. School Learning: An Introduction to Educational Psychology. New York: Holt, Rinehart and Winston, 1969.
- Ausubel, D.P., & Youssef, M. The role of discriminability in meaningful parallel learning. Journal of Educational Psychology, 1963, 54, 331-336.
- Barnes, B.R., & Clawson, E.U. Do advance organizers facilitate learning? Recommendations for further research based on an analysis of 32 studies. Review of Educational Research, 1975, 45, 637-659.
- Barrett, G.V., & Thornton, C.L. Cognitive style differences between engineers and college students. Perceptual and Motor Skills, 1967, 25, 789-793.
- Barron, R.F. The effects of advance organizers upon the reception learning and retention of general science content. Department of Health, Education, and Welfare, Project No. IB-030; Grant No. OEG-2-710030, November, 1971. (ERIC Document Reproduction Service No. ED 061 554)
- Bartlett, F.C. Remembering. A Study in Experimental and Social Psychology. London: Cambridge University Press, 1932.
- Bower, G.H. Organizational factors in memory. Cognitive Psychology, 1970, 1, 18-26.
- Bower, G.H. Mental imagery and associative memory. In L.W. Gregg (Ed.), Cognition in Learning and Memory. New York: John Wiley & Sons, 1972.
- Bransford, J.D., & Franks, J.J. The abstraction of linguistic ideas. Cognitive Psychology, 1971, 2, 331-350.

- Bransford, J.D., & Johnson, M.K. Contextual prerequisites for understanding: Some investigations of comprehension and recall. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 717-726.
- Campbell, D.T., & Stanley, J.C. Experimental and Quasi-Experimental Designs for Research. Chicago: Rand McNally Publishing Company, 1973.
- Collins, A.M., & Quillian, M.R. How to make a language user. In E. Tulving & W. Donaldson (Eds.), Organization and Memory. New York: Academic Press, 1972.
- Davis, J.K., & Klansmeier, H.J. Cognitive styles and concept identification as a function of complexity and training procedures. Journal of Educational Psychology, 1970, 61, 423-436.
- Dooling, D.J., & Christiaansen, R.E. Episodic and semantic aspects of memory for prose. Journal of Experimental Psychology: Human Learning and Memory, 1977, 3, 428-436.
- Dooling, D.J., & Lachman, R. Effects of comprehension on retention of prose. Journal of Experimental Psychology, 1971, 88, 216-222.
- Dooling, D.J., & Mullet, R.L. Locus of thematic effects in retention of prose. Journal of Experimental Psychology, 1973, 97, 404-406.
- Fitzgerald, D., & Ausubel, D.P. Cognitive versus affective factors in the learning and retention of controversial material. Journal of Educational Psychology, 1963, 54, 73-84.
- Frase, L.T. Learning from prose material: Length of passage, knowledge of results and position of questions. Journal of Educational Psychology, 1967, 58, 266-272.
- Frase, L.T. Questions as aids to reading: Some research and theory. American Educational Research Journal, 1968, 5, 319-332.

- Frase, L.T. Influence of sentence order and higher level text processing upon reproductive and productive memory. American Educational Research Journal, 1970, 7, 367-379.
- French, J.W., Ekstrom, R.B. & Price, L.A. Kit of reference tests for cognitive factors. Princeton, N.J.: Educational Testing Service, 1963.
- Geschwind, N. Specializations of the human brain. Scientific American, 1979, 241 (3), 180-199.
- Gombrich, E.H. Art and Illusion. New York: Pantheon Books, 1961.
- Goodenough, D.R. The role of individual differences in field dependence as a factor in learning and memory. Psychological Bulletin, 1976, 83 (4), 675-694.
- Graber, R.A., Means, R.S., & Johnsten, T.D. The effect of subsuming concepts on student achievement on unfamiliar science learning material. Journal of Research in Science Teaching, 1972, 9, 277-279.
- Greeno, J.G. & Noreen, D.L. Time to read semantically related sentences. Memory and Cognition, 1974, 2, 117-120.
- Groteluescher, A., & Sjogren, D.C. Effects of differentially structured introductory materials and learning tasks on learning transfer. American Educational Research Journal, 1968, 5, 191-202.
- Gruenfeld, L.W. Unpublished Data. Cornell University, 1972.
- Holliday, W.G. Teaching verbal chains using flow diagrams and texts. AV Communication Review, 1976, 24, 63-81.
- Huck, S.W., & Long, S.D. The effect of behavioral objectives on student achievement. Journal of Experimental Education, 1973, 42, 40-41.
- Jackson, D.N., Messick, S., & Myers, C. Evaluation of group and individual forms of embedded figures measurements of field-independence. Educational and Psychological Measurement, 1964, 24, 177-192.

- Johnson, R.E. Meaning in complex learning. Review of Educational Research, 1975, 45, 425-459.
- Kagan, J., Moss, H.A., & Sigel, I.E. Psychological significance of styles of conceptualization. In J.C. Wright & J. Kagan (Eds.), Basic Cognitive Processes in Children. Monograph of Society for Research in Child Development, 1963, 28 (2), 73-112.
- Kahle, J.B., & Nordland, F.M. The effect of an advanced organizer when utilized with carefully sequenced audio-tutorial units. Journal of Research in Science Teaching, 1975, 12, 63-67.
- Kahle, J.B., & Rastovac, J.J. The effects of a series of advanced organizers in increasing meaningful learning. Science Education, 1976, 60, 365-371.
- Kintsch, W. Notes on the structure of semantic memory. In E. Tulving & W. Donaldson (Eds.), Organization of Memory. New York: Academic Press, 1972.
- Kuhn, D.J., & Novak, J.D. A study of cognitive subsumption in the life sciences. Science Education, 1971, 55, 309-320.
- Lawson, T.E. Influence of instructional objectives on learning technical subject matter. Journal of Industrial Teacher Education, 1973, 10 (4), 5-14.
- Lawton, J.T. The use of advance organizers in the learning and retention of logical operations and social studies concepts. American Educational Research Journal, 1977, 14, 25-43.
- Lee, L., Kagan, J., & Rabson, A. The influence of a preference for analytical categorization upon concept acquisition. Child Development, 1963, 34, 433-442.

- Luiten, J., Ames, W., & Ackerson, G. A meta-analysis of the effects of advance organizers on learning and retention. American Educational Research Journal, 1980, 17, 211-218.
- Martin, E. Stimulus meaningfulness and pair-associate transfer: An encoding variability hypothesis. Psychological Review, 1968, 75, 421-441.
- Mayer, R.E. Different problem solving competencies established in learning computer programming with and without meaningful models. Journal of Educational Psychology, 1975, 67, 725-734.
- Mayer, R.E. Some conditions of meaningful learning for computer programming: Advance organizers and subject control of frame sequencing. Journal of Educational Psychology, 1976, 68, 143-150.
- Mayer, R.E. Twenty years of research on advance organizers: Assimilation theory is still the best predictor of results. Instructional Science, 1979, 8, 133-167.
- Mayer, R.E., & Bromage, B.K. Different recall protocols for technical texts due to advance organizers. Journal of Educational Psychology, 1980, 72, 209-225.
- McConkie, G.W. Learning from text. Review of Research in Education, 1977, 5, 3-48.
- Merrill, M.D., & Stolurow, L.M. Hierarchical preview vs. problem oriented review in learning an imaginary science. American Educational Research Journal, 1966, 3, 251-261.
- Messick, S. The Criterion Problem in the Evaluation of Instruction. Princeton, N.J.: Educational Testing Services, 1969.

- Meyer, B.J.F. Idea units recalled from prose in relation to their position in the logical structure, importance, stability and order in the passage. Unpublished master's thesis, Cornell University, 1971.
- Meyer, B.J.F. The structure of prose: Effects on learning and memory and implications for educational practice. In R.C. Anderson, R.J. Spiro & W.E. Montague (Eds.), Schooling and the Acquisition of Knowledge. New York: John Wiley & Sons, 1977.
- Meyer, B.J.F., & McConkie, G.W. What is recalled after hearing a passage. Journal of Educational Psychology, 1973, 65, 109-117.
- Nebelkopf, E.B., & Dreyer, A.S. Continuous-discontinuous concept attainment as a function of individual differences in cognitive style. Perceptual and Motor Skills, 1973, 36, 655-662.
- Ohnmacht, F.W. Effects of field-independence and dogmatism on reversal and nonreversal shifts in concept formation. Perceptual and Motor Skills, 1966, 22, 491-497.
- Patterson, F. Conversation with a gorilla. National Geographic, October, 1978.
- Proger, B.B., Carter, C.E., Mann, L., Taylor, R.G., Bayuk, R.J., Morris, V.R., & Reckless, D.E. Advance and concurrent organizers for detailed verbal passages used with elementary school pupils. Journal of Educational Research, 1973, 66, 451-456.
- Proger, B.B., Taylor, R.G., Mann, L., Coulson, J.M., & Bayuk, R.J. Conceptual prestructuring for detailed verbal passages. Journal of Educational Research, 1970, 64, 28-34.
- Reynolds, J.H. Cognitive transfer in verbal learning. Journal of Educational Psychology, 1966, 57, 382-388.

- Richards, J.P., & DiVesta, F.J. Type and frequency of questions in processing textual materials. Journal of Educational Psychology, 1974, 66, 96-98.
- Rothkopf, E.Z. Learning from written instructional materials: An exploration of the control of inspection behavior by test-like events. American Educational Research Journal, 1966, 3, 241-249.
- Rothkopf, E.Z. The concept of mathemagenic behaviors. Review of Educational Research, 1970, 40, 325-336.
- Rothkopf, E.Z., & Bisbicos, E.E. Selective facilitative effects of interspersed questions on learning from written materials. Journal of Educational Psychology, 1967, 58, 36-61.
- Royer, J.M. Theories of the transfer of learning. Educational Psychologist, 1979, 17, 53-69.
- Royer, J.M., & Cable, G.W. Facilitated learning in connected discourse. Journal of Educational Psychology, 1975, 67, 116-123.
- Royer, J.M., & Cable, G.W. Illustrations, analogies, and facilitative transfer in prose learning. Journal of Educational Psychology, 1976, 68, 205-209.
- Rumelhart, D.E., Lindsay, P.H., & Norman, D.A. A process model for long term memory. In E. Tulving & W. Donaldson (Eds.), Organization of Memory. New York: Academic Press, 1972.
- Santiesteban, A.J., & Koran, J.J. Instructional adjuncts and learning science from written materials. Journal of Research in Science Teaching, 1977, 14, 51-55.

- Satterly, D.J., & Telfer, I.G. Cognitive style and advance organizers in learning and retention. British Journal of Educational Psychology, 1979, 49, 169-178.
- Scandura, S.M., & Wells, J.N. Advance organizers in learning abstract mathematics. American Educational Research Journal, 1967, 4, 295-301.
- Schmid, R.F. Prior knowledge, content familiarity and the comprehension of natural prose. Unpublished doctoral dissertation, Arizona State University, 1977.
- Schmid, R.F., & Kulhavy, R.W. Theme and the comprehension of prose. Contemporary Education, (forthcoming).
- Schulz, R.W. The role of cognitive organizers in the facilitation of concept learning in elementary school science. (Doctoral dissertation, Purdue University, 1966). Dissertation Abstracts, 1966, 27, 3784 A.
- Schumacher, G.M., Liebert, D., & Fass, W. Textual organization, advance organizers, and the retention of prose material. Journal of Reading Behavior, 1975, 7, 173-180.
- Smith, R.J., & Hesse, K.D. The effects of prereading assistance on the comprehension and attitudes of good and poor readers. Research in the Teaching of English, 1969, 3, 166-167.
- Weisberg, J.S. The use of visual advance organizers for learning earth science concepts. Journal of Research in Science Teaching, 1970, 7, 161-165.
- Weissenberg, P., & Gruenfeld, L.W. Relationships among leadership dimensions and cognitive style. Journal of Applied Psychology, 1966, 50, 392-395.

Weissenberg, P. Psychological differentiaion and job satisfaction.

Doctoral dissertation, Cornell University, 1967.

West, L.H.T., & Fensham, P.J. Prior knowledge or advance organizers as effective variables in chemical learning. Journal of Research in Science Teaching, 1976, 13, 297-306.

Witkin, H.A. Individual differences in ease of perception of embedded figures. Journal of Personality, 1950, 19, 1-15.

Witkin, H.A. Cognitive style in academic performance and in teacher-student relations. In S. Messick (Ed.), Individuality in Learning: Implications of Cognitive Style and Creativity for Human Development. San Francisco: Jossey-Bass, 1976.

Witkin, H.A., Dyk, R.B., Faterson, H.F., Goodenough, D.R., & Karp, S.A. Psychological Differentiation: Studies of Development. New York: Wiley, 1961.

Witkin, H.A., Dyk, R.B., Faterson, H.F., Goodenough, D.R., & Karp, S.A. Psychological Differentiation. Potomac, Md.: Erlbaum, 1974.

Witkin, H.A., Lewis, H.R., Hertzman, M., Machover, K., Meissner, P.B., & Wapner, S. Personality through Perception. New York: Harper & Row, 1954.

Witkin, H.A., Lewis, H.B., Hertzman, M., Machover, K., Meissner, P.B., & Wapner, S. Personality through Perception. Westport, Conn.: Greenwood Press, 1972.

Witkin, H.A., Moore, C.A., Goodenough, D.R., & Cox, P.W. Field-dependent and field-independent cognitive styles and their educational implications. Review of Educational Research, 1977, 47, 1-64.

APPENDICES

APPENDIX A
Instructions

INSTRUCTIONS

Your participation in this study will enable educational researchers to improve the method of instruction of how people learn from textual materials. Please read the text seriously, the same as you will study materials from which you are expected to learn information.

Note that this is an experiment in learning and any information gathered will be used only for experimental investigation. The results of the experiment can be obtained by contacting the author in H 635-3, Concordia University.

You will be asked to (1) do the Hidden Figures Test in 20 minutes (10 minutes for Part 1 and 10 minutes for Part 2); (2) study the text for 10 minutes; (3) do the multiple-choice test in 8 minutes; and (4) do the questionnaire in 2 minutes.

Please obey all instructions. It is important that you do the tasks in the specified time. If you are not finished with a particular task in the given time, go on to the next task. When the time for a particular task is up, it will be announced.

All the material used in the study must be returned to the experimenter.

Please cooperate by following all instructions.

DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.

THANK YOU.

GOOD LUCK!

APPENDIX B

Hidden Figures Test

HIDDEN FIGURES TEST

Student I.D. _____

Part 1

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____

Part 2

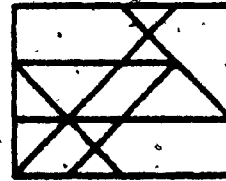
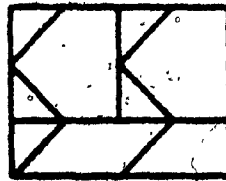
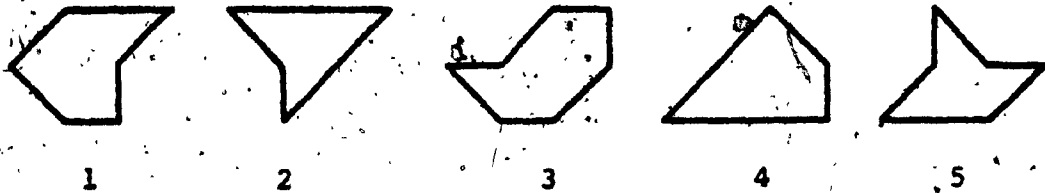
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____
25. _____
26. _____
27. _____
28. _____
29. _____
30. _____
31. _____
32. _____

HIDDEN FIGURES TEST

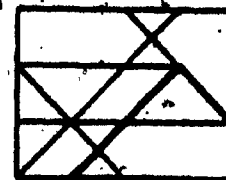
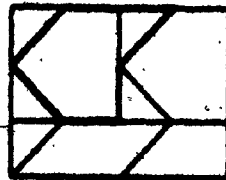
This is a test of your ability to tell which one of five simple figures can be found in a more complex pattern. At the top of each page in the test are five simple figures numbered 1 to 5. Beneath the row of figures is a page of patterns. For each pattern decide which of the five simple figures it contains and mark that alternative by the appropriate number on your answer sheet.

Note: There is only one of these figures in each pattern, and this figure will always be right side up and exactly the same size as one of the five numbered examples.

Now try these two examples:



The figures below show how the figures are included in the problems. Figure 1 is in the first problem and Figure 4 in the second.



You will have 10 minutes for each of the two parts of this test. Each part has 2 pages. When you have finished Part 1, STOP. Please do not go on to Part 2 until you are asked to do so.

DO NOT TURN THIS PAGE UNTIL ASKED TO DO SO.

Part 1 (10 minutes)



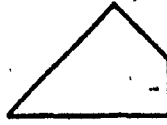
1



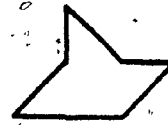
2



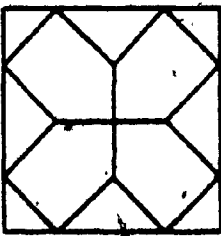
3



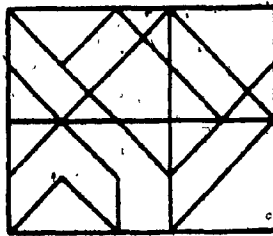
4



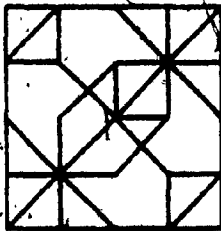
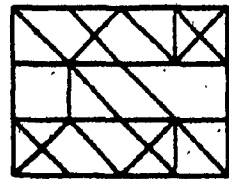
5



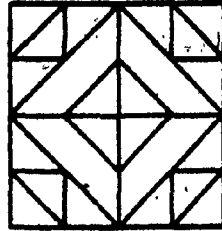
1.



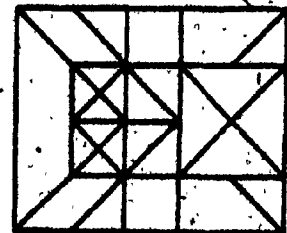
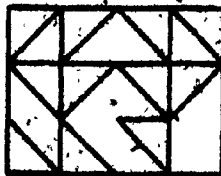
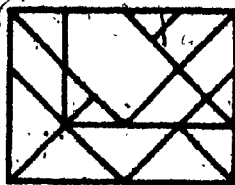
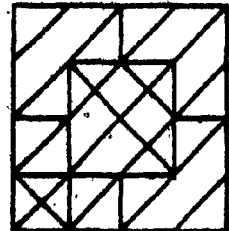
3.



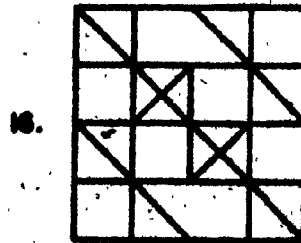
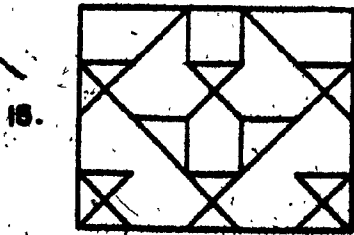
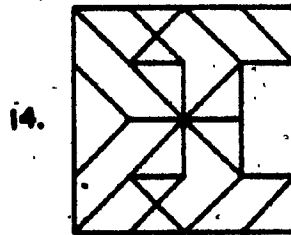
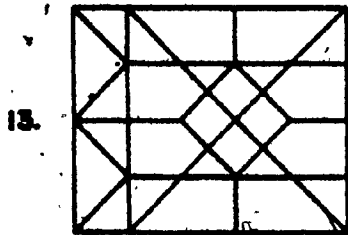
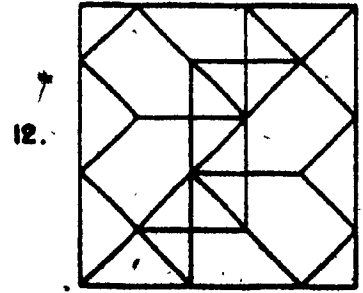
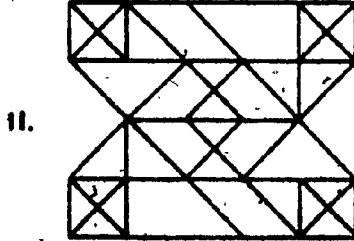
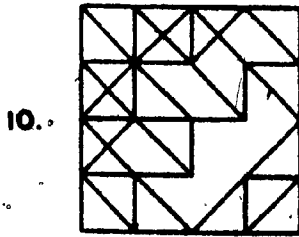
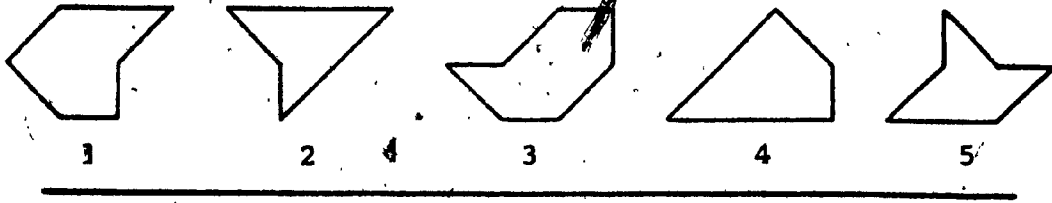
5.



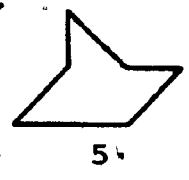
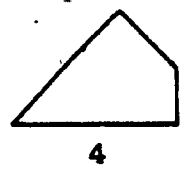
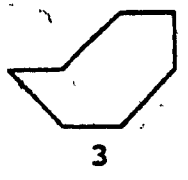
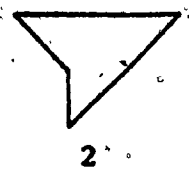
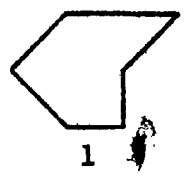
6.



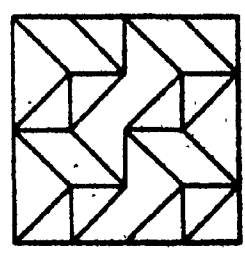
Part 1 (continued)



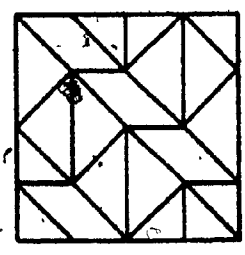
Part 2 (10 minutes)



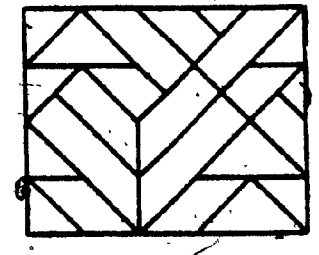
17.



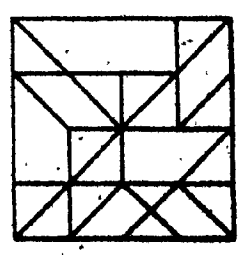
18.



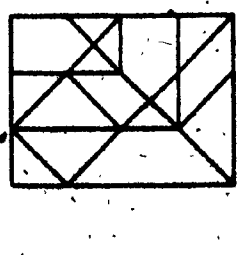
19.



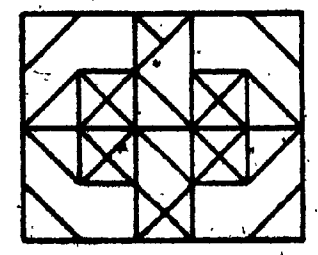
20.



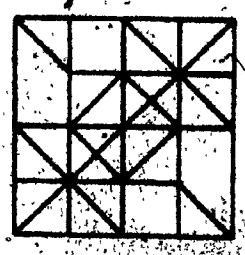
21.



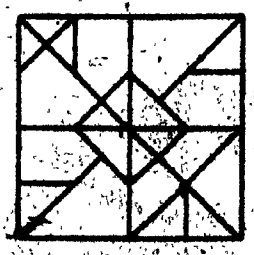
22.



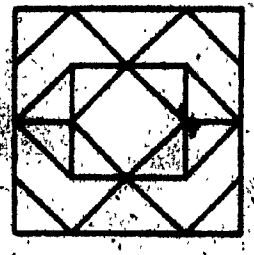
23.



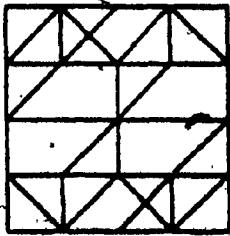
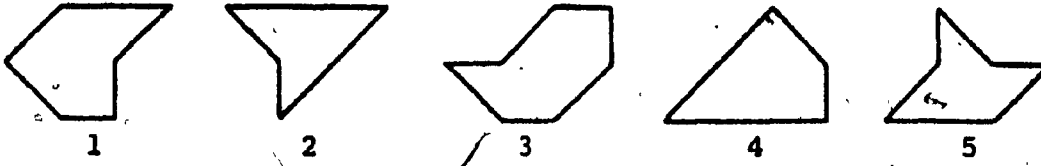
24.



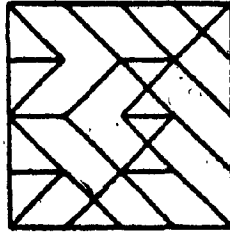
25.



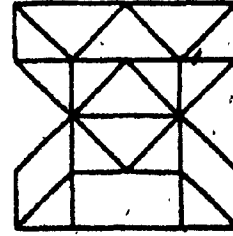
Part 2 (continued)



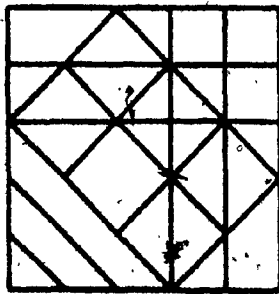
27.



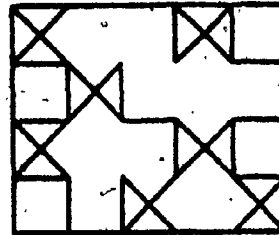
28.



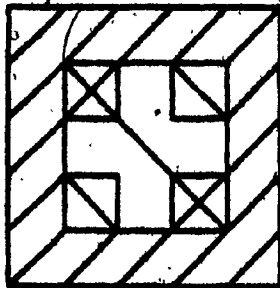
29.



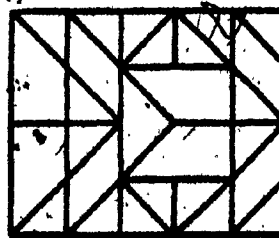
30.



31.



32.



DO NOT GO BACK TO PART 1, AND
DO NOT GO ON TO ANY OTHER TEST UNTIL ASKED TO DO SO.

APPENDIX C
Prose Advance Organizer

Study the following and then turn the page to continue.
You have 10 minutes to complete this section (4 pages).

THE BRAIN

Certain higher faculties, such as language, depend on specialized regions in the human brain. The two cerebral hemispheres, the left and the right, are specialized for different kinds of mental activity. Linguistic abilities reside mainly on the left side of the brain and linguistic competence requires the cooperation of the Broca's area and the Wernicke's area, which are located in the left hemisphere.

When a word is heard, the sensation from the ears is received by the primary auditory cortex and passed on to the Wernicke's area for processing. If a word is to be spoken, some representation of it is transmitted from Wernicke's area to Broca's area.

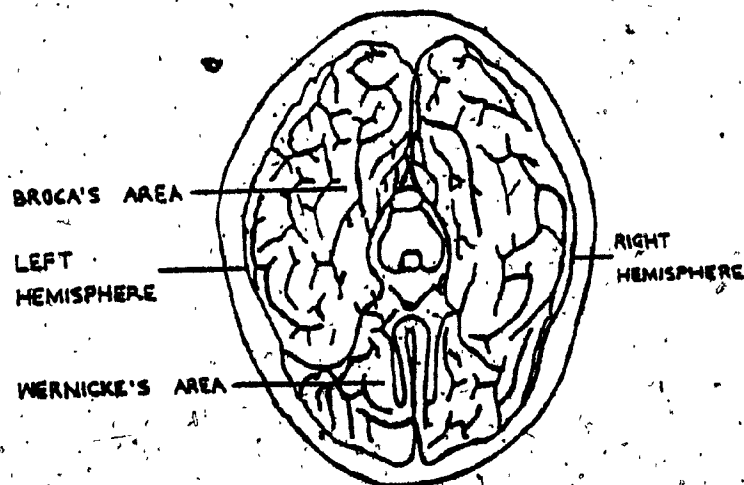
When a written word is read, the sensation is first registered by the primary visual cortex and then relayed to the angular gyrus which associates the visual form of the word with the auditory pattern in Wernicke's area.

APPENDIX D
Pictorial Advance Organizer

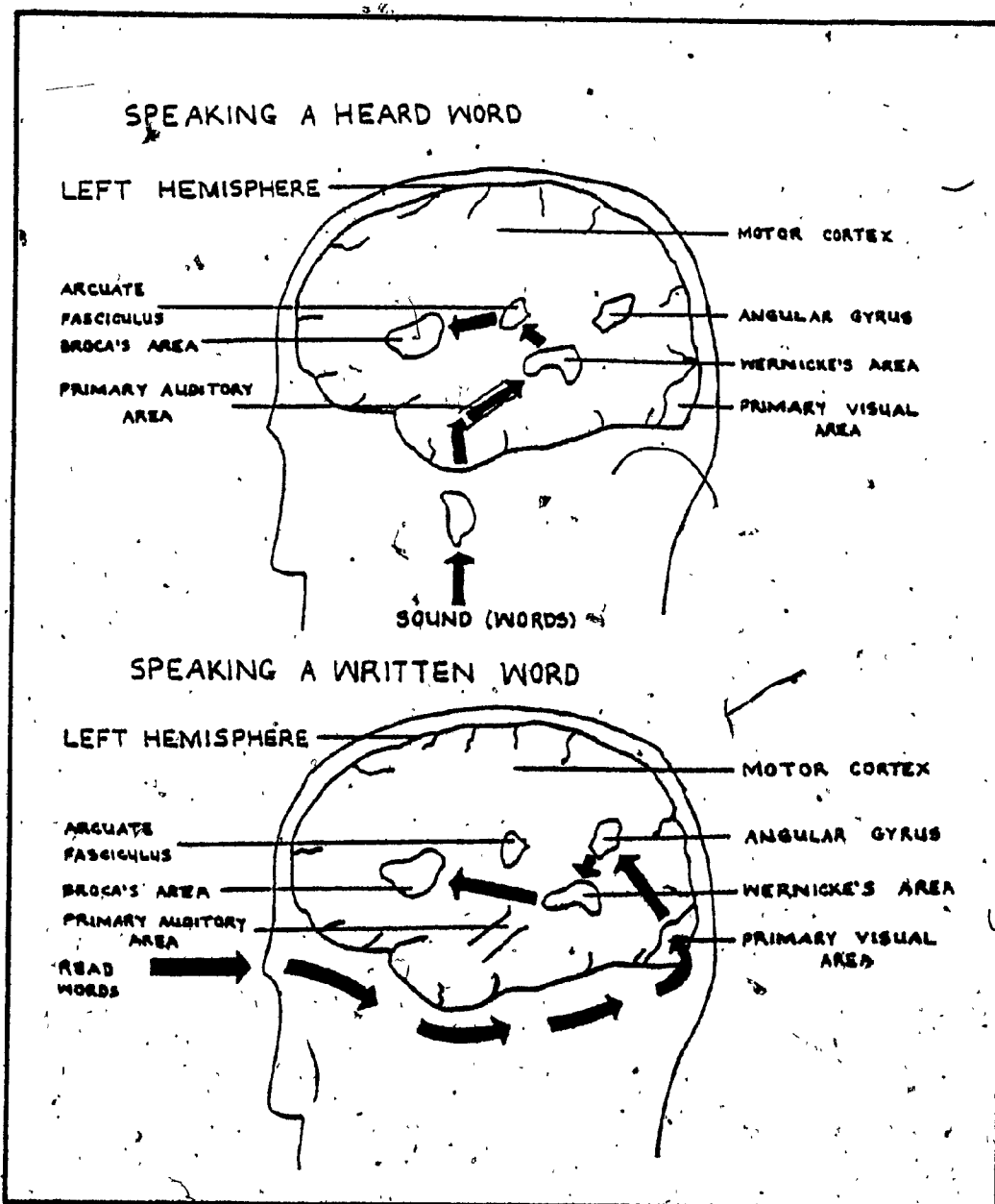
Study the following diagrams and then turn the page and study the following passage.

You have 10 minutes to complete this section (5 pages).

THE BRAIN



Note: 65% of the original size



Note: 65% of the original size

APPENDIX E
Reading Passage.

Language and the Brain

The specialized regions of the brain that have been investigated in the greatest detail are those involved in language. In the 1860's, the French investigator Paul Broca pointed out that damage to a particular region of the cortex consistently gives rise to an aphasia, or speech disorder. The region is on the side of the frontal lobes, and it is now called the anterior language area, or simply Broca's area. He showed that whereas damage to this area on the left side of the brain leads to aphasia, similar damage to the corresponding area on the right side leaves the faculty of speech intact. This finding has since been amply confirmed: well over 95 percent of the aphasias caused by brain damage result from damage to the left hemisphere.

Broca's area is adjacent to the face area of the motor cortex, which controls the muscles of the face, the tongue, the jaw and the throat. When the Broca's area is destroyed by a stroke, there is almost always severe damage to the face area in the left hemisphere as well, so it might be thought that the disruption of speech is caused by partial paralysis of the muscles required for articulation. However, damage to the corresponding area on the right side of the brain does not cause aphasia, although a similar weakness of the facial muscles results. Furthermore, in Broca's aphasia it is known that the muscles that function poorly in speech operate normally in other tasks. The evidence is quite simple: the patient with Broca's aphasia can speak only with

Washoe - learning the signs for "drink" and "more" within the project's first few weeks - I could probe new areas of the gorilla's potential for language and thought.

APPENDIX G
Recognition Test

Multiple-Choice Test Directions.

On the following pages you will be required to answer some multiple choice questions.

Answer each question by selecting the best answer from the four possible choices.

Example.

Concordia University is located in the city of:

- a) Alberta
- b) Montreal
- c) Toronto
- d) Vancouver

The correct answer is 'Montreal', so you would draw a circle (O) around the letter b (ⓐ).

Please answer all the questions.

Turn the page and begin the test.

(You have 8 minutes)

STUDENT I. D. # -----

QUESTIONS

1. The term aphasia refers to
 - a. a speech disorder
 - b. inability to read
 - c. inability to write
 - d. loss of memory
2. Damage to which of these areas could result in a disruption of speech.
 - a. Broca's and angular gyrus
 - b. Broca's and Wernicke's
 - c. Wernicke's and angular gyrus
 - d. cortex and angular gyrus
3. It has been shown that people with Broca's aphasia are more likely to recover when
 - a. the area destroyed is not too large
 - b. the person is younger than eight years
 - c. the person is left-handed
 - d. all of the above
4. The utterance of nonsensical syllables is a symptom of
 - a. Broca's aphasia
 - b. damage to the angular gyrus
 - c. damage to the occipital lobe
 - d. Wernicke's aphasia
5. Which of the following groups may speak and understand speech normally but have difficulty with written language?
 - a. patients with injuries in the angular gyrus
 - b. patients with injuries in the primary auditory area
 - c. patients with injuries in the motor cortex
 - d. patients with injuries in the arcuate fasciculus

6. Which area of the brain when damaged disrupts the use of language completely?
 - a. Broca's area
 - b. primary auditory area
 - c. angular gyrus
 - d. Wernicke's area
7. The muscles of the face, the tongue, the jaw and the throat are controlled by the
 - a. frontal lobe
 - b. motor cortex
 - c. sensory cortex
 - d. temporal lobe
8. The underlying structure of an utterance arises in
 - a. Broca's area
 - b. frontal lobe
 - c. primary auditory area
 - d. Wernicke's area
9. Faulty grammar is a symptom of
 - a. Broca's aphasia
 - b. damage to the angular gyrus
 - c. damage to the arcuate fasciculus
 - d. Wernicke's aphasia
10. Broca's area is located in the
 - a. frontal lobe
 - b. occipital lobe
 - c. parietal lobe
 - d. temporal lobe

11. A patient with Broca's aphasia can
- sing with great difficulty
 - sing with ease
 - speak with great difficulty
 - speak with ease
12. Damage to which part of the brain makes comprehension possible but impairs speech?
- Broca's area
 - primary auditory area
 - angular gyrus
 - Wernicke's area
13. Wernicke's area is located in the
- frontal lobe
 - occipital lobe
 - parietal lobe
 - temporal lobe
14. In Broca's aphasia speech is
- fluent
 - impossible
 - fast
 - telegraphic
15. Broca's area is sometimes referred to as the
- anterior language area
 - primary auditory area
 - temporal lobe
 - frontal lobe

16. In Broca's aphasia it is known that
- a. muscles that function poorly in speech operate poorly in other tasks
 - b. muscles that function poorly in speech operate normally in other tasks
 - c. muscles that function normally in speech operate poorly in other tasks
 - d. muscles that function normally in speech operate normally in other tasks
17. Damage to which side(s) of the brain could result in a speech disorder?
- a. left
 - b. right
 - c. left and right
 - d. front
18. There is difficulty with the inflection of verbs, with pronouns and connective verbs in
- a. Broca's aphasia
 - b. damage to the angular gyrus
 - c. damage to the primary auditory area
 - d. Wernicke's aphasia

APPENDIX H
Questionnaire