EFFECTS OF ADVANCE ORGANIZERS ON IMMEDIATE AND DELAYED RECALL OF ORAL LEARNING IN GRADES FOUR AND SEVEN

by

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ABSTRACT

The goal of this study was to explore the use of advance organizers in an oral learning situation at two elementary school grade levels. It had four main purposes: 1) to determine whether or not advance organizers would facilitate retention in oral learning; 2) to determine if one particular type of organizer would facilitate more than another; 3) to discover whether there were grade differences in retention from an oral lesson; and 4) to determine if there would be differences in the occasion of recall (immediate or delayed).

Students in grade four and seven were randomly assigned to one of four treatment groups: no organizer, outline organizer, prequestion organizer and visual organizer. Each of the treatment groups employing an advance organizer received the same abstract comparative advance organizer followed by an organizer unique to their treatment. The no organizer treatment received an unrelated listening task in place of the organizers.

After an oral learning task of connected discourse, presented on audio tape, all subjects received one of two versions of a sentence completion test based on the listening task. This was the measure of immediate recall. One week later they were administered the second parallel version of the same test as the delayed recall measure.
The results indicated no facilitative effects for advance organizers. There were also no statistically significant interactions between the treatment group and grade level or occasion of recall. Grade level and occasion both showed main effects.

After reexamining the stimuli and recall measures utilized in the study, it was decided that the absence of the expected facilitating effect for advance organizers and of any interactions with them was probably due to poorly constructed stimuli and inappropriate recall measures combined with some administration difficulties.

The grade level main effect was attributed primarily to developmental memory capacities while the main effect of occasion might be accounted for by depth of processing differences.
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CHAPTER I
INTRODUCTION

In the course of a school day a child may find himself in a variety of educational listening situations ranging from formal oral lessons to video programmes and peer presented reports. An extensive 1949 survey of elementary classrooms reported 57.78 of the student's time was spent in listening (Wilt in Duker 1971). Twenty five years later it was estimated that students still spent more than half their time in listening (Lundsteen 1976).

Considerable research has been undertaken in the last fifty years to identify the skills involved in listening; to establish their correlation with other skills and abilities; and to develop programs for teaching listening skills (Devine 1978). Unfortunately, there are still many students who are poor listeners and who miss much of the material presented orally in the classroom.

Since so much of elementary school teaching is spent in the auditory mode, we should look carefully at how we conduct this activity. The oral lesson should be structured in such a way as to assist the learner in his attempt to understand and retain what he hears.

One of the primary deficiencies in poor listeners is their inability to focus their attention. An instructional technique which the educator might use to offset this deficiency is that of advance organizers.
The term "advance organizer" as coined by Augubel, refers to a conceptual introduction to a learning situation which provides a framework within which to fit the new material learned. There is some controversy concerning what constitutes an advance organizer and whether they are effective (Barnes & Clawson, 1975; Hartley & Davis, 1976). There are, however, sufficient supportive studies to lead this researcher to believe that an advance organizer may assist the learner and that they may be particularly useful in an oral learning situation. In an oral lesson the information is usually available only once, when it is spoken, so that providing the listener with an initial framework for learning primes him as to what to listen for as well as aiding in activating storage areas.

Reception of meaningful instruction using an auditory mode commands a number of skills from the listener: the ability to decode the linguistic content into units of information which can be comprehended and stored; a body of knowledge or experience within which to fit the orally acquired information to make it meaningful and a memory structure in which to store it. (Barbara, 1958; Erway, 1972; Fischer, 1978; Lundsteen, 1979). It is suggested that the use of an advance organizer can assist the young listener in each of these demands.

First, an organizer can be used to provide the necessary conceptual base within which to identify and fit the new in-
formation by providing new concepts or activating old ones so that they are receptive to new information. Further, they can provide the listener with a specific structure, or order, on which to focus in order to obtain the key elements of the information and store them. Finally, it can help in forming units, or chunks, of information in order to avoid overloading short term memory. In order to accomplish all this, the organizer must be at a level which is compatible with the child's experience and capabilities.

There have been some advance organizer studies conducted at the elementary level, but they are in the minority. The majority have been at the college or senior high school level and have utilized written materials both for the organizer and the learning task.

Only one by Alexander, Frankiewicz & Williams (1979) has been conducted with elementary children in an oral learning situation and it found advance organizers facilitative at the grades 5, 6 and 7 level. Since there is such a dearth of research in the area of advance organizers in oral learning, a decision was made to examine the possible facilitative effect of the organizers.
CHAPTER II
REVIEW OF THE LITERATURE

Advance Organizers, Theory and Function

The term "advance organizer" was coined by Ausubel to describe an abstract, but inclusive, introduction to a situation of learning, which provides a framework within which the learner's cognitive structure can organize and integrate the new material (Ausubel, 1960, 1961, 1963, 1968). This view is based on the assumption that the cognitive structure is organized hierarchically and that all new learning is incorporated into the structure only insofar as it can be subsumed into already existing concepts. The use of an advance organizer ensures that the appropriate concept is either activated or introduced so that the new material can be integrated into, or assimilated by, the already existing structure (Ausubel, 1960, 1963, 1968, 1978; Ausubel & Fitzgerald, 1961, 1962; Ausubel & Youssef, 1963). In the resulting process of assimilation, the prior knowledge, or old concept, is redefined to include the new information.

In defining advance organizers, Ausubel stated that the organizer was to be at a level of abstraction which matched the cognitive structure of the learner (1968) and although it was to be inclusive, it was to contain none of the actual material to be learned (1963, 1968, 1978) while still taking
Advance organizers will facilitate learning: a) by mobilizing whatever relevant anchoring concepts are already established in the individual's cognitive structure; b) by providing optimal anchorage for easy initial learning and later resistance to obliterative subsumption through the use of general and inclusive ideas of the appropriate discipline and c) by producing meaningful learning by activating or supplying key concepts which will anchor the learning and remove the necessity of rote memorization of unfamiliar or isolated ideas (Ausubel, 1978 p. 137 & 148, Lawton & Wanska, 1977). The role of the advance organizer then, is to bridge the gap between what the individual already knows and what he needs to know in order to understand and retain the new learning.

This conceptualization of the action of advance organizers is based on two assumptions emphasized by Ausubel and his colleagues. First, cognitive structures are hierarchically organized with progressive differentiation within the knowledge so that new ideas are subsumed into the appropriate level within the hierarchy and disappear as separate units of knowledge. Second, new learning material is potentially meaningful and takes on meaning only after it is incorporated into the learner's existing cognitive structure. That is to say, when the new learning is related to some previous knowledge held by the learner, it becomes meaningful and more
likely to be retained.

The advance organizer merely calls to mind the relevant concepts so that when the material to be learned is introduced, its concepts and details will have an already familiar anchor on which to become attached. Once identified as belonging with a specific concept, or anchor, they no longer are isolated details but become meaningful in light of the previous knowledge in the cognitive structure and are subsumed into the anchoring concept (Ausubel, 1960, 1968). By extension, if there is no existing relevant anchor in the learner's cognitive structure and none supplied, it is unlikely that the new learning will become meaningful. Instead, it will remain a memorized, and little understood, isolated fact until the relevant structures are somehow acquired.

Ausubel (1968, 1978), suggested two different types of advance organizer, expository and comparative, which are said to be equally effective but are to be used in different circumstances. The expository organizer is used when material is totally unfamiliar to the learner as determined by a pre-test. It attempts to provide inclusive subsumers, related to the existing cognitive structure, and to provide ideational scaffolding for the new material. Comparative organizers are to be used when the material is familiar or can be related to established ideas. They perform the same function as expository organizers but also, aid in increased discriminability between the new ideas and those previously learned by pointing
out the principle similarities and differences. In both cases, the actual material to be learned should not be included in the organizer which is abstract. The principle difference between the two organizers appears to be that the comparative organizer points out the difference prior to learning and provides its scaffolding through the use of a specific comparable example whereas the expository organizer is purely abstract in its ideas.

In recent studies Mayer has attempted to develop a clearer definition of what constitutes an advance organizer by examining how the organizer functions. He has done this by proposing four theories of advance organizers and testing the theories empirically (1977, 1978, 1979a, 1979b).

One theory is the reception theory where the recall performance of subjects is a function of what is presented and received by the subject. Such a theory although recognizing the value of organizers in general is not particularly supportive of advance organizers since learning depends only on what is presented and what the learner receives. The theory takes no notice of what the learner considers to be important, and therefore memorable, or what past experiences he brings with him, nor does it mention any process of learning.

The retrieval theory is similarly simplistic. Here the organizer acts as a retrieval aid so that the learned material can be cued for recall. Again the learner's abilities and experiences have no part in the learning nor is the
process of storage explained. In this theory advance organizers or postorganizers will be equally effective for learning.

An addition encoding theory predicts that an advance organizer will assist the learner at the time of encoding because it activates or provides relevant concepts. In this manner more anchors are available to assist in both comprehension and encoding of the new information so that the learners' knowledge will be increased. The addition encoding theory is similar to Ausubel's theory but, it does not allow for any integration of the new material. A modification of the addition encoding theory suggests that the anchors may also be selective in the ideas which they will or can accept.

The theory to which Mayer seems most attached and which is the most like Ausubel's is the assimilative encoding theory. This theory predicts that the advance organizer will aid the learner by providing a conceptual framework within which the new learning materials will be integrated. It is unclear exactly how this differs from Ausubel's theory of subsumption since both predict that specific learning will disappear into general concepts and will no longer be distinguishable as separate ideas. Mayer puts a strong emphasis on the encoding aspect of the advance organizer. Ausubel does not specifically state that encoding will be aided however it is strongly implied.

The two are also in agreement that advance organizers will not assist in every learning situation. Each says that
learning will be enhanced only if the material is unfamiliar, and if the learner does not already have an effective strategy of integration or an existing subsumer. In addition they agree that some details will be lost in the assimilation process although concepts will be clearer (Ausubel, 1968, 1978; Mayer, 1979a, 1979b). Mayer and Bromage (1980) further suggest that if the learning material is logically organized with integration of ideas already incorporated within the text then advance organizer will not facilitate. Nor will it assist if the advance organizer does not provide information relevant to the understanding of the material or if it does not encourage the learner to integrate the information of the advance organizer (Mayer, 1979a).

Mayer's work has done much to clarify situations in which advance organizers will not facilitate learning. In the course of these studies he has also broadened Ausubel's definition of an advance organizer slightly. Rather than an abstract, but inclusive, framework within which the learner can organize and integrate the new material the definition becomes: any visual or verbal information, which contains no specific content from the to-be-learned information, but, which provides an ideational structure within which to logically organize the new information (Mayer, 1979a).

The description of Ausubel's advance organizers, and the accompanying instructions on how to construct one, have been severely criticized by Barnes and Clawson (1975) and
Hartley and Davies (1976). It is true that the descriptions are primarily conceptual in nature however, this appears to be because organizers are specific to the particular learning situation and to the learners (Ausubel, 1968, 1978; Lawton & Wanska, 1977). Regardless of the reasons for the lack of specific methods there is no doubt that their absence has contributed to confusion and disagreement as to what constitutes an advance organizer and how it functions. This confusion may be responsible for at least some of the non-supportive studies. A closer look at some of the actual studies will help to clarify the controversy surrounding the use of advance organizers.

Supportive Studies Using Written Advance Organizers

Studies by Ausubel and his colleagues have primarily used what they identified as comparative organizers since the learning materials, although unfamiliar to the learners, were easily relatable to some previously obtained familiar knowledge. Ausubel (1960) used a passage on metallurgy which he related to mining in the advance organizer. Ausubel and Youssef (1963) compared Buddhism and Zen Buddhism to Christianity. In both cases an abstract general introduction pointed out similarities and differences between the existing concepts (mining and Christianity) and those to be learned. In each case the advance organizer was found to be facilitative.
When Ausubel and Fitzgerald (1961) employed both a comparative and an expository advance organizer in the study of Buddhist ideals they found the comparative organizer more effective. Another study by them (1962) using only an expository advance organizer in learning the endocrinology of pubescence utilized an abstract passage on primary and secondary sex characteristics as an advance organizer. Again advance organizers were found to be facilitative although in this case primarily for lower ability students.

In all cases the research was conducted with written materials using college students and a multiple choice recall measure.

Mayer's studies also used college students and were primarily concerned with learning computer materials (1975, 1976, 1978). A comparative organizer was used with a diagram and a description of a computer as a familiar analogy. Unlike most studies, his recall measures consisted of questions of varying difficulty. The greatest effect for the advance organizers was found in the superiority in answering questions requiring transfer.

Other researchers have also used written advance organizers although the organizers are not always identifiable as being of a type recommended by Ausubel. Results from these studies have been mixed.

Grotelueschen & Sjögren (1968) conducted two experiments with above average adults in which the subjects were
taught principles of mathematics. They employed advance organizers on mathematical principles which contained none of the passage material but could be used as transfer material to organize the new learning. They concluded that the advance organizer facilitated both recall and the transfer of learning. Mathematical principles were also employed in a study by Lesh (1976) and advance organizers were judged effective particularly with materials in which structural integration was a problem. Again adults were used while the recall measure required a simple yes or no.

Allen (1970) working with grade 9 students used an abstract organizer which was supposedly both comparative and expository. Using a recall measure with combined multiple-choice and short answer questions, he found no significant difference between the use of the advance organizer and a treatment of adjunct questions except in the case of above average students where the advance organizer was facilitative. Another study with elementary students (Proger et al, 1973) used an advance organizer which incorporated 8 key concepts from the new material, they also found no significant difference among four advance organizers of an abstract paragraph, an outline, a true and false pre-test and a completion test. However, they did observe that girls preferred covert response organizers (the abstract paragraph and outline) to overt ones. A multiple-choice post-test was employed.
The reliance on multiple-choice recall post tests meant that cues for recall were present in many of the studies. Two measures of recall which could have been utilized and which would not contain cues are free recall and sentence-completion.

Steinbink (1971) using 5 & 6 grade Black students in intact social studies classes utilized conceptual advance organizers and daily organizers. The control group received the organizer at the end of the unit and did not receive the daily organizer. Significant differences were found supporting the use of advance organizers. However, the use of individual rather than class means leaves the result open to question.

Anderson (1973) compared advance organizers and post-organizers in college economics classes. The advance organizer did significantly better on a recall employing matching.

Nonsupportive Studies with Written Advance Organizers

Clawson and Barnes (1973) used an abstract expository organizer which was introduced into textbook material on anthropology for grades 3-6 children. There was no significant difference from a multiple choice test when the advance organizer, postorganizer and no organizer treatment groups were compared.

Barron (1971) found the same results with grade 6-12 students when he used an expository organizer and a graphic which focused on key words.
Jerrolds (1968) used two advance organizers, one which dealt with specific facts and one, termed a modified advance organizer, which identified main ideas and concepts. It is unclear whether the material in the organizer was part of the learning passage or not. He found no significant difference when the advance organizer treatments were compared to each other and to a control group of no organizer.

It is difficult to compare some of the studies with others since they often used different subjects from elementary to college and different subject matters. The one thing they do have in common is the fact that they all utilized written organizers and passages and that the majority of them used multiple-choice recall measures. This of course means that the measures were primarily recognition rather than recall. In most cases there is also no acknowledgement of the contention that advance organizers do not aid all subjects or all learning.

It is little wonder that such a mixture of findings has left open the question of the value of advance organizers in learning. As they stand advance organizers cannot be accepted as facilitative but neither can their potential be ignored.

Schulz (1966) working with above average grade six Science students in an extended study (20 weeks) gave the organizer groups two advance organizers at two separate times. Although no statistically significant effect in favour of the
organizers was found he concluded that advance organizers may facilitate learning but not for high ability students.

Feller (1974) used randomly assigned intact classes in comparing a comparative advance organizer, an historical advance organizer and two forms of adjunct questions. After the administration of a multiple-choice test he concluded that advance organizers do facilitate comprehension and application.

Many other studies have been carried out which also show no support for the use of advance organizers. Barnes and Clawson (1975) cited 32 studies, 12 of which supported the use of advance organizers and 20 of which did not. Mayer (1979b), on the other hand, cited 27 only 4 of which were non-supportive. It would not be appropriate here to review all the studies, supportive and non-supportive, which have been carried out on advance organizers since the ones cited above are representative of the types and styles to be found and since few have been done in the area which concerns this study, that of oral learning. The review will therefore turn to some of the problems inherent in dealing with the conflict of views and to other forms of advance organizer.

Other Written Advance Organizers

There have been other forms of written organizers which were utilized previous to instruction but which do not fit into
the advanced organizer models.

Dooling and Lachman (1971) used thematic titles for a prose passage with college students. They found that the presence of thematic titles increased recall but not significantly. Further they found that words and phrases relevant to the theme had superior recall and retention whether they were in the passage or not; and that the thematic titles aided chunked recall.

Kulhavy, Sherman and Schmid (1978) contrasted thematic title prompts and a continuation treatment in which students were to continue the passage. They found that the use of the thematic title resulted in superior recall when compared to the continuance group or a control group with instructions to remember the passage.

Other researchers have used prequestions as organizers. Although prequestions do not fit either Ausubel or Mayer's description of an advance organizer they could create a priming effect for learning by directing the students' attention to specific information. The prequestions do not provide new anchors or organize the information in the cognitive structure, but they do activate already existing subsumers. Peeck (1970) and Berlyne (1966) found prequestions enhanced learning with high school students who were asked to learn quotations and authors, however these were isolated statements rather than connected discourse. A number of the studies found that although prequestions enhanced recall and retention they had a
selective effect on what was learned. Frase (1967) working with college students found that although prequestions assisted intentional learning, there was a depressive effect on incidental learning. This may be a result of a learning set created by the prequestions so that students know what they must learn (intentional) and ignored other (incidental) information. He also found postquestions more effective than prequestions. Peeck (1970) used two forms of prequestion, those for which students attempted to guess the answer and those they simply read prior to the reading passage. He compared them to a passage only group and an extended reading time group. Results showed there was an improvement in retention of information. There was no difference between the guess and no guess treatments. Sangria and DiVesta (1978) had similar results to Frase's, when comparing prequestion, postquestion and no-questions. Intentional learning was enhanced and incidental depressed.

Written objectives have been used in some studies, generally with a facilitative effect, possible they act in a similar manner to prequestions with a priming effect. Kaplan and Rothkopf (1972, 1974) found in two experiments that objectives were better than general ones. When the effect of length of relevant information in a passage and the density of the information were examined it was discovered that the length of the sentence had little effect, however the amount of
information in the passage had a negative relation to the likelihood of mastery of the objective.

Duchastel and Brown (1974) found results similar to those of the prequestion studies in that intentional learning was enhanced by objectives and incidental depressed. Jenkins and Neisworth (1973) provided college students with objectives and a reading passage on teacher effectiveness. The multiple-choice recall test was geared specifically to the objectives. Although they found that the objectives aided the students on a test they point out that the results make no claims that objectives aid in concept attainment since conceptual questions were not asked.

A few other forms of written organizer have been used. Arkes, Schumacher and Gardner (1976) used what they called orienting tasks which were an outline organizer, instructions to copy important points or sentence sorting. Bayuk, Proger and Mann (1970) used two organizers, one an outline and the other a test-like set of questions which were placed in either a before or after position. Both included information from the passage. No significant difference between treatments was found although it appeared that lower ability subjects favoured the outline treatment.

In a few studies there was an attempt to examine the schemata which the learner brought to the experience of learning connected discourse. Grabe (1979) presented college
students with the same ambiguous story which could be interpreted from one of two points of view. He found that what was retained from the story reflected the importance of the text information in terms of the reader's schema of what was happening. Anderson, Reynolds, Schallert, and Goetz (1977) found similar results also using an ambiguous material. They presented it to students from different disciplines and found that the interpretation depended, at least partially, on the student's area of expertise. They concluded that what the reader brings to a text creates the structure in which he views it.

These two studies supply support for Ausubel's contention that the advance organizer should activate the already existing cognitive structure of the learner so that the new material may be effectively related to what is already there.

Nonwritten Organizers

Visual organizers have been used in a number of studies. Bransford and Johnson (1972) gave visual context clues, both complete and partial, in before and after positions for an ambiguous passage. When they were compared to a no cues condition the partial cues in a before position were found to be most helpful in understanding and retention.

With grade 3 subjects, Pressley (1975) found training and instructions to form a mental image aided understanding of
a short story provided subjects were not asked to read and
decide on the same time. Lesgold (1975) found instructions to
imagine the pictures in a story assisted low-ability grade 3
and 4 with recall. Dunham and Levin (1979) dealing with K-1
in an oral situation found that recall benefitted from an
externally supplied picture while Guttmann, Levin and Pressley
(1977) also in an oral learning situation found both external
and self-generated images helpful with grade 3 but only exter­
nal pictures assisted K and 2 students.

Other forms of organizer which were neither written
nor visual appear in the form of games. Livingston (1970) used
a simulation game to act as an advance organizer for a grade
6-12 lesson in economic geography. He found no difference
between the game advance organizer and a control group.
Scandura and Wells (1967) on the other hand found a game quite
facilitative in a math lesson.

One study, by Lucas (1973) used a combination of written
and non-written organizers with a reading passage. He compared
an oral, a visual and a written organizer which were presumably
abstract and found that none of the organizers were particu­
larly effective.

Nugent, Tipton & Brooks (1980) had a somewhat different
study where the organizer consisted of a title or prequestions
but the passage was oral and visual. The learning material was
a TV program which was to have an affective result. He found
that the organizers aided comprehension but inhibited the affective learning.

Alexander et al (1979) are the only researchers to employ both a non-written organizer and a non-written learning situation. Two abstract, inclusive advance organizers, based on Ausubel's principles were used. One was a set of graphics and pictures on slide film and the other an abstract oral presentation followed by discussion questions. Both organizers were presented either orally or with oral accompaniment and the social studies lesson content was also oral. When compared to a control group both organizers were found to facilitate learning although there was little difference in effect between the organizers.

Listening

During the course of a school day students may find themselves in any of a number of listening situations ranging from formal lessons by the instructor to a story or lecture on audio tape. An extensive survey of elementary classrooms in 1949 reported 57.7% of a student's time was spent in listening. In the same study, listening was listed as the first most important language skill by 16% of the teachers polled and the second most important by another 42.7% (Wilt in Duker, 1971).

Twenty five years or more later, estimates of the time
spent in listening in the classroom still ranged above 50% (Lundsteen, 1976; Devine, 1978). Over the course of those years considerable research and theorizing on what constitutes listening has been undertaken.

Although there has been controversy over whether listening is a unitary skill or a complex of activities (Bakan in Duker, 1971; Kelly in Duker, 1971) present researchers tend to view listening as a process by which spoken language is given meaning (Lundsteen, 1979; Fischer, 1978; Devine, 1978). It is a conscious act which requires active participation on the part of the listener in order to identify, recognize and interpret the spoken symbols.

Where do the skills necessary for proficient listening come from? Weaver and Rutherford (1974) developed a hierarchy of listening skills based on theory, logic and a review of the literature. The hierarchy was divided into three sections: Environmental skills - identifying and interpreting sounds from the environment; Discrimination Skills - recognizing differences in sounds and beginning to identify verbal sounds; and Comprehension Skills - where meaning is attached to the sounds.

Examples of a suggested developmental scheme of each of the skills from infancy to childhood (grade 3 or 4) are given. The
implication of course, is that there is a gradual build-up of the skills through experience as well as parental and school guidance.

Sticht (1974) has also advanced a model of language development which includes listening. It is a four stage model in which the ground work for language is laid in early sensory and perceptual development both in pre-linguistic and linguistic phases. The actual process of learning to listen includes: a) focusing on acoustic and phonological attributes for sense and meaning; b) acquiring linguistic competence in semantics or recognizing that words represent concepts; c) acquiring linguistic competence in syntax or learning the rules of the game, and d) developing a memory system which includes sensory information storage, short term memory where information is chunked for further processing and long term memory where the processed information is stored in an abbreviated form and related to previous knowledge. Sticht also suggests that syntactic and sensory processing becomes a relatively automatic process which takes place at a preattentive stage.

An integral part of Sticht's model is the ability to attend to the message. This first appears as an awareness of a message being sent and gradually develops into a more selective attention which involves a process of extracting information from the total message. This can only be done when the listener has some criterion which can be used to weigh
which sections of the information will be retained and stored. This selective attention, along with decoding and the storage of information has been termed auding to differentiate it from hearing without meaning or attention.

Fischer's (1978) model, rather than being one of language development deals specifically with the process of listening. It is a three part model which allows for interplay between each of the three phases. The first phase Speech Perception is where sense is made of raw speech. Here the listener relies heavily upon his knowledge of the language since the acoustics, especially in longer messages, are often obscure. This also often enables him to listen to only part of the word and still be capable of identifying it and making sense of it. This leads to Speech Comprehension where the information is analysed. In the comprehension phase the input is analysed into units of information through the use of a semantic approach which is then confirmed by syntactic analysis. This approach implies a high level of selective attention where key words or concepts supply most of the meaning. Finally, on to the third phase of Memory or Storage. Here the information, assembled in the other two stages, is stored in a skeletal form from which it can be retrieved and added to. A global presentation of the information is formed through the continual retrieval and integration of information. It is here that past experience material is integrated with new information. Needless to say,
the process takes place at a very rapid pace but requires concentration to be effective.

Lundsteen (1979) in dealing with the process of critical listening proposed a three stage model which incorporated ten elements. In the first and largest stage the message is translated from spoken symbol to recognizable concepts through a process of focusing selective attention on the material, comparing it to past experiences, and recoding it into the individual's identified language units. This leads to the next stage of getting meaning and finally going beyond the message meaning to further integrations and implications.

Looking back over the four theoretical models discussed it is plain that selective attention is one of the important listening abilities which are central to the processing of speech. This is particularly true in comprehending connected discourse which contains varying amounts of pertinent information in each sentence and groups of sentences, and where the listener cannot hope to remember all that has been said.

When we approach listening from a different view, that of psychiatry we find that listening ability, or flexibility, is affected by the listener's perception of the purpose of the message and by the ability of the speaker and the listener to create a common language between them (Barbara, 1958). In order for a meaningful communication to take place, Barbara says, the listener must become consciously and actively in-
volved in the listening process. An essential part of such activity is the ability to attend to the message selectively so that the essential rather than extraneous elements are concentrated on and retained.

When we look at the literature on attention in listening we find that the term has a number of meanings which range from keeping one's physical attention firmly fixed on the speaker to attending to a message in one ear while a second is being received simultaneously in the other ear (Broadbent, 1954; Triesman, 1960). An operational definition for selective attention in a natural listening situation appears to be that of focusing on the central elements of the message (Erway, 1972; Tutolo, 1979; Fessenden et al., 1973).

According to Patterson (1979) this focusing or selective attention includes locating the central theme, discriminating between relevant and irrelevant details or arguments, and tracking the intended message over and through competing or distracting messages. Although storage of the information is not mentioned as a part of the attending process it is implied in the tracking.

Support for the emphasis on selective attention in listening comes from work on dichotic listening in which subjects listened to two separate messages simultaneously and were able to focus on the desired one.

In Broadbent's (1954) dichotic listening experiments
he found subjects could continue to track one voice even though there was a potential of interference from another voice. Further, subjects were able to store information temporarily for later attention. To account for this selective listening ability he postulated a "filter" which blocked out all but the message and channel required to fulfill the purpose of the listener.

Triesman (1960, 1964) also conducted a number of experiments on selective attention in dichotic listening in an attempt to determine if messages in the same voice but, of similar and dissimilar linguistic structure or, which were switched from one ear to the other to break the context would have an effect on what was attended to. She found that there was virtually no break in attention to the desired message regardless of the irrelevant message except for the occasional recognition of "highly probable words" which appeared to fit the context of the relevant message. From this she suggested that the "filter" may act as an attenuating factor rather than a blocking mechanism. That is, it is a trigger which rapidly accepts or rejects the probability of the relevance of a particular word or phrase.

This differs from Broadbent's filter which is conceived as being preprogrammed to recognize and act on certain classes of words or phrases so that the rest may be ignored. Triesman suggests that the "attenuation" filter lowers or raises the threshold of acceptance or rejection of certain words or
phrases relative to others on the basis of a pre-conceived notion of what is expected and therefore probable.

It was hoped that the use of an advance organizer would serve to prompt the filter so that the selective attention necessary for effective listening would be activated. If such an action occurred in an oral learning situation then meaningful learning and therefore recall would be facilitated.

The Problem

This study was designed to examine the use of advance organizers in an oral educational situation at the elementary level. It had four main purposes. 1. To determine if the use of an advance organizer facilitated learning and retention in an oral lesson. 2. To see if a particular type of organizer was more, or less, beneficial than other types of advance organizers. 3. To see if grade level would have an interactive effect with the type of organizer. 4. To look for any potential effects or interactions between organizer type, grade level and immediate or delayed recall.

In order to determine these effects two types of comparative organizers, verbal and visual, were designed along with a test to measure immediate and delayed recall. Each organizer consisted of two parts, a conceptual oral statement and a visible display accompanied by an oral explanation. The opening oral statement, which was the same for each organizer, was a comparative statement based on Ausubel's
principles that this advance organizer should be general but abstract and would relate the new learning to previously learned ideas in order to provide ideational scaffolding as well to increase discriminability between old and new ideas. The visible display, in the case of the visual organizer, was a colored drawing. In the case of the verbal organizer two versions were constructed, one which utilized a series of prequestions and one an outline of key concepts. All three of the organizers contained the same nine concepts as subsumers.

Since the visible portion of the organizer did not fall within Ausubel's definition, a modified version was employed in which an advance organizer became visual or verbal information which contained no specific concept from the to-be-learned information, but, which provided an ideational structure within which to logically organize the information (mayer, 1979a).

A no organizer control group was included in the study. This group received an extra unrelated listening exercise in place of the organizer. The control was included, of course, to provide a source of comparison to determine whether or not the advance organizer facilitated learning.

The listening task was an orally presented factual narrative discourse about the life of a female octopus.

Male and female students from grades 4 and 7 were utilized to determine whether there was a possible grade effect.
Since there is so little research on orally presented advance organizers, or advance organizers with oral tasks, the study was intended to be exploratory however, a number of hypotheses, as outlined below, were tested.

**Research Hypotheses:**

1. That advance organizers will facilitate recall.

2. That recall will differ according to grade level.

3. That there will be a difference between immediate and delayed recall scores.

4. That different treatments will be more or less facilitative at different grade levels.

5. That different treatments will be more or less facilitative for immediate and delayed recall.

6. That what is recalled for immediate or delayed recall will differ according to the grade level.

**Rationale**

Both Ausubel's subsumption theory and Mayer's assimilation theory argue that advance organizers assist at the encoding stage by providing a framework for learning through the supply or activation of key concepts. Since oral discourse must be processed at the time of reception, it is likely that a previously activated conceptual framework will assist in the
processing by shortening the time required for meaningful identification and assimilation of ideas, by focusing attention on main ideas and by assisting with chunking of information for storage and later recall. It will also assist by providing linkages between ostensibly isolated ideas within the conceptual framework.

One of the major stumbling blocks to understanding and retention of facts and concepts of orally presented material, is an inability to focus attention on central arguments or to track them through competing components of a message. An advance organizer should assist with focusing on the principle ideas by introducing them prior to the learning task and because of this, activating a form of selective attention. This repetition of ideas, in the organizer and in the task, even when one is conceptual rather than specific, should aid in memory storage as well.

For similar reasons it is expected that delayed recall will be facilitated by the use of an advance organizer. Advance organizer theory suggests that not only will encoding of information be assisted but, because of the anchoring concepts, learning will be more meaningful to the learner. It will become part of his cognitive structure and will therefore be retained more easily. Whether this will happen in a listening situation is, of course, unknown. However, since there are strong similarities between listening and reading processes and, since advance organizers have been found to facilitate
with written materials, it is not unreasonable to expect a similar result with listening.

The grade levels, 4 and 7, chosen for the study represent two different developmental levels in Piagetian stage theory, concrete and formal operations. Since the two stages utilize different cognitive patterns it was deemed possible that different forms of organizer would facilitate at each of the two levels.

It was further expected that there would be a differential effect between the two groups in what was recalled since memory is also documented as a developmental skill related to maturation (Flavell, 1977; Paris & Lindauer, 1976; Piaget & Inhelder, 1973).

Summary

Because of the amount of time spent in oral lessons and activities at the elementary level and because there are varying abilities in listening there is a need to explore methods of enhancing learning from oral lessons. Advance organizers, because of their potential for assistance at encoding and with selective attention were selected as a possible method of facilitating learning and retention from an oral lesson. Grade level was selected as a blocking variable to examine potential differential effects of the advance organizers because of past research.
CHAPTER III
METHODOLOGY

Design

The design of the research was a 2X4X2 factorial ANOVA with repeated measures. It consisted of two grade levels, grade four and seven; and four treatment groups, a visual organizer (VO), a prequestion organizer (PQ), an outline organizer (OT) and a no organizer (NO) group. Each of the organizer groups, except for NO, received a two part organizer, a practice exercise, a listening task and a short irrelevant task followed by two recall tasks spaced one week apart. The recall tasks were the repeated measures. The NO group received an unrelated listening task in place of the organizer in order to equalize the treatment times.

Subjects

Subjects were 99 grade four and 108 grade seven students from three schools in the Lower Fraser Valley. The schools were located in a semi-rural area, a new subdivision and an established residential area near the town centre. The sample was expected to be representative of the general population for these two grade levels since it contained a cross-section of abilities (except for those with severe learning disorders) in each of the classes.
Stimulus Material

This section will be divided into two parts of 1) treatment materials for all groups and 2) treatment materials which varied for each group.

Stimulus Material (General)

This section will describe materials used with each of the treatment groups.

Each treatment group received the same: statement of purpose, 2 minute practice exercise, 9 minute listening task, 2 minute intervention task and sentence completion recall tests. Copies of each of the materials may be found in Appendix B.

The statement of purpose was designed to introduce the examiner and to reassure any students who may be experiencing anxiety due to the unfamiliar activity. It informed the students that they were part of an experiment to determine how well students listen in different situations and that the results from the experiment were not for use by their teachers or the school. Informing the subjects of the purpose probably created a mental set towards listening but it was felt that this would only strengthen the comparisons between treatments.

A two minute practise listening exercise on alligators and crocodiles accompanied by 5 orally presented questions was utilized for three reasons. One, to ensure that the equipment
was working and that the children were comfortable with it; two, to help the children adjust to an unfamiliar voice imparting information and, three, to make them aware of the type of questions they would be asked following the listening task. Alligators and crocodiles were chosen as a topic of interest to the children because of its unfamiliarity combined with its exotic nature. The general information was taken from a children's book (Zim, 1978).

The listening task began with an introduction of unfamiliar terms which were incorporated into a description of an octopus and presented orally by the E. Students were then instructed to put on their headphones and a connected discourse on the life of a female octopus was read by a male voice from a cassette audio tape. The octopus story demonstrated the interrelationship of life in the sea. The text was taken from a children's book (Carrick, 1978) with minor adaptations having been made to simplify the vocabulary after piloting. (see Appendix A)

The topic of octopuses was chosen because advance organizer theory indicated the organizers are most facilitative in science situations (Ausubel 1968; Mayer 1979b) because it was thought that the topic would be of interest to grades four and seven; and because it seemed to the experimenter that it was unlikely that Ss would have much prior knowledge of the subject.
An intervention task was deemed necessary to ensure that long term and not short term memory was being measured. This task consisted of making a finger puppet following oral instructions. It was also chosen for its interest. It had been used with grades 2-7 on previous occasion with considerable success. The task held the children's interest by keeping them guessing as to the end product and provided a pleasant surprise when completed. The activity also gave them a fun product to take away with them as an unanticipated reward for their cooperation in the experiment.

Treatment Stimulus

Except for the NO treatment group all treatment groups received a conceptual organizer designed on the basis of Ausubel's description of a comparative organizer. His definition required that it be abstract but, that it point out the specific similarities and differences between a familiar body of knowledge and the unfamiliar one to-be-learned. Care was taken not to include any information from the particular learning task.

It was decided to use Man in a comparison to animals as Man would be the most familiar to the children. The organizer pointed out that Man is responsive to his physical make-up and his environment, as are other creatures.

In addition to the initial abstract organizer statement,
each treatment group, except for the NO, received a visual display which pointed out that in learning about animals there are some common elements. These elements may have individual variations but examining them can aid in understanding the animal's life. The common elements are the physical description, unusual physical feature, methods movement, basic needs, food habits, habitat or homes, potential enemies, natural protective features and early life habits or styles. The script for these presentations are available in Appendix B for each of the treatment groups.

Subjects in the PQ treatment group were given a visible stimulus of twelve questions hand-printed in black felt pen on separate 6 X 56 cm. cards of yellow bristol board. The twelve questions were all representative of the aforementioned nine common elements. Children were instructed to imagine a familiar animal and to silently answer the questions about it.

Subjects in the OT treatment received a visible stimulus of the nine common elements expressed in key words and hand-printed in black felt pen on 8 X 28-1/2 cm. cards of yellow bristol board. Again the children were instructed to imagine a familiar animal and think about these elements in its life.

Subjects in the VO group viewed a 28 X 35 cm. coloured picture of woodland life (See Reference Note). The nine elements were introduced in an accompanying oral script and
and examples of the elements either pointed out or elicited from the group.

Each of the visible stimuli was accompanied by an orally presented explanation which was read by the experimenter. In the case of PQ and OT treatments, subjects were encouraged to imagine familiar animals. VO subjects were provided with visible examples.

Subjects in the NO treatment group received a listening exercise about a volcano eruption with three questions in lieu of the organizer. This was to equalize treatment times.

Equipment

The audio cassette tapes, prepared on a Sanyo M2533 cassette tape recorder, were played back on Califon 3420 tape playback units in conjunction with Audiotronics D-12 listening centres. Each center had a maximum of 8 headphones per center so that for some groups two playbacks and two listening centers were required.

Recall Measures

The dependent variables of immediate and delayed recall were one page tests of 32 sentence completions, see Appendix C. The test was based on the material in the listening task. Although the answers for the questions came from the
story, they were formulated on the basis of the nine elements incorporated in the organizers. In some cases, the answers were specifically stated in the oral task while in others they required interpretation of incidents or clues from the story.

Two parallel versions of the same test were developed. Subjects were randomly assigned as to which version they would receive as an immediate recall. The second version, which they had not received, was used as their delayed recall measure. Answers were basically the same for both forms so that recall by occasion comparisons could be made.

Scoring

Papers were scored by 2 markers independently using a master sheet of correct answers. One mark was given for each correct answer. Both markers had read the listening task at least once.

As this was a sentence completion test all possible answers could not be anticipated, therefore there were some differences in the marking. All differences between scores on individual questions were resolved through consultation between the two markers after each one had marked the two tests.

Pilot Testing

Materials were piloted in mid-February to determine
vocabulary and instructional problems. This resulted in the discarding of some materials and the replacement of others.

The advance organizers were retained as designed except for two elements. The pilot study had employed a black and white drawing of an octopus to accompany the introduction of unfamiliar terms. This was dropped when it was discovered that there was total recall of the picture but not of the text. Since the study was concerning itself with oral learning the picture was removed as a contaminating influence.

In the original pilot study embedded figures from a children's magazine were used for the intervening task and a series of pencil and paper mazes were used in place of the organizer for NO treatment. Both of these tasks were discarded because they were potentially frustrating for the subjects. They were replaced by simpler tasks related to oral instruction.

Only an immediate recall measure was used for the pilot study but it was employed in two different forms. One form, a free recall, although a powerful and stringent measure of recall was judged to be too difficult. The difficulty arose from spelling and sentence construction problems, which appeared to frustrate and limit the grade fours in particular. This occurred in spite of the fact that the subjects were told that point form could be used and that spelling did not count. The second measure, a multiple choice test, although effective and
easy to administer, was judged to measure recognition and not recall (Salso, 1979). The sentence completion test was substituted as a more powerful measure of what had been learned. Assistance was given with spelling throughout the test if students appeared to require it.

Procedure

Subjects were randomly assigned to different treatment groups within grades and within schools by the simple device of drawing names from a box. Every attempt was made to equalize cell sizes within the grades; however, this was not totally possible. To offset the anticipated minimally unequal cell sizes two subjects from each treatment group were randomly chosen for potential discard. The subjects received the treatment but were slated for discard if it became necessary to equalize the cell sizes. This was done as suggested for ANOVAs in Glass and Stanley, (1970). Because of the large number of absentees for some groups on the days of the experiment, this method of equalizing Ns was subsequently abandoned as inadequate.

Treatments were administered by one of two female Es, both of whom were qualified teachers with an average of 10 years experience. The researcher was one of the Es. In order to control for teacher variables in the treatments, each E was rotated between treatment groups at each grade level and at each school. This meant that all treatments at both grade
levels were administered at least once by either of the Es.

The experiment was conducted on three consecutive days: Tuesday, Wednesday and Thursday, in early April, at the three schools. Teachers were supplied with a class list of students with a designation of which area in the school to send the group and at which time. Two groups from the same grade were treated simultaneously in two separate areas of the school. This pattern was considered to be best both for the teacher and the E. The teacher had half the class at any one time and there was no overlap between halves, so that the same lesson could be used. The E found that it was easier to control for possible contamination, as contact between the groups was thus minimized and hopefully eliminated.

Grade sevens were treated before recess and grade four following the recess break. Neither grade was aware that the other was receiving the same experiment and, in general, played on different areas of the playground.

Ss received an introductory statement of purpose which introduced the E and assured Ss that they were not being tested. The introduction was followed by the appropriate treatment, a practice exercise and a listening task. There was a 2 minute break with an irrelevant intervening task before the measure of immediate recall. At the end of the recall test Ss were instructed to return to their classroom and asked not to discuss the procedures or task with the rest of the class as this would give them an unfair advantage and spoil the experiment.
One week later one E returned to the school to administer the delayed recall test. This was done with intact classes in the classroom. Where split grade classes had been used the test was still given in the classroom, but only to the appropriate students. Non-participating students were asked to work quietly on classroom assignments or read a book for the time required for the test. Answers to any questions were supplied, if requested, after the tests had been collected.
CHAPTER IV

RESULTS

The study was designed to have equal cell sizes within grades however, because of absenteeism on the days of treatment 8 Ss were lost from grade four and 4 from grade seven. A further 8 grade four, and 13 grade seven Ss did not receive the second recall measure, the delayed recall (DR). Because cell sizes had been created through random assignment and since they were reduced by circumstances unrelated to the experimental treatments, it was decided to follow Winer's suggestion (1971, p. 210) and leave the ns unequal rather than discard data.

Since a repeated measures design assumes homogeneity of variance (Ferguson, 1976, p. 306) and is less robust with respect to violation of this assumption when there are unequal cell sizes, a check for homogeneity was required. Hartley's test of homogeneity (Winer, 1971, pp. 206-207) was therefore carried out.

Test of Homogeneity

The test was conducted using the formula

\[ F_{\text{max}} = \frac{s^2_{\text{largest}}}{s^2_{\text{smallest}}} \]

The degrees of freedom were determined by using the largest cell size since ns were unequal (Winer, 1971). Results are reported in Table I.
TABLE I
Test of Homogeneity

<table>
<thead>
<tr>
<th></th>
<th>$s^2$ largest</th>
<th>$s^2$ smallest</th>
<th>df</th>
<th>$F_{\text{max}}$</th>
<th>$F_{\text{max.99}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>grade 4</td>
<td>35.473</td>
<td>23.665</td>
<td>21</td>
<td>1.50</td>
<td>4.3</td>
</tr>
<tr>
<td>grade 7</td>
<td>34.871</td>
<td>19.704</td>
<td>26</td>
<td>.05</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Since the observe values of $F_{\text{max}}$ are smaller than $F_{\text{max.99}}$ in each case the assumption of homogeneity of variance was upheld.

Hypothesis Testing

The research hypotheses identified in Chapter II were reworded into null and alternate hypotheses so that they could be tested statistically. All probability levels were set at alpha .05.

**Hypothesis One:** $H_0$ There will be no statistically significant difference between treatment means.

$H_1$ There will be a statistically significant difference between treatment means.

**Hypothesis Two:** $H_0$ There will be no statistically significant difference between recall scores of the two grades.

$H_1$ There will be a statistical significant difference between recall scores of the two grades.
Hypothesis Three: \( H_0 \) There will be no statistically significant difference between immediate and delayed recall scores.

\( H_1 \) There will be a statistically significant difference between immediate and delayed recall scores.

Hypothesis Four: \( H_0 \) There will be no statistically significant interaction between treatment and grade.

\( H_1 \) There will be a statistically significant interaction between treatment and grade.

Hypothesis Five: \( H_0 \) There will be no statistically significant interaction between treatment and occasion of recall.

\( H_1 \) There will be a statistically significant interaction between treatment and occasion of recall.

Hypothesis Six: \( H_0 \) There will be no statistically significant interaction between grade level and occasion of recall.

\( H_1 \) There will be a statistically significant interaction between grade level and occasion of recall.

The data was entered into the computer and a 2X4X(£) ANOVA with repeated measures was conducted using BMDP Program P:2V (Dixon & Brown, 1979, pp. 252-254). This program was chosen as it allowed for both repeated measures and unequal cell sizes. Results of the ANOVA are reported in Table II.

It can clearly be seen that only grade level \( F(1, 166) = 43.94, p < .0000 \) and occasion of recall \( F(1, 166) = 12.00, \)
\( P < .0007 \) had a statistically significant effect. No interactions were observed between any of the experimental factors.

**TABLE II**

ANOVA Grade X Treatment with Repeated Measures \( N = 174 \)

<table>
<thead>
<tr>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>( F )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>625393.698</td>
<td>1</td>
<td>625393.698</td>
<td>1269.02</td>
</tr>
<tr>
<td>Grade</td>
<td>2167.190</td>
<td>1</td>
<td>2167.189</td>
<td>43.94</td>
</tr>
<tr>
<td>Treat(^a)</td>
<td>38.083</td>
<td>3</td>
<td>12.694</td>
<td>0.26</td>
</tr>
<tr>
<td>GT</td>
<td>55.0154</td>
<td>3</td>
<td>18.338</td>
<td>0.37</td>
</tr>
<tr>
<td>Error</td>
<td>8187.862</td>
<td>166</td>
<td>49.324</td>
<td></td>
</tr>
<tr>
<td>( B )(^b)</td>
<td>48.795</td>
<td>1</td>
<td>48.795</td>
<td>12.00</td>
</tr>
<tr>
<td>BG</td>
<td>10.617</td>
<td>1</td>
<td>10.617</td>
<td>2.61</td>
</tr>
<tr>
<td>BT</td>
<td>9.585</td>
<td>3</td>
<td>3.195</td>
<td>0.79</td>
</tr>
<tr>
<td>BGT</td>
<td>7.864</td>
<td>3</td>
<td>2.621</td>
<td>0.64</td>
</tr>
<tr>
<td>Error</td>
<td>674.829</td>
<td>166</td>
<td>4.065</td>
<td></td>
</tr>
</tbody>
</table>

\(^* p < .01 \) \(^a\) \( n = 22, 19, 20, 22, 22, 20, 27, 22 \)

\(^b\) \( B \) = repeated recall measures

Hypothesis 1 expected that treatment groups would differ in their recall results particularly in relation to the NO treatment group which received no advance organizer. As can be seen from the ANOVA results in Table II there was no main effect of treatment. The null hypothesis was therefore accepted.
Hypothesis 2 predicted that there would be a difference in scores between the grade levels. A statistically significant difference was observed between grades on recall scores with $F(1, 166) = 43.94$, $p < .01$ as reported in Table II. The null hypothesis was therefore rejected and the alternate hypothesis of a difference between scores accepted.

When the mean scores are examined in Table III, it can be seen that grade seven recall was superior to grade four recall over all the treatments.

TABLE III

Mean Performance Scores for Recall by Grade and Treatment

<table>
<thead>
<tr>
<th>Grade</th>
<th>NO</th>
<th>VO</th>
<th>PQ</th>
<th>OT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4$^a$</td>
<td>10.386</td>
<td>10.895</td>
<td>11.100</td>
<td>11.500</td>
</tr>
<tr>
<td>7$^b$</td>
<td>16.568</td>
<td>15.825</td>
<td>15.074</td>
<td>16.477</td>
</tr>
</tbody>
</table>

$n_a = 22, 19, 20, 22$

$n_b = 22, 20, 27, 22$

A further 2X4 ANOVA was run using only immediate recall (IR). Since mortality rate within the measures was large (21 Ss), it was thought that an ANOVA including them might provide a more powerful test of the main variables of interest than the repeated measures (RM).
TABLE IV

ANOVA Grade X Treatment for Immediate Recall

<table>
<thead>
<tr>
<th></th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>33593.139</td>
<td>1</td>
<td>33593.139</td>
<td>1281.70</td>
<td>0.0000</td>
</tr>
<tr>
<td>Grade</td>
<td>1365.339</td>
<td>1</td>
<td>1365.339</td>
<td>52.09</td>
<td>0.0000*</td>
</tr>
<tr>
<td>Treat^a</td>
<td>57.869</td>
<td>3</td>
<td>19.290</td>
<td>0.74</td>
<td>0.5320</td>
</tr>
<tr>
<td>GT</td>
<td>30.293</td>
<td>3</td>
<td>10.098</td>
<td>0.39</td>
<td>0.7637</td>
</tr>
<tr>
<td>Error</td>
<td>4901.232</td>
<td>187</td>
<td>26.210</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .01  ^a\textit{n} = 24, 23, 20, 24, 27, 24, 28, 25

Again only grade level had a statistically significant effect and no interaction between treatment factors was observed. Occasion was, of course, not considered since there was only one occasion, the IR.

Hypothesis 3 expected a difference between the occasion of recall. As observed in Table II there was a statistically significant difference between IR and DR scores, with \( F(1, 166) = 12.00, P < .0007 \). The null hypothesis was rejected in favour of the alternate hypothesis.

Hypotheses 4, 5, and 6 were designed to determine whether the components of the experiment had an effect on one another. In each, as recorded in Table II, no interaction was found between any of the factors either together or in
combination at the alpha .05 level. As a consequence none of the three hypotheses were considered to be viable and all three null hypotheses were accepted.

In examining the means of the recall scores in Table V, it was observed that DR scores were generally larger. This was particularly true in grade four where DR scores were consistently higher although not significantly so. It is interesting, but not significant, that the NO treatment had the smallest increase. Grade seven scores were less consistent in their superiority with the DR score for the VO treatment decreasing rather than increasing. As noted, none of these results were statistically significant at the alpha .05 level.

In an attempt to address the matter of the large error terms in the ANOVAs, a third ANOVA was run using gender as a blocking variable. Gender was a statistically significant factor but, it did little to reduce the error term. Results of this ANOVA are reported in Appendix D.
TABLE V
Mean Performance Scores for Immediate and Delayed Recall by Grade & Treatment

<table>
<thead>
<tr>
<th>Grade</th>
<th>Recall</th>
<th>Treatment</th>
<th>NO</th>
<th>VO</th>
<th>PQ</th>
<th>OT</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>IR</td>
<td>10.045</td>
<td>10.474</td>
<td>10.200</td>
<td>10.955</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DR</td>
<td>10.727</td>
<td>11.316</td>
<td>12.000</td>
<td>12.045</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>IR</td>
<td>16.090</td>
<td>16.000</td>
<td>14.778</td>
<td>16.273</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DR</td>
<td>17.045</td>
<td>15.650</td>
<td>15.370</td>
<td>16.682</td>
<td></td>
</tr>
</tbody>
</table>

\[a_n = 22, 19, 20, 22 \quad b_n = 22, 20, 27, 22\]

Summary

Both grade and recall occasion had statistically significant effects at \( p < .05 \) with grade seven > grade four and DR > IR.

None of the treatments were found to differ significantly and there was no interaction between treatments at a statistically significant level.
CHAPTER V
DISCUSSION

The study was designed to determine: 1) whether the use of an oral advance organizer would facilitate recall in oral lessons; 2) if one particular type of organizer would be more beneficial than another type; 3) whether recall from an oral lesson would be influenced by grade level and 4) if there would be any difference resulting from the occasion, of recall, either immediate or delayed, and if this occasion would interact with grade or treatment conditions. The following discussion will address these issues in terms of the results of the study.

Facilitation by Advance Organizer

It was found in the study that the use of an advance organizer did not facilitate recall, either immediate or delayed. This was not the result expected since facilitative effects had been found with written advance organizers and in one study where oral organizers and tasks were employed. There are a number of possible explanations for the conflicting results.

First, the majority of research on advance organizers which produced facilitative effects has used a multiple
choice, or recognition, test as their measure of recall. This study chose to use a sentence completion recall test as a more stringent measure of recall than that of recognition. It may be that such a test was too difficult for the grade levels chosen or that advance organizers do not facilitate for this form of recall.

A second reason lies in Ausubel's and Mayer's contention that although learning is enhanced by the use of advance organizers, specific facts and details may be lost in the subsumption process. Only conceptual learning will be assisted. When the current study's recall test is re-examined in light of this contention it can be seen that many facts and details were required for the answers. The organizers were therefore possibly non-facilitative for the learner in acquiring the knowledge which was being tested. This could account for the lack of difference between the NO and advance organizer treatments.

In Mayer's (1979) summary of situations in advance organizers which do not aid learning, he mentions situations in which an assimilative context may be present, however, the learner is not encouraged to integrate the information. Such a situation may exist in the present study in that Ss were encouraged to imagine situations which would fit the organizer criteria but, there was no opportunity for Ss to demonstrate that they had succeeded in doing so. The lack of this opportunity may have signalled to the Ss that the
activity was unimportant and therefore not meaningful.

A final reason for the lack of difference in the treatment results which is related to advance organizer theory lies in Ausubel's insistence that the organizer be compatible with the Ss' cognitive level. No pre-assessment of cognitive level was undertaken. It may be that the comparison between Man and other creatures which was to be transferred to a strikingly different animal, an octopus, was too abstract for these grade levels.

A further possible explanation for a lack of treatment effect may have come from the physical conditions under which the treatments were conducted. Two physical areas were required in each school. In one of the schools this consisted of the staff room and a small kitchen area adjoining the gym. Although teachers had been asked to refrain from using the gym on the treatment morning two groups were interrupted by classes in this area. One group in the staff room was also interrupted by the secretary at one point. In a second school the original plan was to use the medical room and a partitioned classroom. When the areas were examined on the day of treatment the medical room was found to be crowded with equipment. It was still possible to use the area although it was cramped. In addition a gym accident required supplies from the area which resulted in frequent interruptions. Authorization for the use of the partitioned classroom was withdrawn 10 minutes before treatment was to begin because of instructional re-
quirements and a narrow storage space was substituted. Seating and writing space in both areas was cramped, particularly for the grade sevens, and the atmosphere was not conducive to learning.

All of the reasons mentioned may have contributed to the lack of difference between treatments however, it is this researcher's opinion that the choice and design of the recall measure was the prime factor. The use of this test was a major weakness of the study.

Type of Organizer

Since advance organizers were not found to be beneficial and treatment means were so close together, it was impossible to determine if one organizer could have been more beneficial than the other. On the surface they were not.

Reasons for the lack of difference in the means were discussed in the previous sections however, there is one reason related specifically to the organizer format which was not mentioned.

In order to allow for comparisons between them, the organizers used exactly the same abstract introduction as well as the same conceptual elements to the point of utilizing the same vocabulary. This may have placed the organizers so close together in their key characteristics that they were basically all the same organizer. This may account for the lack of variance between them however, it does not account for
the lack of difference between them and the NO treatment condition.

The only difference between the advance organizer treatment groups and the NO treatment group was the use of a listening task about volcanoes for NO. Since this was read to them by the E they had the benefit of non-verbal clues with a practice in listening to connected discourse. The text of the task was exciting and interesting. It may be that a strong listening set was introduced because of the content of the volcano passage which combined with the practice in listening assisted the NO group by motivating them to listen closely.

Grade Level and Recall

As was expected grade level did have an effect on what was recalled. A large part of the variance can be accounted for in the progressive development of memory however, the magnitude of the difference displayed in this study requires some further explanation.

Since the recall measures were in written format and required that the child supply the appropriate word(s) to complete the sentence two factors other than memory enter the picture.

The first factor is the reading ability of the child. Although an effort was made to keep the reading level compatible with the lower grade (4) the older students would have had an advantage because of their greater ability and experience in reading.
A second factor would lie with Ss' language ability. The grade sevens would have a larger vocabulary from which to choose the appropriate missing word(s) and a greater ability to decode and recode syntactical structure.

Similar arguments applied to the listening task itself would find the grade sevens enjoying the advantage.

Since a post-test was not utilized because it was felt that it would act as a form of rehearsal, it is impossible to know if grade sevens also had an already superior knowledge concerning octopuses, which would have accounted for part of the large variance.

Occasion, Grade and Treatment

Although occasion of recall, immediate vs delayed, did result in a main effect, it was not significantly related to either grade or treatment in an interaction. There is a need, then, to explain the larger scores for DR. As for other findings in this study, a number of reasons are possible.

One possible explanation for the effect comes from information processing theory. In this theory retention is a function of the depth of processing and this depth depends on the method of processing. Deeper processing often takes longer and is most successful when achieved through elaborative or semantic encoding (Craik & Lockhart, 1972; Craik & Tulving, 1975). The time lag of one week between IR and DR tests could have allowed time for rehearsal which served the function of
elaboration. In addition the IR test required that Ss complete an existing sentence so that semantic processing was demanded. Two of Craik and Lockhart's deep processing level demands, elaborative and semantic, were therefore met. Such actions would enhance later recall.

A second memory theory which may explain the larger DR scores is that of spontaneous recall. Such a recovery of memory usually occurs as a result of the removal of an interference or as the result of being provided with different cues. In this study, it is possible that interference did exist for the IR measure. The intervening task between the listening task and the IR test was one of making a finger puppet. Ss were extremely interested in the final products. This interest may have produced proactive interference as some Ss may have found the puppet distracting and concentrated on it rather than the test.

Another possible reason lies in the use of parallel forms of the recall test. The first administration, the IR measure, would serve both as an encoding and as a practice device for DR since they were essentially the same test. Recall of an answer during the IR test would result in a repetition for encoding both when recalling the content and when selecting the appropriate sentence completion words from those available to the S.

Less theoretical explanations are also possible. An introduction to the world of octopuses may have sparked an
interest in the topic so that Ss gathered information about the creatures on their own. They may also have discussed the topic among themselves or even discussed individual questions to compare answers. These latter activities would have violated the assumption of independence in an ANOVA however, this is a continuing problem in educational research where intact classes and delayed measures are used.

A final reason may rest with the administration of the DR test. The test was given in the classroom with Ss in their normal seating position. The familiar surroundings may have served to lessen any anxiety which Ss may have experienced and hence produced better scores.

As in other cases any or all of these explanations may have accounted for superiority of DR over IR. It is this researcher's opinion however that the rehearsal inherent in the IR produced a greater depth of processing and hence greater delayed recall. Although no statistically significant interaction was established between grade level and occasion the results ($MS = 10.617, F(1, 166) = 2.61, p < 0.1080$) suggest that with stronger treatments and tighter controls a significant interaction might be found.

An explanation for the lack of interaction between treatment and occasion can likely be found in arguments similar to those presented for the lack of treatment effect.
Limitations of the Study

As has been noted previously one major limitation lies in the design of the recall measure utilized in this study. Although the sentence completion measure is cognitively demanding, it is restrictive in what it measures. First, the quantity of questions which can be effectively used is limited by the practicalities of administrations such as space and time. This means that learning which may have taken place may not be recognized. In this particular study, the tests probably did not measure the learning most facilitated by the use of an advance organizer so that the results may be misleading.

The variety of advance organizers used constituted another limitation. Each of the organizers were remarkable similar in their content so that in an unsuccessful attempt to ensure viable comparisons of format there may have been little left to compare. Other methods of presenting advance organizers are available which are equally or even more compatible with the cognitive styles of elementary students than the ones used. Some examples of these organizers are slides or motion picture film, cartoons and even written verbal organizers.

A further limitation lies in the relatively small amount of time used for the experiment. The treatment plus IR measure took approximately 75 minutes. There was a great
deal of information presented in this time; information which ranged from man to alligators and puppets to octopuses. Such an abundance of information could have been confusing to the elementary student and may have had a detrimental influence on the results.

In addition to the short time allowed for a great deal of information, the material was transmitted using an unfamiliar voice without the help of the non-verbal cues normally present in a teacher presented oral lesson. The short practice exercise may not have been a sufficient time to allow students to acclimatize themselves to the new voice so that potential information was lost before familiarity was achieved. Presentation by the experimenter, although creating a situation in which variables would be more difficult to control, would have been closer to the normal classroom situation and would have aided in a more rapid familiarization to a new voice.

The lack of a pre-test was another limitation. Although the decision not to employ such a test was based on the possibility that the pre-test would act as a rehearsal agent it meant that there would be no indication of the students' prior knowledge of the tape and therefore, no clear measure of what was actually learned. It is likely that the pre-test could have been designed so that it did not act as a preview agent and one should have been used.

A further limitation lay in the size of the groups. Because of the close quarters required by the available
physical areas not already in use in the average elementary school, smaller group sizes would have been more effective. This would also have alleviated some of the crowding at the listening centers.

Finally, the study employed a story format for its listening task. This may have influenced the results since elementary school students are probably more accustomed to recalling plot lines rather than concepts and facts from stories.

Recommendations for Further Study

Several areas which require further research were evident in the discussion and limitations. The use of a variety of carefully constructed advance organizers including visual and verbal, oral and written formats needs to be systematically explored. The suitability of different types of advance organizer at various grade levels requires further exploration. This is true also of preferences for organizer types at these grade levels. The exploration of the possible interaction of gender and/or grade and advance organizers could also yield important results as can be seen in Appendix D.

The possibility that a sentence completion recall measure may have contributed to the lack of a main effect for advance organizers in the present study suggests that different formats for recall measures should be examined in oral lessons using advance organizers.
Although this study did not directly address the question, literature in both advance organizer theory and listening studies indicate that an examination of a potential interaction between listening ability, verbal ability or academic ability and advance organizers in oral learning possibly might be sought.

Final Comment

Although the present study did not find facilitative effects for the use of advance organizers, it is possible that this lack was due, in large part, to the instruments employed in the study and not to a weakness in the arguments which lead to the study.

The use of advance organizers in oral learning has had little attention in research and deserves further study.
REFERENCES


Organizer, general background and antecedent learning variables in sequential verbal learning. *Journal of Educational Psychology*, 1962.


Devine, T. G. Listening: What do we know after fifty years of research and theorizing? *Journal of Reading*, 1978, 21, 296 - 304


Duker, S. Listening: Readings II. Metuchen, N. J. Scarecrow press, 1971

Dunham, T., & Levin, J. R. Imagery instruction and young children's prose learning: No evidence of "support". *Contemporary Educational Psychology*, 1979, 4, 107-113

Erway, E. A. Listening the second speaker. *Speech Journal*, 1972, 10, 22-27

Feller, W. A. The effects of two types of advance organizers and two types of spaced questions on the ability of a selected group of tenth grade biology students to recall, comprehend, and apply facts from written science materials. *Dissertation Abstracts International*, 1974, 34, 1766A


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


Grabe, M. D. Reader imposed structure and prose retention, Contemporary Educational Psychology, 1979, 4 162-171


Jerrolds, B. W. The effects of advance organizers in reading for the retention of specific facts. Dissertation Abstracts International, 1968, 28, 4532A

Kaplan, R., & Rothkopf, E. Z. An explanation of the effect of density and specificity of instructional objectives on learning from text. Journal of Educational Psychology, 1972, 63, 295-302

Instructional objectives as directions to learners. Journal of Educational Psychology, 1974, 66, 448-456

Mayer, R. E. Some conditions of meaningful learning of computer programming: Advance organizers and subject control of frame dequencing. 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, 1979b, 8, 133-167

The sequencing of instruction and the concept of assimilation-to-schema. Instructional Science, 1977, 6, 369-388

Mayer, R. E., & Bromage, B. K. Different recall protocols for technical texts due to advance organizers. Journal of Educational Psychology, 1980, 72, 209-225


Patterson, A. Listening as a learning skill. Media and Methods, 1979, 15, 18-20, 80


Pressley, G. M. Mental imagery helps eight year olds remember what they read. Journal of Educational Psychology, 1975, 68, 355-359


Steinbink, J. E. The effects of advance organizers for teaching geography to disadvantaged black students. *Dissertations Abstract International*, 1971, 31, 5949A

Sticht, T. G. and others *Auding and Reading*. ERIC Document Reproduction Service, 19 ED 097 641, 1974


Tutolo, D. Attention: Necessary aspect of listening. *Language Arts*, 1979, 56, 134-137

Weaver, S. W. & Rutherford, W. L. A hierarchy of listening skills. *Elementary English*, 1974, 51, 1146-1150


APPENDICES
APPENDIX A

PROCEDURE FOR ADAPTATION OF THE LISTENING TASK
PROCEDURE FOR ADAPTION OF THE LISTENING TASK

The text of the book Octopus was typed and submitted to a grade five and a grade four student at separate times. The students were instructed to read it and underline any word they did not understand. The text was then read aloud to them and they were asked to signify with a raised hand any word they did not understand.

Each of the underlined or indicated words were then altered, in consultation with the child, to a word which was understood. The grade five student was used first, then the grade four.
APPENDIX B
TREATMENT STIMULI

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INTERVENING TASK.........................99
STATEMENT OF PURPOSE

Hello, I'm ______________________. I'm going to ask you to do some exercises for me today. The reason I'm asking you to do them is because I want to find out how well grade ___s listen in different situations. This means that each group I see will have a slightly different set of instructions.

This is not a test and will not be used by your teacher for marks, or any other reason, but please do the best you can.
You will be hearing three listening exercises of different lengths today.

We will start with one on volcanoes. Before we begin, what volcano near us erupted last year? (Mount St. Helens) Pelee, the volcano you are going to hear about is on an island in the South Atlantic.

MOUNTAIN THAT EXPLODED

In the year 1902 an old, quiet volcano on the island of Martinique, in the West Indies, came to life in a terrible way. The people of Martinique can never forget how it destroyed their city, Saint Pierre, and in one dreadful minute killed the 28,000 inhabitants.

Saint Pierre was a busy seaport. Offshore, ships could always be seen loading sugar and rum. The cane from which these products were made grew on plantations spreading over the slopes and valleys behind the city.

Five miles to the north rose a mountain named Pelee. The islanders knew it was an old volcano. It had fumed a little fifty years earlier, but since then had been quiet and harmless.

Pelee was not shaped like a regular cone. Before historic times its top had caved in, leaving a hollow about
half a mile across. Water had once filled the hollow, but it was dry now, so people called it the Dry Pond.

THE AWAKENING

One day toward the end of April, 1902, a plume of vapor rose from Pelee, and some light dust fell on villages nearby. Once in a while the ground trembled as a low rumbling came from the mountain. This caused no alarm. The same things had happened fifty years earlier and nothing worse had followed. Students and teachers at the local high school discussed the mountain's behavior. They compared Pelee to Vesuvius, the volcano that destroyed the ancient city of Pompeii.

Boys and girls joined parties of sightseers and climbed to the top of Pelee. The Dry Pond had filled with water. Trees growing there were nearly submerged, with only their tops showing. In the middle of the pond rose a cone made of lava fragments. Jets of water spurted from it, along with puffs of dusty vapor.

Gradually the mountain became more violent. One night there were several explosions. The wall of the Dry Pond collapsed, leaving a V-shaped gap. Water rushed through the gap, forming a deluge of mud that poured down the valley and swept houses and people into the sea.
Repeated flows of mud buried villages near the mountain. People fled to Saint Pierre for safety. Everywhere, a light gray dust fell like snow, covering the ground and weighing down the branches of trees. At night, clouds gleaming with an orange light rolled down from the summit. Glowing blocks of lava burst out of the mountain and hurtled down its slopes.

Then came the eighth of May and the eruption that brought death to Saint Pierre.

DAY OF DESTRUCTION

Afterward, a man who lived a mile from the city told what he saw that morning. At first there was only the usual vapor rising over the mountain. Then something spurted from the summit—a jet of dark fluid lava.

The jet raced downslope. Behind it rose a wall of cloud. In a minute and a half the cloud rolled to Saint Pierre and covered the city. Meanwhile the watcher felt a blast of wind from the cloud.

This wind saved the lives of some sailors aboard ships at anchor. It threw them into the sea before the cloud reached them. When the cloud came, it scalded them about the head and shoulders, but the parts of their bodies under water were unharmed.

In Saint Pierre the sudden blast of wind tumbled houses
and buried their occupants in the ruins. Stoves and lamps set the wreckage ablaze. The whole city became a furnace.

A RESCUE

During the following week, rescue parties searched the ruins. Under the dust and rubble they found a sheet of paper with a student's notes about Vesuvius and the destruction of Pompeii.

One man, a shoemaker, was found alive. It seemed that not another soul had survived. But on the fourth day the searching heard cries coming from the dungeon of the city prison. When they broke through the door a young prisoner was there, waiting.

Louis Cyparis had been sentenced to a month in jail for getting into a fight. Near the end of the month he was let out to do a day's work, but instead of coming back in the evening he stayed out all night. When he returned the next morning the warden shut him up in the dungeon. To this punishment, Louis Cyparis owed his life.

Telling his story afterward, Louis said that on the morning of the disaster he suddenly heard people scream and cry out that they were burning. Then there was silence.

"A vapor rushed in through the little window over my door," Louis said. "It burned so much that I jumped around everywhere trying to get away from it."
Louis had burns on his back and other parts of his body, but his clothing was unharmed. The vapor had no odor, he said. The sailors agreed about this. They compared their burns to scalds from steam, and thought the vapor of the cloud must have been steam or something like it.

WHY SO EXPLOSIVE?

After May 8 there were many similar eruptions of Pelee, which were observed by the French scientist Alexandre Lacroix. Each time, lava spurted through the heap of material at the summit. As the lava jet raced downward, vapor billowing from it formed a dark wall of cloud.

Clearly, the jet was highly charged with gases. Inside the volcano, the gases were held in the lava under pressure, as gas is held in soda-water when the bottle is capped. But once the stuff was outside, the gases bubbled out violently. Boiling against the ground, they formed a vapor cushion on which the mixture floated downslope.

Gobs of lava were carried up in the cloud. Foaming and freezing at once, they turned into a glassy froth, called pumice. Millions of frozen bubbles burst in the air, and their fragments drifted down as dust.

Pelee's explosiveness was due largely to the stiff-ness of the lava. Most of it emerged as nearly solid chunks that clogged the volcano's mouth. Deeper down, more lava was
accumulating. When the pressure of its bottled-up gases reached a certain point, the mixture blasted out through a weak part of the summit.

**********

1. How was the eruption similar to Mount St. Helen's? (sudden, side of mountain collapsed, light gray dust, survivors)

2. How was it different? (lava, vapor, large scale death, lumps of pumice)

The next listening exercise is on tape so put on your headphones.

ABSTRACT ORGANIZER

We know that, in order to survive, people have certain basic needs. We require food, a source of warmth, protection from the weather, clean air and many other things. Nature helps us with these needs not only by providing things like food and trees or materials for buildings but also by designing us in certain ways. We are one of the few creatures with hands which have fingers so that we can hold things. We are the only creatures to stand upright when we walk.

Like us, animals are also affected by their needs which may be the same as ours in some ways and different in others. The way they are made will help to decide how they will go about fulfilling these needs.
(As you read the question mount it.)

When we are studying about animals, we can learn about them not only by looking at their appearance but also by looking at their needs and how they go about meeting them. Some of the questions we might ask about them are:

1. What does an animal look like?
2. Is there anything unusual about the animal?
3. Does this animal need anything special in order to survive?
4. What does the animal eat?
5. Where does the animal get its food?
6. How does this animal move?
7. Why does the animal move this way?
8. Where does the animal live?
9. What was the animal like as a baby?
10. What was this animal like when young?
11. Does the animal have any enemies?
12. How does the animal defend itself against these enemies?

All of these are important questions to ask when you are learning about animals and how they live in their world.
Think of an animal you know well and try to imagine how you would answer these questions about it. (Repeat questions with 5 second pause between each. Touch each question as you read it.)

Let's have a little practice exercise to see if you can find the answers to these questions.

Put on your headphones.
VISUAL ORGANIZER TREATMENT

(As you mention the animal touch it on the picture). When we are studying about animals, we can learn about them by looking at their appearance but also by looking at their needs and how they go about meeting them. One of the things we might look at is how the way an animal looks and acts helps it. For instance the owl has sharp claws to catch its food, the field mouse, who has big ears to let it hear its enemies, the owl and the fox, so it can run into its home. Other animals in the picture have other ways of catching their food or of escaping from becoming food. See if you can see some of these ways.

Notice the beaver's unusual features of sharp teeth, for cutting wood to build its home, and a broad tail used as a warning for other beavers to help protect them. See if you can see some other animals with unusual features. Some of the features will be useful while others will just make the animal look different.

The forg is hard to see because of its color. It is soon going to get some food, a dragonfly, if the insect doesn't fly away. Notice in the picture all the different ways the various animals can move. The frog has long legs for jumping,
the butterfly has wings for flying and the deer long legs for running. Look for other ways of getting around.

Notice how close the frog lives from the water in which it grew up as a tadpole. The squirrel is probably also close to its home in one of the trees because of its babies. Look for some other homes.

All of the things you have looked for are important things to learn about when you are learning about animals and how they live in their world. Let's see if you can find them when you listen not look.
OUTLINE ORGANIZER TREATMENT

(Mount word as you say it.)

When we are studying about animals, we can learn about them not only by looking at their appearance but also by looking at their needs and how they go about meeting them. Some of the things we might look at are:

- Its DESCRIPTION or what it looks like
- If it has any UNUSUAL FEATURES, that is, if there is anything unusual or different about it
- If it has any special NEEDS that it must fulfill in order to survive

We can look at its FOOD HABITS or what it eats and where the food comes from

- How it gets around, that is its MOVEMENT
- Where it lives or its HOME
- What it was like as a baby or its EARLY LIFE
- If it has any ENEMIES
- If it has any way to protect itself from these enemies
- If it has any PROTECTION from these enemies, either protection it makes itself, or what nature has given it.
All of these things help us learn about animals and how they live in their world. (Give a 5 second pause between each point and touch the keyword.)

Think of an animal you know well and try to imagine how you would describe it; its unusual features; it it has any special needs; its food habits; how it moves around; where it lives; how it spent its early life; if it has any enemies; and how it protects itself from them.
PRACTICE EXERCISE

Crocodiles live in warm areas and in damper habitats than most reptiles. They never go far from the water, usually staying in swamps, marshes, lagoons, lakes and rivers. Some like the brackish water at a river's mouth. Others like the salt water of quiet bays and may even go out to sea.

The long heads of crocodiles show the way nature has fitted them for life in the water. A flap of skin at the back of the mouth acts as a valve or doorway opening and closing the passage to the throat. The nostrils, near the tip of the snout, join up by way of a long bony passage to the throat behind the flap. A crocodile can breathe with only the tip of its snout above the water. Similar flaps keep water out of its nose and ears.

Hidden in the water weeds, a crocodile will wait motionless until a duck, fish or other small animal comes close. With a sudden plunge and a snap the croc grabs its dinner. If there is a struggle, the croc can hold its victim underwater to drown. The croc can breathe without difficulty because of its special air passage.

On land crocodiles look sluggish and lazy. They lie quietly with their bellies in the sand or grass. But, if they
are startled or frightened they rise up on short legs and can move very rapidly. Their front feet have five claws, their back feet only four. All are webbed. With these webbed feet and a broad tail, crocodiles are at home in the water.

A crocodile uses its feet for slow paddling and to keep its balance in the water. But, if it is chasing a victim in the water, it swings its tail from side to side like a fish and can swim faster than a man can paddle.


Practice Exercise Questions

1. Where do crocodiles make their homes?
2. How does a crocodile keep water out of its ears?
3. How does a crocodile get around?
4. What does it like for dinner?
5. What is unusual about its feet?

Answers

1. Crocodiles make their homes in warm, damp areas beside rivers, lakes, swamps, lagoons, marshes or on seashores.
2. It has a flap of skin to keep the water out.
3. A crocodile swims, paddles or runs.
4. A crocodile likes small animals for food.
5. Its front feet have five claws and its back feet four, or its feet are webbed.
LISTENING TASK

Introduction of Terms

Before we listen to a story about octopuses there are a few words you should know.

The body of an octopus is covered with a mantle. This mantle is a loose bag of skin which surrounds the body.

Within the lower part of the mantle is a water filled space with a round tube-like opening into the sea water called a siphon. The space contains the gills. Water enters through the siphon and flows over the gills, where it gives oxygen to the octopus and removes carbon dioxide. Most of the time the water is pumped out of the mantle through the siphon quite slowly. The head is quite roundish and is found between the body and the arms. Underneath the head is the mouth with a sharp beak inside.

The arms surround the mouth. Each of the arms has a double row of discs or suckers on its underside. The suckers are circular in shape.

Remember the mantle is the skin around the body; the siphon is a tube for sucking in and blowing out water. The beak is just inside the mouth and suckers are round discs on the bottom of the arms.

Please put on your headphones.
LISTENING TASK

There are about 150 different kinds of octopuses living in the seas of the world, mostly in tropical or subtropical areas, although a few have also been found in the Arctic. Some octopuses are only a few inches across when they are fully grown. The giant octopus of the Pacific Ocean can weigh over 100 pounds and measure 30 feet across from tip to tip with the arms stretched out. Octopus vulgaris, the one we know best, reaches about 10 feet across and weighs about 55 pounds. Usually, however, it is somewhat smaller. The story you are about to hear is about an Octopus vulgaris.

OCTOPUS

by Carol Carrick

The octopus' eyes rose on little knobs. She stretched forward. She was watching a lobster pick its way cautiously through the plumes of seaweed that clung to the rocks.

The octopus shot a jet of water from the siphon tube, that stuck out from the loose bag of skin covering her body. Like a rocket, she launched herself from the ocean bottom.
The empty space under the mantle filled again with water. She forced out another spurt and soared higher.

Spreading wide her eight webbed arms, the octopus floated down over the lobster like a parachute and covered him.

The lobster held its claws high in defense. With his pinching claw he managed to seize one of the octopus' writhing arms, which were two feet long and armed with double rows of powerful suction discs. But as he tried to pull his great crushing claw from the octopus' grip, he only pulled the rubbery noose of her arm tighter.

Then the octopus' victim saw the black beak hidden between the circle of her arms. She drew the struggling lobster close. With a bite from the powerful beak, her poison was injected into the lobster. He shuddered, relaxed his grip, and was paralyzed in seconds.

The octopus curled sleepily in front of her home, flushing a purple brown color. Orange bumps of happiness rose over her eyes and on her mantle. She spent the morning eating her lobster dinner.

During the next few weeks the octopus gradually moved inshore. When the few shelters she came upon were already in use, she slept half-buried in the holes that she blew in the sand with her siphon. Except for the steady rise and fall of her mantle to wash oxygen over her gills, her pale, pebbly
body could hardly be seen on the floor of the sea.

Occasionally, a dark shape scuttled across the sand. A crab! And where there was one crab, there would be more. The octopus waited patiently, her arms coiled and ready. When another crab appeared, her arm flashed out and flicked at it. Instantly the suction cups on her arm attached themselves to the crab's shell and he was drawn toward her.

Slowly the octopus took the crab apart. The delicate tips of her arms extended to the very points of his legs and claws to remove the tiniest piece of meat.

A strong feeling was now driving the octopus. It was time to find a safe den. Alert to the smells of danger that she could sense through her skin, she pulled herself slowly over the bottom of the sea.

As the sunrise filtered down through the water, throwing shadows that might mean hunting sharks or dolphin, her panic grew. She began to pick up speed, reaching out her forward arms, fastening her suckers to objects and pulling her body along. In this fashion, she flowed sideways until the sea ended in a towering wall of rock.

With the tip of her arms she poked into every crack in the wall, no matter how narrow. Her exploring arms could be stretched to paper thinness, and although her boneless body was as large as a grapefruit, she could squeeze through an opening less than an inch across.
Reaching into a small hole her sensitive suckers tasted and touched a creature that made her arm withdraw in terror. The octopus turned pale. Shooting a powerful squirt of water out through her siphon, she jetted backwards, but rows of needle sharp teeth had already fastened on her arm. Spilling out of the small hole came yards of the octopus' deadliest enemy, a moray eel.

The octopus wrapped her free arms around the head of the eel and tried to reach him with her sharp parrot like beak. The eel formed a loop with his tail. Pulling his head backward through the loop, he slid the octopus from his slippery body.

Then the eel straightened. With the octopus' arm still gripped in his teeth, he began to spin like a top until the arm was twisted from her body.

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The octopus had only one chance to save herself. During the brief time it took the eel to gulp down her arm, she jetted away. At the same time to avoid capture, she darkened her skin and then squirted a cloud of black ink behind her. The thick ink spread in the shape of a fleeing octopus. Changing her direction and color, the real octopus hurried away unnoticed.
The eel snapped at the false ink-octopus. He was further confused as the ink began to spoil his sense of smell. Without the use of his most important hunting tool, his nose, the near-sighted eel had little chance of finding his victim.

Because the octopus' blood vessels had closed tight, there was no bleeding where her arm had been torn away. When she was tiny, a clam had snapped shut on her arm. She had only been able to free herself by pulling off her arm. It had grown back in six weeks. In a few weeks the arm would begin to grow back again, but much more slowly this time. Now her body was preparing for something more important.

The octopus discovered a small hole in the foot of the rock wall. She enlarged it by blowing away some of the drifted sand. Then she collected stones that had fallen away from the wall and piled them across the doorway.

Soon after she slipped through the narrow opening her eggs began to come...little pearly eggs, like grains of rice. She twisted the thread attached to each egg to a stem of threads she had fastened to the ceiling of the cave. As each line of eggs was lengthened to several inches, she would start another. At the end of two weeks, almost 50,000 eggs hung in the cave like a miniature bunch of grapes.

For a month the octopus cared for nothing but her eggs. She cradled them gently, vacuuming them with her suckers, and blowing fresh water over them.
Little fish gathered outside, hoping for a chance to get at the eggs or some newly-hatched babies. But the octopus never left the eggs to feed herself, and she showed little interest in the crabs that glided within her reach. She was slowly starving to death.

A large fish with a huge mouth peered at the entrance to the tiny cave. The side of the octopus facing the fish turned pale as she was torn between fear and loyalty to her eggs. She withdrew deeper into the cave, her arms still encircling the egg clusters, but when another octopus appeared she turned red with anger. The other octopus quickly moved off.

After a few weeks, a little pair of eyes could be seen through the thin clear outer coat of each egg. Occasionally one of the unborn octopuses flushed pink or orange when its egg was jarred.

One morning as the mother octopus was blowing away a bit of sand and seaweed that had drifted in during a storm, some of the egg cases burst and the babies wriggled free. During the next week, thousands of octopuses no larger than fleas hatched and floated to the upper ocean layers. Their heads were crowned with budding arms and covered with tiny hairs that would help them drift in the currents.

In the crowded world of minature floating plants and animals called plankton, most of the young octopuses would
lose their lives as other creatures ate them. This way they formed part of the ocean's food chain.

A month later the survivors would develop from helpless drifters to bottom crawlers like their mother. As they crept along the shallow tidal pools, some of those left would be discovered by shrimp, crabs, and shore birds. Perhaps in the end only two or three would grow up to be full-grown octopuses.

Two years before, their mother had burst from an egg herself. She had held out against all dangers of the ocean and so would a few of them.

Now the ocean rocked her gently. A quietness slowly crept through her until she was as empty of life as the egg cases she still held in her arms. Like a flower that withers so that its seed can be carried on the wind, the octopus had blown her children into the world and died.

Story is taken from Octopus by Carol Carrick, New York, Seabury Press, 1978. Some portions have been left out and some words changed in order to keep it within a grade 4 vocabulary.
INTERVENING TASK

That was a long time to listen. Let's try some listening just for fun.

Take a sheet of paper. Fold it in half.

Open up the fold and fold the right edge to the centre so that you have 2 long narrow pieces and one wide piece.

Do the same with the left edge so that you have 4 long narrow pieces.

Fold the centre fold again on the original fold.

Now take the top of the long narrow strip that you have and fold it down to the bottom.

Fold the bottom edge of the top layer up.

Turn the paper over and again fold the bottom edge of the top layer up.

Take a crayon and draw in lips, eyes and a nose.

Put your name on the face.

(Collect the faces—they will be returned to the classroom).
APPENDIX C

RECALL MEASURES

INSTRUCTION FOR RECALL TEST ...................... 101
FORM X .............................................. 102
FORM Y .............................................. 104
INSTRUCTIONS FOR RECALL TEST

The questions on the sheet can be answered from the information in the story "Octopus". Some are one word answers while others will require a few words. The length of the line has nothing to do with the length of the answer.

If you get stuck on a question leave it and go on to the others. You can always go back to the missed question when you have finished the others.
Fill in the blanks using the information from the story "Octopus".

1. An octopus' eyes are set on __________________. Showing below its mantle is a ______________. It has ______________ arms. On the bottom of the arms are ______________ rows of __________________. Between the arms there is ______________.

2. Octopuses are afraid of ______________ and ______________.

3. An octopus eats ______________ and ______________.

4. An octopus shoots water through a siphon tube in order to ______________.

5. An octopus shows it is happy when it ______________.

6. In order to move around an octopus will ______________ or ______________.

7. An octopus squirts ink when it wants to ______________.

8. Two reasons an octopus changes color are ______________ and ______________.

9. The octopus uses its beak to ______________.
10. Octopuses can be found in ____________________.

11. When her babies are gone, the mother octopus ________.

12. Unlike most creatures, the octopus can ______________ arm.

13. An octopus will defend itself by trying to ______________ or by ________________.

14. There are large numbers of octopus eggs because ________________.

15. Because the octopus has a boneless body, it can ________________.

16. When tiny, baby octopuses live in ________________.

17. To stay alive, an octopus needs _______ and _______.

18. Octopuses are important to life in the ocean because ________________.

19. An octopus will make a home for itself by ________________ or by finding a ________________.

20. Newly hatched octopuses are helpless in the ocean currents because ________________.
FORM Y

Fill in the blanks using the information from the story "Octopus".

1. An octopus has _______ arms with _______ rows of _______ number _______. on the underside. The arms are joined by _______. Its eyes are on __________________________________________. Sticking out of the loose bag of skin covering its body is a __________________________________________.

2. Enemies of the octopus are _______ and _______.

3. When hungry, an octopus will look for _______ or _______.

4. An octopus shoots water through its siphon tube when it wants to __________________________________________.

5. When an octopus is happy, it will __________________________________________.

6. Octopuses can move around by __________________________________________ or by __________________________________________.

7. An octopus will squeeze out some ink in order to __________________________________________.

8. Octopuses change color because they want to __________________________________________ or to __________________________________________.
9. The octopus uses its beak for a special purpose which is to _____.

10. Octopuses live in the _____.

11. After the babies leave, the mother octopus _____.

12. When an octopus loses its arm, it can _____.

13. When attacked an octopus will try to _____ or to _____.

14. An octopus lays many eggs because _____.

15. Having a boneless body helps the octopus by allowing it to _____.

16. Unlike their mother, baby octopuses live _____.

17. In order to survive an octopus needs _____ and _____.

18. Octopuses are an important part of ocean life because they _____.

19. When looking for a home, an octopus will either make one by _____ or find a _____.

20. When tiny, baby octopuses must drift in the ocean currents because _____.
APPENDIX D

ANOVA TABLE OF GRADE GENDER TREATMENT WITH REPEATED MEASURES
## ANOVA

Grade X Gender X Treatment with Repeated Measures

\(N = 174\)

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\(^a\) = 11, 11, 10, 10, 10, 11, 8, 10, 12, 9, 7, 15, 10, 13, 13, 12,12

\(^b\) = Gender

\(^c\) = Repeated Recall Measures

\(*p < .05\)