LEARNING MODALITIES AND READING IN KINDERGARTEN

by

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ABSTRACT

It was assumed that word recognition is a very important facet of the early reading process, and that children use their visual, auditory and kinesthetic senses in acquiring word recognition skills. It is not known which of these sensory channels (or modalities), or combination of them is most effective with individual children.

This study explored the possibility of using a group teaching technique to determine the modality that individual kindergarten children would find most effective in learning written words. The results of the technique were compared with the results of an individual teaching technique used with the same children.

An individual and a group Learning Methods Test based on the Mills Learning Methods Test were administered to twenty eight kindergarten children who had not received any formal reading lessons and could not read the written words used in the tests. Six different words were taught and tested by means of an immediate recall, and a twenty four hour delayed recall test, in one modality each day. These modalities were the visual, auditory, kinesthetic and a combination of the three. A period of two weeks elapsed between the administration of the group and the individual tests which were alternated between the two classes used in the study.

The scores of correct responses on the two tests were analyzed by computer to determine the correlation coefficients between the modalities and total words learned, and the T Test probabilities of the differences

between the means for tests, modalities, sex, intelligence, and school class.

The analysis of results showed significant, but low, correlations between the two tests in all modalities, and total words learned except in the visual modality. The group test was able to determine eight children's most efficient learning modalities but these only corresponded with the individual test results in two cases. The highest individual scores in modalities suggested a much closer relationship between the two tests.

No significant relationships were shown between the most efficient modality and sex, intelligence or school class. The analysis of the differences between means, showed that in the auditory and visual modalities, and in total words learned, the boys, the low intelligence group, and to some extent one of the classes scored significantly higher on the individual than the group tests.

The results suggested that some children found some words easier to learn than others, which could have affected modality efficiency results in individual cases. In addition there was evidence of individual word recognition cues being used by some children which were different from the word recognition cues being taught.

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CHAPTER I

SIGNIFICANCE AND BACKGROUND

Statement of the Problem

Little is known of the mental processes that take place in the learning of the relationships between speech and the graphic symbols that represent it. Attempts to understand how children learn to read have to be confined to observations and experiments with the overt representation of this process. For this reason many different hypotheseshave been advanced about the nature of the reading process and many different teaching methods have been formulated to support these. There has been very little agreement among the proponents of the various methods as to which is the better and there is now strong support for the position that there is no one single best method of teaching reading to all children. (Dechant, 1970; Southgate & Roberts, 1970; Spache & Spache, 1969; Moyle, 1968; Ravenette, 1968; and Chall, 1967) These writers suggest, instead, and are supported by Sartain (1965, p. 82) and Harris (1970, p. 79), that means must be found to find the best method for individual children at different stages of their development.

Whatever method of teaching reading is used, it seems obvious that very soon, in the initial stages, the child has to become aware of words and learn to recognize them when he sees them again. It is also obvious that in this process the child has to make use of his sensory abilities in some way. What is not so obvious is the particular sensory

channel, or channels which are utilised, and the degree to which they are used in the perceptual process of recognizing words. Most initial reading methods seem to depend largely on the visual sense channel, others on the auditory, and a few on the kinesthetic, haptic or motor channels.

Children are unique individuals, each with his own patterns in all facets of the growth process. Children also seem to have their own individual temperaments and personality characteristics. It would be illogical to suppose that the maturation of the sensory abilities involved in perception do not also show inter and intra-child differentiations. If this is so then it would seem possible that methods of teaching reading which could utilize the maturation stage, or individual differences of the child's sensory abilities, would help to maximize the learning process. It should also prevent possible difficulties through trying to teach through a child's weakest modality. The importance of trying to avoid early failure in learning to read, with all its social and psychological correlates is well recognised. It is necessary then to have an efficient method of diagnosing a child's sensory strengths and weaknesses before he commences reading so that methods of teaching can be devised to suit his individual needs.

This possibility is explored in this study. More specifically its purpose is to devise a reliable group kindergarten test based on the Mills Learning Methods Test (Mills, 1955), a test administered individually to determine the relative strengths of the subject's sensory modalities.

CHILDREN'S LEARNING MODALITIES AND READING

Individual Differences

Support for the suggestion that the teaching of reading should cater to the preferred (meaning most efficient) sensory learning modes of the individual child is presented by many writers. Terman (1943) considers:

> If educational methods were more intelligently adapted to the idiosyncracies of the individual child, all children would achieve up to their mentalage level in all school subjects (p. IX).

Vernon (1957, p. 195) suggests that one of the causes of backwardness in reading may be teaching methods unsuitable for children of particular abilities or stages of maturation. She suggests further (Vernon, 1968, p. 14) that teachers of reading should be trained to use a variety of methods, materials and devices since there is no universal agreement on a single successful method of teaching reading. Gates and Bond (1936) in a study involving the giving of over one hundred reading readiness tests to four large classes of first graders, and correlating the results of these with later measures of reading ability, reported that there were large individual differences and failures. These were improved when materials and techniques adjusted to individual children were used. The study pointed to the need to adjust for individual sensory abilities both before and after the beginning of reading. Olsen (1968) reviews the approaches to teaching reading and suggests that, although no one method will probably be successful with all children, the problem of selecting the most successful for individual children

is still very much a hit-or-miss procedure.

Many writers and researchers have gone further in emphasising the importance of the sensory channels in the individual differences of children learning to read. Robinson (1965, p. 2) says that research dealing with the basic attitudes of young children, "appeared to be pointing to different constellations of abilities". She envisages schools of the future, in which children, who are likely to learn best by a phonic, visual or kinesthetic approach will be assigned to teachers who are most competent in a particular approach. She suggests that teachers have to learn to understand the individual differences of the child. Earlier, Havighurst (1964, p. 12) had discussed different sensory imagery which accompanies thoughts and said that although there was not much research on this topic, it was believed to be especially important in the teaching of reading.

Harris (1964) summarizes important research in individual differences in modes of learning, dating back to 1860, and concludes that the implications for reading instruction are clear:

> It would seem reasonable to utilize instructional methods which encourage each child to learn by procedures which are adapted to his particular strengths in perception, imagery and recall (p. 24).

Weintraub (1966) considers that far more attention has to be paid to the concept of individual differences in children. He suggests that research has not considered the problem in any great depth but it is to be hoped that information will soon be forthcoming on ways of identifying which children learn best by which approaches.

Schubert (1968) and Wepman (1964) discuss the necessity for individual approaches based on utilizing the child's preferred modality or pathway of learning in helping children with reading disabilities. Wepman goes further in suggesting that, since disabled readers are only one extreme of the total reading population, then the preferred modality approach should be of importance also to normal readers. He says that the methods to be used by teachers to determine this maximum learning modality have yet to be discovered. Both writers agree that fewer problems in reading would arise if the preferred modality could be identified and if teaching methods could be adapted to this concept. This is supported by Dechant (1968) who suggests that children may have different rates of maturing in different modes of learning. He believes that trying to teach a child by a method that relies on an undeveloped modality may lead to reading failure or not doing as well as he might by some other method. He says, "Identification of the child's preferred mode (or modes) of learning may well be the ultimate goal of all classroom diagnosis (p. 156)." He feels that many of the reports on the superiority of some reading method are biased by children's preferred modes.

Modality Diagnosis and Teaching

Some attempts have been made to adapt modality concept teaching methods to individual children with reading and spelling problems. Gates and Russell (1940) devised a procedure for diagnosing the preferred mode--visual, auditory, kinesthetic or combined methods in learning spelling and suggest procedures for remedial teaching in the different

modalities. Burt and Lewis (1964) conducted two studies involving children with reading problems. They investigated visual, phonic, kinesthetic and mixed methods of teaching reading to groups of children for one year. They reported great and highly significant differences between methods but no attempt was made to determine the child's preferred method before teaching began.

Harris and Roswell (1953) describe the informal procedures they use in their reading clinic for ascertaining the most suitable learning methods for the individual child. This consists of teaching the child a few words by each of several teaching procedures which they name the visual method, the word family approach, the phonic method, the visual-motor method and the kinesthetic method. The child is carefully observed and his preferred mode of learning and his weaknesses are estimated. They (Harris & Roswell) consider this to be of great help in developing remediation programmes. Similar procedures are suggested by Myers and Hammill (1969) with only three methods which they name the traditional look-and-say method, the kinesthetic and the phonic approach.

These various names for the teaching methods which emphasize various modalities can be grouped into auditory, visual and kinesthetic methods or various combinations of these. There is no such thing as a teaching method using only one modality but it is assumed that each method refers to the sensory channel of the child which is utilised to the greatest extent in the method used. This is the assumption which is used throughout this study. It is also the terminology used by Mills (1955) who has produced the only commercial learning modalities test known to the experimenter. The test will be described in detail later but

basically a child is taught ten words by each of these three methods and a combination of the three. An immediate and delayed recall test is given with each method. The scores of correct responses are used to determine the child's modality strengths and weaknesses.

The test was designed for children with reading problems but several studies of it have been conducted with normal readers and it does seem to discriminate between children's modes of learning on the test. Spache and Spache (1969) recommend that every primary teacher use this test. They suggest that it can find those pupils "who demonstrate an unsuspected aptitude for more effective learning by some one method of presentation (p. 436)," and that reading success is much more likely if in the initial teaching of reading the method best suited to each child is used.

The experimenter has found no study using the test with kindergarten children or children who have received no reading instruction. The test, as designed, is for individual testing and takes approximately twenty minutes with each child over a period of four days with one recall test on the fifth day. This makes it difficult, by reason of the time factor, for a teacher with a class of thirty children to administer the test to all of her children. For these reasons, the present study attempts to adapt the test for group administration to kindergarten children. If the group test has the same discriminatory abilities as the individual Mills Test then it would enable a teacher to administer the test in one week to all the children along with other reading readiness tests to provide a better evaluation of the children's reading potentials and individual differences.

The Mills Test Studies

The Mills Test uses a pre-test to identify a pool of words unknown to the child. Forty words are selected at random from the unknown words and arranged in random sets of ten for each of the modalities:- visual, auditory, kinesthetic and the three combined. One set is taught to a child for exactly fifteen minutes by a standardised teaching cycle and an immediate recall test is given. On the successive days a delayed recall test of the previous day's words is given and a new set of words are taught by a different mode. From the four delayed scores the relative efficiency of a particular instructional procedure may be determined and this is called the child's "preferred modality".

Equivalent forms reliabilities ranging from .908 to .970 are reported for the four methods by Mills (1970, p. 54) Eller (1965) found a reliability of .70 on the visual subtest. The validity of the tests can only be established by longtitudinal studies but Mills (1970, p. 53) states:

> The L.M.T. is actually a measure of a childs proficiency in the task of learning to recognise words under various teaching procedures. Since this is the ultimate criterion for which the test is designed, the instrument possesses what is termed "content" or "Work-sample" validity. The usability of the test in clinical situations, another test of validity, has been successfully demonstrated in more than one hundred clinics and school centres throughout the United States.

Mills (1956) reports its use with 58 subjects in grades two, three and four. The study showed that no one method was best for all children, and that different children learn to recognise words by different teaching methods. There were tendencies for the children of low

intelligence to learn best by the kinesthetic method, with the visual method superior to the kinesthetic method for the children of high intelligence. The younger children tended to prefer the visual method; the eight year olds the kinesthetic; and with nine year olds no method seemed to be much better than another with the exception of the visual method being slightly better than the kinesthetic method.

Rivkind (1958) devised a group test using similar procedures but different words with two second grade and three third grade classes. There was no evidence of teacher or class effects on preferred modalities and the test showed that children have individual efficiencies in learning words by different modalities as defined by the test. In one class of 24 children, two preferred the visual, three the kinesthetic, five the auditory and four the combination teaching method. There were tendencies but no large differences between modality efficiencies in the remainder of the class.

The Mills Test was used by Coleman (1962) with 51 subjects age seven and a half to 28 years of age. The study showed no particular learning method was most efficient for the underachievers as a group, or for sub-groups delineated in terms of age, intelligence or degree of under-achievement. There was a tendency for all groups to favour the visual and combination methods. This could have been due to the fact that the normal teaching procedures for the subjects favoured visual and phonic methods. Coleman states that clinically significant differences were found in the efficiency of different methods for individual children but this is not explained. Coleman felt that the difficulty of the words was probably an important variable and that easy

words could be learnt by any method, whereas a particular method may be more efficient for a difficult word and for a given subject. This hypothesis was not, however, tested.

Taylor (1968) used the Mills Test to identify the learning methods of first grade children after eight months in the class. The teachers then attempted to teach words to the poor readers for six weeks by means of their preferred modality. Reading tests at the end of the six weeks showed no significant gains for the treatment groups as compared with control groups. This failure to obtain significant results could be attributed to the variations introduced by the small sample, the short period of the treatment, and the fact that the pre-test and post-test of reading included comprehension scores. Both groups should probably have been taught and tested on the same group of words. The teacher variable is also very difficult to control in a study of this nature.

Studies Using Mills Test Models

Arnold (1968) used Mills Test procedures with 12 delinquent boys with reading disabilities. The kinesthetic method appeared to be least effective but no significant differences between methods were found for the total group.

A positive relationship between learning to recognize words by any one of the Mills procedures and performance on tests designed to measure the same sensory mode of learning was reported by MacAuley (1965). Her study was conducted with 82 first grade entrants but some effect of the normal class teaching of reading were beginning to show at the end of the ten weeks of testing.

The most recent study found using the Mills Test model is that of Cooper (1969). He selected 15 poor readers and 15 good readers from a pool of 186 first graders and used the model to test learning efficiencies by means of five consonant-vowel-consonant nonsense syllables. He used the number of trials to mastery for the acquisition scores criterion and the number of syllables recalled as the retention criterion. He reports results which show that no modality was significantly superior for either group of readers but it appears to be an individual matter. There appeared to be more individual differences amongst the poorer readers. There was a tendency for the kinesthetic method to be least efficient for the poorer readers and best for the good readers.

Conclusion and Summary

This chapter has discussed the need for individual diagnosis of children's patterns of learning in the reading process. It has also shown support for the suggestion that the learning of word recognition is of an individual nature and is dependent to some extent on individual sensory modality strengths and deficits. Attempts to diagnose and teach word recognition by various researchers have been discussed and the Learning Methods Test (Mills, 1955) has been explained in some detail. Group studies with this test or tests based on the same model seem to lend further support to the concept of individual modality functioning in word recognition. MacAuley (1965) has shown that the test can be used with children commencing to learn to read and that the findings correlate with other tests of sensory functioning. Rivkind (1958) has

shown that the Mills Test model can be adapted to group teaching and testing. Staples (1968) considers the Mills Test model to have possibilities as a diagnostic tool before commencing teaching reading and reported that the University of Chicago Reading Clinic was trying to adapt it to a one day diagnosis.

These studies suggest that the test could be adapted for use with Kindergarten children and that a group form of the same test could be developed. This is the purpose of this study. It is realised that reading is much more than word recognition but this study is only concerned with this one aspect of the total reading complex.

The next chapter will examine modality functioning in more detail and describe studies dealing in depth with the various modalities and various combinations of them.

CHAPTER II

REVIEW OF RELATED LITERATURE

Word Recognition

The historical perspective of the modality concept in reading has been reviewed quite adequately by Russell (1928), Mills (1970) and Cooper (1969) so this review will be concerned with more recent studies.

Although there are many definitions of the reading process, Smith and Dechant (1961) say that, "It is common observation that the major emphasis in grades one and two is on recognizing and identifying words (p. 191)." Later Dechant (1970) says, "Reading is a sensory process (p. 19)." and, "Reading begins with the sensation and the subsequent recognition of the printed symbol (p. 26)." Bateman (1966) says,

> The evidence is mounting that we need to critically re-evaluate the emphasis on reading as a meaningful process of comprehension and re-focus on the arbitrary non-meaningful aspects of words recognition (p. 27)."

Mecham (1969, p. 60), in a study of the development of audio-linguistic skills in children, suggests that words themselves may be selectively accessible to different sensory channels. For example, words and concepts such as those relating to time may be developed mainly through the auditory channel and those relating to number or colour may be almost completely visual.

Individual Differences in sensory Abilities

The importance of differences of ability in the sensory channels of individuals receives a great deal of attention by Johnson & Myklbust

(1967). In their clinic for learning disabilities, which is concerned greatly with reading problems, they place stress on diagnosing individual modality deficits and strengths for later remediation. They review the works of a number of scientists, representing a number of disciplines, probing the relationship between brain functions and ways in which man learns. The summarize as follows:

> The semi-autonomous systems concept . . .
> proposes that the brain is made up of semi-autonomous systems, that at times a given system functions semi-independently from others, at times in a supplementary way with another, and at times all systems function interrelatedly . . .
> This being the case Psychoneurologically there are three primary styles of learning--the first requiring only one neurosensory system, such as the auditory; the second requiring two or more but not all of the systems; and the third requiring all of the systems functioning as a unit (p. 78)

They develop also a theory of "multiple states of readiness" (p. 53) in which they consider a child may be ready to learn reading by one sense channel but not by another. For this reason, they point out the dangers of a multisensory approach used indiscriminately with children learning to read. Some children have low tolerance levels for stimulations received through some sense channels. They hypothesize that stimulations through two sense channels together may serve to obliterate each other in some children. For the same reasons, they warn against the indiscriminate use of emphasis on one channel only. They give no evidence for their conclusions except for their own clinical observations. If these conclusions have validity for children with reading problems then it is logical to suppose that they have validity also for a heterogeneous class of first graders.

de Hirsh (1957) is also concerned with this problem and says that most of the tests she uses with six year olds to predict potential reading difficulties are designed "to measure the child's ability to pattern, structuralize and adequately respond to the endless stream of stimuli to which he is exposed at every moment (p. 573)." She says that most of the children do better with a phonetic approach rather than a whole word attack but points out that there are exceptions. This she suggests is because maturation is largely a process of integration and differentiation; the child of six whose performance in either perceptual, motor, visuo-motor or conceptualization is relatively undeveloped is likely to have reading difficulties.

Infants' varying responses to stimulation in different modalities, and changes in sensitivity between infancy and age five were examined in a study by Escalona, Sibylle, & Heider (1959, p. 243). They reported that the differences in perceptual sensitivity in the various modalities were not usually retained in their original form by members of the sample yet there were some children who showed remarkable behaviour constancy in this respect. Some of their predictions based on the implications of individual sensory thresholds for infants were amongst their most successful ones.

Georgiades, Romano, & Baronowski (1965) found opposite results to de Hirsh (1957) with kindergarten children in that many children had a marked weakness in auditory discrimination. Although they present no evidence they report that a four weeks training period to correct this was highly encouraging.

Visual and auditory discrimination with 28 good and 28 poor readers were studied by Weiner, Wepman, & Morency (1965). There was a very low correlation between the tests for each, which they claim supports the contention that there are different learning types related to the ability to use vision and audition in gaining information. The results also suggested that difficulties in one major perceptual pathway do not appear to lead to difficulties or increased ability in another channel.

The Modality Concept and Reading

Some evidence for the validity of the modality concept in improving the teaching of reading is provided by de Hirsh, Jansky, & Langford (1966). They attempted to predict the later reading difficulties of kindergarten children by means of four tests of visual perception and four tests of auditory perception. They found few significant differences between auditory and visual perceptual competence in 43 out of 53 subjects, but 10 of the subjects exhibited discrepant modality patterning. Seven of these obtained high auditory scores and low visual scores. The other three were the reverse. The three who obtained high visual and low auditory scores scored high on the reading tests given at the end of grade two. Of the seven with high auditory scores five passed and two failed all the reading tests given at the end of grade two. According to evidence given by the teachers of these children, the five who received high auditory scores and who passed had all been given intensive training in phonics while the two who received high auditory scores and who failed had received no special phonic training. The writers admit that this is only a preliminary report of their

findings and they report no details of the phonic training so the evidence is not conclusive. The results do suggest the individual nature of sensory perception with some children.

Hurley (1968) examined the relation of perceptual deficits to reading problems. His subjects were 40 children mostly from first and second grades in one school matched for sex age and I.Q. with 40 children from 12 schools in another town. He tried to discriminate between adequate and inadequate readers by means of various perceptual tests. His results showed that each group of adequate and inadequate readers differed on different factors of the perceptual tests used. He suggested that a relationship might exist between the method of teaching (phonic or sight) and the kinds of reading problems observed. There definitely appeared to be some children in this study who used primarily an auditory or a visual channel of learning.

Shepherd (1968) tested two boys who were considered to be adequate readers by means of a diagnostic reading test and found specific difficulties relating to auditory or visual problems. He hypothesized that the boys would probably read much better if these were remediated. For these reasons he felt that individual diagnosis should be a preliminary factor to beginning reading as group differentiations based on general tests of readiness may hide individual differences that may be significant for learning.

Perception and the Modality Concept

There is evidence supporting the modality concept in the literature on perception. Vernon (1954) says that there is little doubt that, in

certain individuals, imagery is clearer and more vivid in one modality than in others. Werner and Kaplan (1963) describe individual differences in the pace and direction of development in the different perceptual areas. They attribute this to the role of the "self" in the perceptual process. Langman (1960) suggests that different language backgrounds and development of motor control," . . . make each child unique in the degree to which he has learned fine auditory discrimination (p. 26)." She also suggests that the visual perception of words may be culturally conditioned so that the child pays attention to those aspects of perception that are relevant to him. Goins (1958) found a wide range of individual variations in perceptual abilities and evidence of distinct types of perceivers while Lenon (1962) supports the contention of different rates of development of perceptual abilities.

There is evidence that perceptual deficits related to reading persist into adulthood (Silver, & Hagin, 1964) but a later study (Silver, Hagin, & Hersh, 1967) showed that improvements in perceptual and achievement scores can be effected by specific perceptual training.

Yamanoto (1969) obtained evidence in his studies that children are not able to process information so effectively when two or more modalities are used simultaneously. This supports the observations of Johnson and Myklebust (1967).

These studies on differences in perception between individuals and between modalities within individuals lend support to the implied basis of this study, that individual diagnosis of these and the teaching of reading to make most effective use of modality maturation, should maximize the learning process. The remaining sections of this chapter

will examine studies related to the specific modalities concerned with the teaching of reading, the visual, auditory and the kinesthetic and various combinations of these.

Auditory and Visual Modalities

The most commonly taught word recognition techniques use a combination of auditory and visual stimuli with an emphasis, usually, on one or the other such as a look-and-say or phonic approach. For this reason most of the research studies in learning through different sensory channels have concentrated on these modalities. Many have attempted to show that one or the other is most effective with particular age, sex, or ability groups. Other studies have explored intermodality functioning but few seem to have explored individual differences in modality functioning.

Worcester (1925) examined the learning of prose selections by college students in aural and visual presentations. His study indicated that there seemed to be an intrinsic superiority for retention in the auditory modality for his students. There was also wide variations in individual learning abilities but his sample (13) was too small for the results to be of much significance. Russell (1928) conducted a similar study with 650 children from 5th, 6th and 7th grades. He found that the 5th grade learned best by aural presentation, the 7th grade by the visual and no differences for the 6th grade.

150 college students received varied auditory and visual training in nonsense syllables and were tested by auditory or visual means in a cross-over design by Postman and Rosenweig (1956). The subjects

trained and tested in the same modalities performed better than the cross modality subjects. Of the latter group, visual training and auditory testing was superior to the reverse method. It was hypothesised that this was because the subjects receiving visual training vocalised the stimulus but those receiving auditory training did not visualise the stimulus so effectively. The frequency of training compared to testing scores favoured the auditory training method. This agrees with Worcester's findings.

In another study using nonsense syllables with grade four and grade six pupils Lockard and Sidowski (1961) obtained results which suggested that visual training was better than visual and auditory combined and both were significantly better than auditory for both grades. Katz and Deutsch (1964) studied the relationships of auditory, visual, and combined learning tasks of poor and good readers with 1st, 2nd, and 3rd grade negro students. Their findings suggest that the auditory stimulus is poorest for all students and the visual is best. The poorer readers had particular difficulty with the auditory material and they also showed a more uneven pattern of modality functioning. Part of the problem could well be the fact that they were negro students from a poor social environment. This study is of particular interest in that the poor and good readers in the first grade were identified through the use of a predictive test. It suggests that modality functioning is of importance in learning to read for some students. They say, (p. 627)

> Since early reading instruction clearly requires the capacity to absorb auditory and visual information, learning difficulties might arise from attentional

> deficiencies in either one or both stimulus modalities. Furthermore the possibility suggests itself that differential modality patterns are developmentally determined.

Since their findings with respect to age paralled those associated with differences in reading ability, it could be interpretated that poor readers function at a developmentally lower level than the good readers.

An earlier reported study with the same subjects, (Katz & Deutsch, 1963) investigated the effects of modality shifting. They found that the poorer readers took significantly longer in shifting from one modality to another. This perceptual behaviour was not related to intelligence and again they suggest that since modality shifting differences can be related to reading potential, then this perceptual skill is basic to reading performance. One could question the applicability of these findings to reading in that lights and sound tones were the stimuli in this experiment and that pictures were the visual stimuli in the first mentioned study. Are these perceptual skills involved in the reading process ?

Budoff and Quinlan (1964) compared the learning efficiency of average and retarded readers at the grade two level when meaningful words were presented aurally and visually in a paired associates paradigm. The results showed that both groups learned more quickly by the aural method and more slowly by the visual method. This was at variance with the Katz and Deutsch (1964) study but could be accounted for by the fact that the latter used negro students and did not use meaningful materials.

Hill and Hecker (1966) did a similar study with grade two pupils except they used pictures for the visual stimulus. Their results showed neither sense modality nor order of presentation contributed significantly to the variance but significant interaction was found. This reflected a lack of transfer from the auditory to the visual task and positive transfer from the visual to the auditory task.

In summary these studies show no conclusive support for either the visual or the auditory modality as being more efficient for any particular group of children. The results obtained in these studies would appear to depend on the kinds of materials used in the teaching and testing and possibly on the socio-economic or cultural status of the subjects. There is some evidence that children function at different levels in shifting from stimulus to response across modalities. No study is reported with grade one or kindergarten children apart from one with culturally deprived negro students. They all seem to lend support to the thesis that modality functioning is an individual characteristic not related to age or intelligence.

Audio-Visual Integration

Many studies have tried to determine a relationship between a subject's reading abilities and his ability to integrate his visual and auditory senses. That is to say his ability to relate a phoneme to its graphic representation or the reverse.

The relationship of audio-visual integration in normal and retarded readers from 9.4 to 10.4 years of age was studied by Birch and Belmont (1964). They utilised tapped Morse Code type patterns as the auditory

stimulus and similar patterns of lines and dots as the visual recognition task. They found significant differences between the poor and good readers on audio-visual integration abilities but there was also considerable overlap between the two groups. A later similar study, Birch and Belmont,(1965) with 220 subjects from kindergarten to grade six, showed a correlation of .70 between audio-visual integration and reading readiness in the youngest group but this decreased with age and in the oldest group intelligence correlated more highly with reading ability. They concluded that the period of most rapid development in audio-visual integration occurs between the ages of five and seven years in bright and normal children. Muehl and Kremenack (1966) in a similar study with first grade children found that audio-visual integration and visual-audio integration made significant contributions to predicting reading ability. Beery (1967) extended these studies with the older children and found the same results with retarded and average readers. Although there is no evidence in these studies it would seem reasonable to assume that the child's abilities in one or other of the modalities would have an influence on these results. In any case they point out the importance of modality functioning in beginning reading and the developmental nature of this concept.

Braun (1969) studied the effects of auditory versus auditory-visual presentations and interest loading in the learning of words with kindergarten children of high and low ability. Auditory treatments were best for both groups and was most significant with low ability boys. Part of the results could have been attributed to low variances for the high ability groups. Mira (1968) found that listening deficits

were more common than looking deficits and that the majority of children with listening deficits were experiencing reading difficulties. Her study also demonstrated that children have individual patterns of attending to auditory and visual events.

In all these studies there is no conclusive evidence that the visual or auditory modality is superior for any particular group learning to read. There is strong support for the modality concept and for the fact that it is a very individual matter. There seems to be more support for the effectiveness of the auditory channel in learning to read than is generally supposed by reading teachers.

The Auditory Modality

The auditory modality and its relationship to reading has been explored extensively by Wepman. He describes (Wepman, 1960) the evaluation of a test of auditory discrimination with 80 first graders and 72 second graders. He found a positive relationship between auditory discrimination and reading comprehension. There were also indications that auditory discrimination is developmental in nature. This is also supported by Katz and Deutsch (1963, 1964,), Birch and Belmont (1965) and Birch and Lefford (1963). He suggests that children should be studied as they reach school age, to determine whether their auditory abilities have reached the level of maturation where they can benefit from phonic instruction in reading. Wepman follows this (Wepman,1961) with evidence of differential maturation in auditory abilities and suggests,

> The fact that children during their first three years of school life (ages 6 to 9) have differential development of their auditory ability and the fact that different facets of hearing come to maturity at different rates and thereby limit the ability to learn aurally during these most important years has been given little attention (p. 247).

Wepman describes (Wepman, 1964) a child with auditory imperception who was taught to read through the visual modality yet could not take a telephone message correctly. His theories are supported by Sabitino (1969) whose data indicates that visual and auditory perception are different behaviours. He says,

> Auditory perception is a complex function with specific behavioural components that must be assessed independently if classroom management of these behaviours is to be provided (p. 736).

Kinesthetic Modality

Fernald is credited with the first studies of a kinesthetic method of teaching reading. She reported her successful experiences with several retarded readers (Fernald, 1943) and attributed this to the tracing method which she had evolved. She also found that there were individual differences in each child's learning method with some preferring to use mostly a visual, auditory or kinesthetic method (p. 109). She states that experiments with first graders show that some children prefer a kinesthetic approach (p. 160). Others have said that it was the novelty and the individual nature of her approach which produced the successful results. Forester (1941) showed that with a group of college students look-and-say was better than tracing in learning new phonetic symbols. Berman (1939) failed to find any advantage in the addition of kinesthetic techniques for the recall of

nonsense syllables with retarded readers although there was superiority in learning for the kinesthetic method. His subjects were only 17 in number and of different ages and it is doubtful if learning of nonsense syllables is strictly comparable to the complete reading process. He stated that the results showed that the child had an individual learning pattern.

Lowenfeld (1945) reports that in 224 adults studied to explore their visual or kinesthetic preferences 47% were visual, 23% were haptic, and 30% indeterminate. Wilson (1961) examined kinesthetic preferences of grade one children. He found that children do differ in kinesthetic abilities but in this study it had no relationship to reading abilities. Since no kinesthetic training was given in the schools this is not surprising. One interesting result was that he found a strong positive effect for the auditory stimulus and a strong negative effect for the visual stimulus in learning the associative tests he used.

Buchner (1964) found that tactual-visual skills correlated very highly with academic achievement in fourth grade and that the children had very wide differences in their manners of perceiving. Ford (1967) found in his study with fourth grade children that their tactual-visual integration was not related to intelligence or reading achievement but auditory-visual integration was. He also concluded that, in his study, the two integrated modalities were not related to each other. Otto (1961) used auditory, visual and kinesthetic modes of reinforcement in the acquisition of paired associates with 2nd, 4th, and 6th grade children. His study showed no significant interaction

between modes of reinforcement and reading ability but the mode was significant for grade level. The kinesthetic mode was most successful in the 2nd and 6th grades and was next best in the 4th grade. Later (Otto, 1963) he found the kinesthetic mode best with poor readers.

In these studies there seems to be evidence that the kinesthetic mode is of importance for some children. Apart from remedial work little use has been made of this in the teaching of reading. One of its drawbacks is that it is a slow method and requires a lot of individual attention on the part of the teacher. There is also little evidence on the effectiveness of kinesthetic methods of teaching reading to children who have not developed reading problems.

CHAPTER III

THE EXPERIMENTAL DESIGN

This study was designed to develop a reliable group test based on the Mills Learning Methods Test that can be used with kindergarten children. Its purpose was to measure children's written word learning potentials in visual, auditory, kinesthetic or combined modalities.

This study took the form of administering a group test based on the Mills Test and an individual test similarly based to the same group of kindergarten children at a period two thirds of the way through the school year. This appeared to be a time, based on kindergarten teachers observations, when the children generally are developing an interest in words and letters. The writer's own observations during the testing period confirmed that this was so.

This chapter will outline the definitions of terms used in the study, the selection of the sample, a description of the testing instruments, the design of the study, a statement of the hypotheses to be tested and the methods of analysis of the data obtained.

In defining the modality methods it is recognised that none of them result in teaching or testing by a pure sensory channel as auditory and visual channels are utilised in all four methods. It is assumed that the emphasis on a particular mode of learning, in each of the defined modalities, will produce more efficient learning in that mode if the child is able to process information received through that channel better than through his other sensory input facilities.

Definitions

1. M. L. M. T. : The Mills Learning Methods Test

2. I. L. M. T. : The Individual Learning Methods Test used in this study.

3. G. L. M. T. : The Group Learning Methods Test used in this study.

4. Preferred Modality : The sensory pathway through which the child learns to read written words most effectively. In this study it will be referred to as one of the four teaching procedures which produces the highest score on the delayed recall tests for any child.

5. Visual Method (V. M.) : The teaching of word recognition, relying almost exclusively on the visual stimulus of the word, carried out by utilizing the following teaching techniques;

(1) Using picture, written and spoken word association.

(2) Stressing a careful visual study of the written word.

(3) Stressing the general configuration of the written word.

6. Phonic or Auditory Method (A. M.) : The teaching of word recognition stressing almost exclusively the sound qualities of the grapheme-phoneme associations in the words, through the use of the following teaching techniques;

(1) Teaching the phoneme-grapheme association for six initial consonant graphemes.

(2) Finding spoken words with similar initial phonemes.

(3) Blending the six initial consonant phonemes with one vowel phoneme and ending consonant phoneme and teaching the meaning and the grapheme-phoneme associations of the word which is being formed.

7. Kinesthetic Method (K.M.) : The teaching of word recognition, utilizing the child's sense of touch and movement in tracing and writing words, by use of the following teaching techniques;

(1) Tracing and saying the word.

(2) Writing the word from memory.

8. Combination Method (C.M.) : The teaching of word recognition, giving equal emphasis to visual, auditory, and kinesthetic approaches. The three methods outlined above will be combined into the following teaching techniques;

(1) Using picture and written-spoken word associations.

(2) Using the phoneme-grapheme associations in the word.

(3) Using word configurations to discriminate between written words.

(4) Tracing the word while saying it.

9. Word Gestalt : The outline of the whole word such as  for 'tree'.

10. Immediate recall score : The number of correct oral responses to the written word recognition tests given at the end of each teaching cycle.

11. Delayed Recall Score : The number of correct oral responses to the written word recognition tests given twenty four hours after the teaching cycle.

12. Teaching Cycle : The set of teaching steps used in teaching six words by one of the four modality methods.

13. Word Recognition : The oral responses to a written word stimulus whose grapheme-phoneme relationship has been previously taught.

14. Intelligence : The standardised score obtained on the Goodenough-Harris Drawing Test (Harris, 1963).

Population and Sample

The population of this study consisted of the pupils in the two kindergarten classes at Royal Oak Elementary School in the Saanich School Board District. One class was held in the morning and one in the afternoon, in the same room and with the same teacher. There were 19 children in each class. This school was chosen by the Saanich School Board for the study when the writer requested the use of a kindergarten class where no formal reading lessons had been taught and where a convenient room for testing was available. Such a small sample was dictated by the length of the individual teaching and testing procedures.

Most of the children's fathers worked as skilled tradesmen, electricians, carpenters, etc. Several owned small businesses and a few were professional classes. The catchment area of the school could be described as upper working class to middle class.

The sample consisted of the total population for the group tests and 14 pupils randomly selected from each of the two classes for the individual tests. The average age of the subjects was 5 years 10 months for the boys and 5 years 8 months for the girls. The average age for each class was 5 years 9 months. The range was from 5 years 4 months to 6 years 6 months. There were 13 girls and 15 boys with a difference of only one between the two classes.

The classroom was large, pleasantly painted, and well lit with a good supply of kindergarten equipment. The room used for testing was the teachers office which opened into the classroom. The building was separate from the main school so that distractions were at a minimum

apart from recess times in the morning and afternoon which were held at separate times from the kindergarten classes.

The children worked in groups during the day on activities, largely self chosen with very few periods of whole class activities.

TESTING INSTRUMENTS

The Goodenough-Harris Drawing Test (Harris, 1963)

This was administered by the teacher under the supervision of the writer who also marked the test. The classes were asked to draw a man one day and a woman on another day. The scores on the two tests were averaged to provide an estimate of the mental maturity of each child. This is recorded as the I.Q. on the tables of results.

Validity and Reliability

Harris (1963, p. 90) reported correlations coefficients of .80 to .96 for inter-score reliability and correlations of .60 to .70 for scores with the same group of children, on tests separated by as much as three weeks (p. 91).

Tables (Harris 1963, p. 96) reported correlations of .41 for I.Q. values of kindergarten children between the Goodenough Test and the Stanford-Binet. In a study with six year olds correlations of .47 are reported with the W.I.S.C., using full scale I.Q. values. A study with kindergarten children reported correlations of .46 with the S.R.A. test of Primary Mental Abilities using full score, raw score values.

The Individual Learning Methods Test

A pilot study was undertaken using the Mills Learning Methods Test with a class of bright kindergarten children from Cordova Bay Elementary School, which is situated near to the school used in this study. As a result the writer found it necessary to modify the test for administration to kindergarten children who have not begun to read at all. the following modifications were made to devise the tests used in this study;

a. The words to be learned in each teaching method were reduced from 10 to 6. This was found to be the maximum number that could be taught in fifteen minutes and it was not feasible to keep the children's attention for longer.

b. Three and four letter words only were used.

c. Words were chosen which would have good discriminability and which would have meaning for the children being tested.

d. For the Auditory method six initial consonant grapheme-phoneme associations only were taught. There has been criticism of this part of the Mills test in that it is difficult to follow his teaching procedures with some words which have irregular grapheme-phoneme relationships. The use of words with only regular grapheme-phoneme relationships has been suggested by Culliton (1965), and Cooper (1969) also used syllables with regular grapheme-phoneme relations.

With these modifications the I. L. M. T. used in this study follows the same procedures as in the Mills test. A description and teaching directions are included in Appendix A.

The Group Learning Methods Test

This was a modification of the I. L. M. T. to enable the teaching of the words to small groups of children together. The testing was still done on an individual basis as no satisfactory method of group testing of kindergarten children could be evolved by the writer. The basic modification was an increase in the size of the word cards, pictures and print used in the teaching and testing process. The time of each teaching cycle was extended to twenty minutes to compensate for the extra administration procedure. A description and teaching directions are included in Appendix B.

Scoring Procedures

Each child in both the individual and the group tests was tested on his oral recognition of the written words presented to him in random order at the end of fifteen or twenty minutes of teaching and again twenty four hours later. The same print as used in the teaching was used for the testing. If a correct response was not made within twenty seconds after exposure of the word it was marked as not known. All responses were recorded. The children were not informed of the correctness or otherwise of their responses. Copies of the record forms are included in Appendix C. and D.

Plan of Administration

The study was conducted according to the following plan. Class A. is the morning class and Class B. the afternoon class. Subjects were assigned on a random basis to groups 3, 4, and 5. These were then pooled and random selection made of groups 1 and 2. The I. L. M. T.

and the G. L. M. T. were rotated to minimize the effects of one procedure on the other.

	Class A.	Class B.
week 1.	I. L. M. T. to group A.1. n=7	G. L. M. T. to groups B.3., B.4., B.5. n=6 n=6 n=7
week 2.	I. L. M. T. to group A.2. n=7	
week 3.	I. Q. tests n=19	I. Q. tests n=19
week 4.	Easter Vacation	
week 5.	G. L. M. T. to groups A.3., A.4., A.5. n=6 n=6 n=7	I. L. M. T. to group B.1. n=7
week 6.		I. L. M. T. to group B.2. n=7

The order of teaching the four methods adhered to the following plan in order to minimize the effects of the teaching procedures on each other. Six written words were taught each day to individuals in groups 1. and 2. and to groups 3., 4., and 5.

Each teaching period was followed by an immediate recall test. A delayed recall test was given on the following day before the next teaching cycle was begun. On Fridays a recall test of Thursday's words was given.

Group	Mon.	Tues.	Wed.	Thurs.
A.1.	V.M.	A.M.	K.M.	C.M.
A.2.	C.M.	K.M.	A.M.	V.M.
B.1.	A.M.	V.M.	C.M.	K.M.
B.2.	K.M.	C.M.	V.M.	A.M.
A.3.	V.M.	K.M.	A.M.	C.M.
A.4.	C.M.	A.M.	V.M.	K.M.
A.5.	K.M.	V.M.	C.M.	A.M.
B.3.	A.M.	C.M.	K.M.	V.M.
B.4.	V.M.	C.M.	K.M.	A.M.
B.5.	K.M.	A.M.	V.M.	C.M.

The Selection of the Words

The following words were taught and tested;

I. L. M. T.

V.M.	K.M.	A.M.	C.M.
box	bed	cat	egg
cow	leg	bat	hen
pig	toy	fat	man
cake	baby	hat	lamp
desk	door	mat	milk
tree	head	sat	tail

G. L. M. T.

V.M.	K.M.	A.M.	C.M.
arm	dog	get	car
bus	pie	jet	key
cup	sun	let	mop
coat	boat	net	fish
eyes	fork	pet	duck
snow	hand	wet	girl

It will be seen that apart from the auditory group words there are three three-letter and three four-letter words in each group. The words should all be in the speaking vocabulary of the children but in any case

the meaning was established as part of the teaching procedures.

All of the words are taken from the Mills group of 46 Primer words or the Language Master, Word Learning Picture Series, Set 1., Everyday Things. The Mills words were taken from "The Author's Word List For The Primary Grades" (Krantz, 1945). The "Language Master" words are taken from Buckingham and Dolch (1936) and Rinsland (1945).

There is support from other studies, already mentioned (Mills, 1956., Rivkind, 1958., Cooper, 1969) that the particular words used are not a critical factor in the use of the test. This also receives support from Culliton (1965). It would appear that the use of the standardised teaching procedures in each of the modalities is the important factor in controlling reliability.

Statement of the Hypotheses

1. Some non-reading kindergarten children will have individually preferred modes of learning written words.

2. The Group Learning Methods Test will indicate these childrens preferred modes as effectively as the Individual Learning Methods Test based on the same teaching and testing procedures as the Mills Learning Methods Test.

3. There will be no relationship between sex, intelligence or school class and preferred modality.

Working Statements on the Hypotheses

1.1 There will be no differences greater than one word between the two highest immediate recall scores on the I.L.M.T. for any child.

1.2 There will be no differences greater than one word between the two highest delayed recall scores on the I.L.M.T. for any child.

1.3 There will be no differences greater than one word between the two highest immediate recall scores on the G.L.M.T. for any child.

1.4 There will be no differences greater than one word between the two highest delayed recall scores on the G.L.M.T. for any child.

2.1 There will be no significant correlation between the immediate recall scores obtained on the I.L.M.T. and the G.L.M.T. for the Visual Modality.

2.2 There will be no significant correlation between the immediate recall scores obtained on the I.L.M.T. and the G.L.M.T. for the Auditory Modality.

2.3 There will be no significant correlation between the immediate recall scores obtained in the I.L.M.T. and the G.L.M.T. for the Kinesthetic Modality.

2.4 There will be no significant correlation between the immediate recall scores obtained in the I.L.M.T. and the G.L.M.T. for the Combined Modality.

2.5 There will be no significant correlation between the delayed recall scores obtained in the I.L.M.T. and the G.L.M.T. for the Visual Modality.

2.6 There will be no significant correlation between the delayed recall scores obtained in the I.L.M.T. and the G.L.M.T. for the Auditory Modality.

2.7 There will be no significant correlation between the delayed recall scores obtained in the I.L.M.T. and the G.L.M.T. for the

Kinesthetic Modality.

2.8 There will be no significant correlation between the delayed recall scores obtained in the I.L.M.T. and the G.L.M.T. for the Combined Modality.

3.1 There will be no relationship between sex and preferred modality on the I.L.M.T.

3.2 There will be no relationship between sex and preferred modality on the G.L.M.T.

3.3 There will be no relationship between the school class and preferred modality on the I.L.M.T.

3.4 There will be no relationship between the school class and preferred modality on the G.L.M.T.

3.5 There will be no relationship between intelligence and preferred modality on the I.L.M.T.

3.6 There will be no relationship between intelligence and preferred modality on the G.L.M.T.

Analysis of the Data

Hypotheses1.1 to 1.4 were tested by inspection of the tabulated raw scores obtained on the four sets of four tests for each child. The criterion of two words difference between the two highest scores in correct recall words for establishing the significance of a preferred modality is based on other studies. Mills (1956) made a frequency distribution of the 300 deviation scores of his 75 subjects and a mean deviation score was obtained. From his data it was concluded that if a score deviated in either direction by more than

1.5 words from a child's own mean on the four tests, this was a greater deviation than would occur in approximately 68 percent of the cases and was probably of clinical significance if not statistically significant. Rivkind (1958) using 13 words per test analysed the deviations obtained and concluded that a difference of two words between the two highest recall scores was statistically significant.

In this study using only 6 words per test the mean differences between the two highest recall scores were 1.5 words for both the I.L.M.T. and the G.L.M.T. so that a two words difference appeared most usable. In actual fact a difference greater than this was recorded for only five children on both tests.

Hypotheses 2.1 to 2.8 were tested by finding the product moment correlation coefficient between the scores on the two tests for the 28 children who completed all tests. The testing of hypotheses 3.1 to 3.6 was dependant on the numbers of children who had a preferred modality as defined by the procedures already described. It was intended to use Chi Square test to establish any relationship found and to use a probability level of .05 for significance. If less than 20 percent of the eight cells contained expected frequencies of less than 5 an examination only of the results could be made.

CHAPTER IV

FINDINGS AND CONCLUSIONS

This chapter will examine the data obtained from the tests administered to 28 kindergarten children who completed both the group and individual tests designed to investigate the problem of kindergarten children's preferred modalities in learning to read words. It will first determine the support or rejection of the three major hypotheses of the study.

1. Some children will have preferred modes of learning to read.
2. A group test will be as effective as an individual test for determining these.
3. The children's preferred modalities will have no relationship to sex or intelligence.

Next, it will examine the relationships between modalities, sex, school class, intelligence, and the test words which are suggested by the findings. Lastly the conclusions to be made from the study will be stated and the chapter will be summarized.

Children's Preferred Modalities

The first hypotheses stated that some children would have individually preferred modes of learning written words. This would be indicated by differences of two words or more between correct responses on the four modality tests for both immediate and delayed recall tests after individual and group teaching techniques had been used. An examination of Table 1 shows that in the I. L. M. T. differences of

TABLE 1.

The Individual Learning Methods Test Scores

Subject	Age	I.Q.	Immediate Recall Scores	Delayed Recall Scores	Preferred Modality Immediate Recall	Preferred Modality Delayed Recall
			V A K C	V A K C		
1.	5.9	123	3 4 3 3	4 1 2 4		
2.	5.5	113	4 3 1 3	2 5 1 1		A. M.
3.	5.7	88	2 5 5 6	4 4 4 4		
4.	6.6	119	4 6 6 6	4 4 3 4		
5.	5.9	119	1 5 1 3	2 5 1 1	A. M.	A. M.
6.	5.8	106	0 4 0 1	1 3 1 1	A. M.	A. M.
7.	5.11	131	5 5 2 3	5 6 1 1		
8.	6.3	86	4 4 1 5	2 2 0 2		
9.	5.5	109	4 4 2 5	3 4 2 4		
10.	5.5	102	1 2 2 1	0 2 1 2		
11.	5.8	108	5 6 1 4	3 2 1 1		
12.	6.0	102	4 6 3 4	5 4 1 4	A. M.	
13.	5.7	88	1 1 0 2	2 3 0 1		
14.	5.11	80	2 2 0 2	4 3 0 1		
15.	5.4	108	6 6 6 6	5 5 6 6		
16.	5.9	90	5 6 4 4	5 5 2 1		
17.	5.7	105	5 4 5 5	6 6 5 2		
18.	6.0	99	6 6 4 2	4 4 4 2		
19.	6.4	93	4 2 0 0	4 2 0 4	V. M.	
20.	5.9	108	6 5 3 2	6 4 0 2		V. M.
21.	6.0	92	4 2 2 2	3 4 0 3	V. M.	
22.	5.9	113	1 2 4 3	1 1 1 1		
23.	5.11	129	1 5 2 1	1 4 1 4	A. M.	
24.	5.7	93	5 6 5 4	4 5 2 2		
25.	5.9	141	4 6 6 6	4 3 5 5		
26.	5.9	94	3 2 2 3	2 3 2 2		
27.	5.5	96	3 4 2 2	5 3 0 1		V. M.
28.	5.9	136	6 6 5 6	2 6 4 3		A. M.

Age in years and months
V. Visual Modality
A. Auditory Modality
K. Kinesthetic Modality
C. Combination Modality

two or more words between the two highest scores were recorded for six children on both the immediate and delayed recall tests. Two subjects recorded their highest modality score in the same modality for both tests. Table 2 shows that in the G. L. M. T. six children had preferred modalities in the immediate recall test and eight children in the delayed recall tests. One subject had highest scores in the same modality and one in different modalities in the immediate and delayed recall tests.

The first hypotheses may be rejected and it may be concluded that, according to the criterion established for the definition of preferred modality in this study, some children did have preferred modes of learning written words.

Comparison of the G. L. M. T. and the I. L. M. T.

The major purpose of this study was to investigate the possibilities of using group teaching techniques to ascertain the nature of children's preferred modalities. For this reason it was necessary to establish that an individual and a group teaching procedure obtained the same results with the same child. An examination of Tables 1 and 2 shows that only for subjects number 6 and 28 are the preferred modalities identical in the two tests. However if the highest score in any modality were used as the criterion for preferred modality then there were 15 subjects who had highest scores in the same modality in both tests. This is shown in Table 3.

It was hypothesised that there would be significant correlations between the scores obtained in similar modalities in the group and

TABLE 2

The Group Learning Methods Test Scores

Subject	Age	I.Q.	Immediate Recall Scores				Delayed Recall Scores				Preferred Modality Immediate Recall	Preferred Modality Delayed Recall
			V	A	K	C	V	A	K	C		
1.	5.9	123	4	5	3	5	3	3	2	4		
2.	5.5	113	3	3	0	2	3	3	0	0		
3.	5.7	88	2	4	3	0	2	2	0	1		
4.	6.6	119	4	5	6	6	4	4	3	4		
5.	5.9	119	5	4	2	6	6	4	1	2		V. M.
6.	5.8	106	0	2	0	1	1	3	1	1		A. M.
7.	5.11	131	2	2	4	2	2	0	2	4	K. M.	C. M.
8.	6.3	86	2	3	4	1	3	2	0	0		
9.	5.5	109	2	6	1	1	2	3	1	0	A. M.	
10.	5.5	102	2	3	2	3	0	2	3	1		
11.	5.8	108	1	2	2	3	2	2	1	0		
12.	6.0	102	2	4	5	5	2	3	3	3		
13.	5.7	88	3	2	1	5	2	2	0	2	C. M.	
14.	5.11	80	2	1	0	1	0	1	0	1		
15.	5.4	108	2	6	6	6	2	6	4	4		A. M.
16.	5.9	90	1	2	4	3	2	2	1	2		
17.	5.7	105	5	4	5	5	2	4	5	5		
18.	6.0	99	5	3	4	4	4	4	4	2		
19.	6.4	93	1	1	0	1	3	0	2	0		
20.	5.9	108	3	3	4	0	1	2	4	1		K. M.
21.	6.0	92	1	3	1	1	1	2	0	0	A. M.	
22.	5.9	113	2	3	4	2	2	5	2	2		A. M.
23.	5.11	129	3	3	5	3	3	1	3	4	K. M.	
24.	5.7	93	3	3	4	1	2	2	2	0		
25.	5.9	141	5	4	4	3	3	5	3	4		
26.	5.9	94	2	1	0	0	3	1	1	1		
27.	5.5	96	0	3	4	3	1	3	1	2		A. M.
28.	5.9	136	2	6	1	4	2	6	4	2	A. M.	A. M.

Age in years and months
V. Visual Modality
A. Auditory Modality
K. Kinesthetic Modality
C. Combination Modality

TABLE 3

Highest Scores as Preferred Modality

	Immediate Recall								Delayed Recall							
	Individual Test				Group Test				Individual Test				Group Test			
	V	A	K	C	V	A	K	C	V	A	K	C	V	A	K	C
1.		x				x		x	x			x				x
2.	x				x	x				x				x	x	
3.			x			x			x	x	x	x		x	x	
4.		x	x	x			x	x	x	x		x		x	x	x
5.		x						x		x				x		
6.		x				x				x					x	
7.	x	x					x			x						x
8.			x				x		x		x	x		x		
9.			x			x				x		x			x	
10.		x	x			x		x		x		x				x
11.		x						x	x					x	x	
12.		x					x	x	x						x	x x
13.			x					x		x				x	x	x
14.	x	x			x				x						x	x
15.	x	x	x	x		x	x	x				x			x	
16.		x					x		x	x				x	x	x
17.	x		x	x	x		x	x	x	x						x x
18.	x	x			x				x	x	x			x	x	x
19.	x				x	x		x	x			x		x		
20.	x						x		x							x
21.	x	x				x				x					x	
22.			x	x			x		x	x	x	x			x	
23.		x					x			x		x				x
24.		x					x			x				x	x	x
25.		x	x	x		x					x	x			x	
26.	x			x		x				x				x		
27.		x						x	x						x	
28.	x	x				x				x					x	

V. Visual Modality
A. Auditory Modality
K. Kinesthetic Modality
C. Combination Modality

the individual tests. These correlations are shown as the total group correlations in Table 4 and are used to test hypotheses 2.1 to 2.8. In the visual modality the correlation coefficients, although positive, fail to reach the required 0.05 level of significance so hypotheses 2.1 and 2.5 relating to the visual modality cannot be rejected.

The remaining hypotheses relating to significant correlations between the two tests in the auditory, kinesthetic and combination modalities may all be rejected as all correlations were significant beyond the 0.05 level. The highest correlation was in the kinesthetic modality with an r of 0.546 for the delayed recall tests.

The correlation coefficients for the total words learned on the two tests were almost 0.6 on both immediate and delayed recall tests so that it can be said that the G. L. M. T. does correlate positively with the I. L. M. T. in all modalities and in total words learned, and that all coefficients are significant beyond the 0.05 level except for the visual modality.

Relationship Between Modalities and Sex, Intelligence or School Class

It was hypothesised that the children's preferred modalities would have no relationship to sex, intelligence or school class. The number of preferred modalities as defined in this study were too few for this relationship to be examined statistically so that an examination of the children's highest scores has been made in Table 5.

The high intelligence group (I. Q. = 102 and above) obtained more highest scores in the auditory and combination modalities. The low intelligence group obtained more highest scores in the visual modality.

TABLE 4

Correlations Between the I.L.M.T. and the G.L.M.T.

Group	V.M.		A.M.		K.M.		C.M.		Total Words Learned	
	I.	D.	I.	D.	I.	D.	I.	D.	I.	D.
Total Group	.126	.058	.459*	.172*	.655*	.546*	.256*	.334*	.599*	.558*
Girls	-.055	-.187	.398*	-.028	.657*	.735*	.219	.621*	.529*	.572*
Boys	.342*	.155	.492*	.422*	.635*	.341*	.310*	-.011	.691*	.651*
Class A	-.005	.102	.366*	-.027	.688*	.219	-.032	.294*	.498*	.420*
Class B	.220	-.292	.520*	.232	.531*	.598*	.518*	.319*	.655*	.608*
High I.Q.	-.017	-.155	.248	-.023	.608*	.472*	.445*	.530*	.546*	.575*
Low I.Q.	.306*	.139	.518*	.524*	.651*	.546*	-.045	-.150	.570*	.603*

I. Immediate recall test
D. Delayed recall test

* Significant beyond .05 level

Total Group n = 28
Girls n = 13
Boys n = 15
High I.Q. n = 14
Low I.Q. n = 14

TABLE 5

Frequencies of individual children's highest scores in each modality

Group	I. L. M. T.			G. L. M. T.			
	V. M.	A. M.	K. M. C. M.	V. M.	A. M.	K. M.	C. M.
Sex							
Girls	1	5	2	2	6		2
Boys	4	4	1	2	2	2	1
Intelligence							
High	2	5	3	1	6	1	3
Low	3	4	3	2	1		
School Class							
Class A	3	5	2	2	2	1	2
Class B	2	4	1	2	6	1	1

This was true for both tests. The girls had more highest scores in the auditory and combination modalities than the boys on both tests. The boys had more highest scores than the girls in the visual modality on the I. L. M. T. and in the kinesthetic modality on the G. L. M. T. Class A had more highest scores than Class B in all but the kinesthetic modality on the I. L. M. T. and Class B had more highest scores than Class A in the auditory modality with the G. L. M. T.

All these differences were small and only indicate trends but suggest that with this sample there may have been some relationship between modalities and sex, school class or intelligence. The results are not significant and so the third hypotheses may not be rejected. The trends shown are at variance with other studies using Mills type procedures. The fact that others have used larger samples and have not used kindergarten children could account for the variance. It is also possible that larger samples of kindergarten children would negate the trends shown in this study.

Interactions Between Tests

The order in which the two tests were given was alternated between the two classes to minimize any test-retest interactions. Table 6 illustrates the total numbers of words recalled both immediate and delayed for both classes in all modalities. The data shows that the I. L. M. T. had higher total scores than the G. L. M. T. for all but the kinesthetic modality. However, Class B which received the group tests first, had greater differences between the two tests than Class A. Since the means for intelligence and age are almost identical, and

TABLE 6

Total words learned in each modality for each class

Class	Immediate Recall				Delayed Recall			
	V	A	K	C	V	A	K	C
G.L.M.T.								
Class A (n = 14)	34	46	33	41	33	34	17	23
Class B (n = 14)	35	45	46	36	31	43	36	29
I.L.M.T.								
Class A	40	57	27	48	39	47	18	27
Class B	59	62	49	46	52	55	32	38

V Visual Modality
A Auditory Modality
K Kinesthetic Modality
C Combination Modality

there is a difference of only one in sex between the two classes, it is difficult to find a cause. The greatest difference occured in the visual modality which also had the lowest correlations between the two tests. It is possible to attribute the greater numbers of words learned in the I. L. M. T. to the more intensive teaching occuring in the one to one situation but the greater increase in words learned for Class B is probably related to some kind of test-retest interaction. Some possible reasons may be the kinds of activities taking place in the classrooms at the time the children left to do their teaching-testing sessions. There were indications that occasionally some children were reluctant to leave pleasant activities taking place in the classroom. There were also changes caused by visitors such as the school nurse which could have affected the emotional climate at the time of testing for some children. The group test is designed to be used by the class teacher who could control many of these variables. It is also possible that the experimenter varied his teaching technique since Class B also received the last week of teaching and testing.

Differences in results for boys and girls

The next variable examined was that of sex. Table 7 shows that both boys and girls performed better on the I. L. M. T. than on the G. L. M. T. There were exceptions to this in that some girls and boys performed better on the group test than the individual test. These children all had an I. Q. over 100. On the other hand the boys performed better than the girls on the individual tests and the girls better than the boys on

TABLE 7

Means of total words learned

	Immediate Recall		Delayed Recall	
	I.L.M.T.	G.L.M.T.	I.L.M.T.	G.L.M.T.
Total Group	13.893	11.286	11.214	8.750
Girls	12.462	11.769	10.077	9.077
Boys	15.133	10.867	12.200	8.467
Class A	12.286	11.000	9.857	7.571
Class B	15.500	11.571	12.571	9.929
High I.Q.	15.071	12.714	11.571	10.429
Low I.Q.	12.714	9.857	10.857	7.071

the group tests. This can be explained for this study by the fact that the boys were more easily distracted by each other in the group situation. For instance one boy said another was pushing him, or had his chair on his foot, or had his pencil etc. The girls also tended to dominate the oral exchanges in the group situations. It is interesting to speculate what would happen in segregated groups but the experimenter assumes that boys would still be less attentive than the girls.

MacKinnon (1959), in a well controlled experiment teaching five and six year old children to read, obtained highly significant results in favour of a group teaching programme. These results may be accounted for by the fact that the experimenter was actually teaching whereas in MacKinnon's study the children were teaching themselves with the experimenter acting as a guide only. This meant there was more group interaction in MacKinnon's study.

As examination of Table 8 shows further sex differences in the modality means. In the visual modality the boys excelled the girls in all but the delayed recall scores of the group test. The auditory and combination modalities favoured the girls on the group tests. In the kinesthetic modality the boys excelled in all but the immediate recall scores of the group test. The mean differences in age and intelligence for the two groups were very small.

Differences between the I.L.M.T. and the G.L.M.T.

Table 9 shows that there were many significant differences between the scores of the G.L.M.T. and the I.L.M.T., all in favour of the

TABLE 8

Means of total words learned in each modality

		Boys	Girls	Class A	Class B	High I.Q.	Low I.Q.
Visual Modality							
Immediate Recall	I.L.M.T.	4.133	2.846	2.857	4.214	3.571	3.500
	G.L.M.T.	2.533	2.385	2.429	2.500	2.714	2.214
Delayed Recall	I.L.M.T.	3.733	2.846	2.929	3.714	3.071	3.571
	G.L.M.T.	2.067	2.462	2.286	2.214	2.571	1.929
Auditory Modality							
Immediate Recall	I.L.M.T.	4.467	4.000	4.071	4.429	4.786	3.714
	G.L.M.T.	3.200	3.308	3.286	3.214	3.857	2.643
Delayed Recall	I.L.M.T.	3.933	3.385	3.429	3.929	3.786	3.571
	G.L.M.T.	2.400	3.154	2.429	3.071	3.357	2.143
Kinesthetic Modality							
Immediate Recall	I.L.M.T.	3.000	2.462	1.929	3.571	3.000	2.500
	G.L.M.T.	2.733	2.923	2.357	3.286	3.000	2.643
Delayed Recall	I.L.M.T.	2.000	1.462	1.286	2.214	2.000	1.500
	G.L.M.T.	2.333	1.385	1.214	2.571	2.214	1.571
Combination Modality							
Immediate Recall	I.L.M.T.	3.533	3.154	3.429	3.286	3.714	3.000
	G.L.M.T.	2.400	3.154	2.929	2.571	3.143	2.357
Delayed Recall	I.L.M.T.	2.533	2.385	2.214	2.714	2.714	2.214
	G.L.M.T.	1.667	2.077	1.643	2.071	2.286	1.429

	Average age yrs	mths	Average I. Q.
Boys	5	10	104.4
Girls	5	8.5	108
Class A	5	9.25	105.3
Class B	5	9.25	104.8

TABLE 9

T Tests for means between the I.L.M.T. and the G.L.M.T.

		VIS.		AUD.		KIN.		COMB.		TOTAL	
		T.	Prob.	T.	Prob.	T.	Prob.	T.	Prob.	T.	Prob.
Total Group	Immediate Recall	2.647	0.013*	3.334	0.002**	0.242	0.811	1.428	0.165	2.868	0.008**
	Delayed Recall	2.714	0.011*	2.555	0.017*	0.510	0.614	1.836	0.077	3.481	0.022**
Girls	Immediate Recall	0.648	0.529	1.612	0.133	1.105	0.291	0.000	1.000	0.489	0.634
	Delayed Recall	0.615	0.550	0.399	0.697	0.267	0.794	0.805	0.436	0.926	0.373
Boys	Immediate Recall	3.886	0.002**	3.020	0.009**	0.654	0.524	1.939	0.073	4.141	0.001**
	Delayed Recall	3.587	0.003**	3.717	0.002**	0.717	0.485	1.653	0.121	4.494	0.001**
High I.Q.	Immediate Recall	1.264	0.228	2.061	0.060	0.000	1.000	1.097	0.293	1.753	0.103
	Delayed Recall	0.833	0.420	0.657	0.523	0.543	0.596	1.000	0.336	1.444	0.273
Low I.Q.	Immediate Recall	2.783	0.016*	2.599	0.022*	0.366	0.720	0.929	0.370	2.249	0.042
	Delayed Recall	3.371	0.005**	4.907	0.000**	0.173	0.865	1.524	0.151	4.193	0.001**
Class A	Immediate Recall	0.763	0.459	1.758	0.102	1.194	0.254	0.690	0.502	0.945	0.362
	Delayed Recall	1.189	0.256	2.082	0.058	0.186	0.856	1.228	0.241	2.187	0.048*
Class B	Immediate Recall	3.122	0.008**	2.973	0.011*	0.618	0.547	1.508	0.156	3.429	0.004**
	Delayed Recall	2.623	0.021*	1.522	0.152	0.862	0.404	1.319	0.210	2.663	0.020*

* $p < .05$ ** $p < .01$

individual tests. These significant scores were in Total Words Learned: The total group, the boys, the low I.Q. group, and Class B with both recall tests; Class A with delayed recall tests only. Visual Modality: The total group, the boys, the low I.Q. group, and Class B, with both recall tests. Auditory Modality: The total group, the boys, and the low I.Q. group with both recall tests; Class B with the immediate recall tests only.

Differences Between School Classes

The class modality means can be found in Table 8 and show that Class B performed better than Class A in all but four tests; in the group tests: the visual delayed recall, the auditory immediate recall, and combination immediate recall tests; in the individual tests: the combination modality immediate recall test only. These four differences were very small. Table 10 shows that three of the differences between classes were significant at the .05 level:

1. Visual Modality, immediate recall test of the I.L.M.T.
2. Kinesthetic modality, immediate recall test of the I.L.M.T.
3. Kinesthetic modality, delayed recall test of the G.L.M.T.

This difference between classes could have been the different effects caused by receiving the group or individual tests first, the differences between morning and afternoon classes or the variations in the experimenter's teaching techniques.

Differences Between Low and High Intelligence Groups

Examination of the intelligence modality means in Table 8 shows that the high intelligence group performed better than the low group, in all

TABLE 10

T Tests for differences between means of modalities and total words learned for sex, school class and intelligence.

			High I.Q. and Low I.Q.		Class A and Class B		Girls and Boys	
Modality	Test	T Test	I.R.	D.R.	I.R.	D.R.	I.R.	D.R.
V.M.	I.L.M.T.	T	0.103	-0.816	-2.127	-1.307	-1.994	-1.485
		Prob.	0.918	0.422	0.043*	0.203	0.057	0.150
	G.L.M.T.	T	0.925	0.400	-0.130	0.150	-0.270	0.838
		Prob.	0.364	0.173	0.898	0.882	0.789	0.409
A.M.	I.L.M.T.	T	1.790	2.444	-0.566	-0.932	-0.741	-1.024
		Prob.	0.085	0.021*	0.576	0.360	0.465	0.315
	G.L.M.T.	T	0.394	2.171	0.130	-1.081	0.195	1.275
		Prob.	0.697	0.039*	0.898	0.290	0.847	0.214
K.M.	I.L.M.T.	T	0.676	0.787	-2.143	-1.506	-0.720	-0.847
		Prob.	0.509	0.439	0.023*	0.144	0.478	0.405
	G.L.M.T.	T	0.479	1.141	-1.278	-2.649	0.401	-1.731
		Prob.	0.636	0.264	0.213	0.014*	0.802	0.095
C.M.	I.L.M.T.	T	1.072	0.294	0.210	-0.892	-0.559	-0.261
		Prob.	0.892	0.381	0.835	0.381	0.581	0.796
	G.L.M.T.	T	1.077	1.465	0.481	-0.711	1.028	0.678
		Prob.	0.292	0.153	0.634	0.483	0.313	0.504
Total words learned	I.L.M.T.	T	1.067	0.435	-1.484	-1.739	-1.214	-0.327
		Prob.	0.296	0.667	0.150	0.094	0.236	0.196
	G.L.M.T.	T	1.523	2.269	-0.292	-1.519	0.462	0.377
		Prob.	0.140	0.032*	0.772	0.141	0.648	0.709

I.R. = Immediate recall test
D.R. = Delayed recall test
* $p < .05$

but the individual delayed recall scores of the visual modality, and here the difference was small. The greatest difference and the highest means occurred in the auditory modality with the combination modality being next. Table 10 shows that the differences were significant at the .05 level for the Auditory Modality, delayed recall tests for both the I.L.M.T. and the G.L.M.T. The means of total words learned in Table 7 also show that the high intelligence group performed better than the low intelligence group but the differences are less in the individual tests than in the group tests. This suggests that individual teaching techniques could minimize the differences in learning words between the two groups. All children who recalled more total words on the group tests than on the individual tests had I.Qs. over 100.

Differences Between Modalities

Further examination of Table 8 shows that for both tests the auditory modality had the highest delayed recall means with the visual modality next. The kinesthetic modality was lowest in the individual tests and the combination modality in group tests. Table 11 shows the total words learned for all subjects in each modality. This also shows better results in the auditory and visual modalities.

Table 12 shows that there were significant differences between the means of total words learned in modalities, for the total group of subjects, with the delayed recall scores of both tests. In the I.L.M.T., the visual and auditory modalities were significantly better than the Kinesthetic and Combination modalities and the combination modality was significantly better than the Kinesthetic modality. In the G.L.M.T.,

TABLE 11

Total Words Correct on Delayed Recall Tests

Group Learning Methods Test (33 Subjects)

V.M.		A.M.	
eyes	25	wet	25
snow	19	jet	20
arm	10	net	16
coat	9	pet	15
bus	7	let	7
cup	6	get	7
	76		90
K.M.		**C.M.**	
sun	16	car	16
dog	12	fish	14
pie	11	girl	14
fork	11	mop	9
boat	8	key	8
hand	4	duck	5
	62		66

Individual Learning Methods Test (29 Subjects)

V.M.		A.M.	
pig	22	cat	24
cow	20	mat	21
tree	19	fat	18
box	13	bat	15
cake	13	sat	13
desk	7	hat	10
	94		101
K.M.		**C.M.**	
toy	15	egg	21
leg	10	man	14
door	8	milk	10
baby	7	tail	9
bed	4	hen	7
head	4	lamp	5
	48		56

TABLE 12

Correlated T Tests Between Means of Total Delayed Recall scores for each modality

Means		
Modalities	I.L.M.T.	G.L.M.T.
V.M.	3.221	2.250
A.M.	3.679	2.750
K.M.	1.750	1.893
C.M.	2.464	1.857

T Tests				
	T	Prob.	T	Prob.
V.M. & A.M.	-1.109	0.277	-1.491	0.148
V.M. & K.M.	4.219	0.000**	1.011	0.321
V.M. & C.M.	2.340	0.027*	0.251	1.174
A.M. & K.M.	6.010	0.000**	2.828	0.009**
A.M. & C.M.	3.173	0.004**	2.668	0.013*
K.M. & C.M.	-2.423	0.022*	0.138	0.892

* $p < .05$

** $p < .01$

Degrees of freedom = 27

the auditory modality was significantly better than the Kinesthetic and combined modalities.

It was noticeable that many of the subjects appeared to be less enthusiastic during the kinesthetic teaching sequences. The combination of methods in a short period of time also appeared to be hindering learning for some children in the combination modality, especially in the lower intelligence group.

Differences Between The Words Used in the Tests

In order to see if the words used accounted for any of these differences an examination of the words correctly recalled was made Table 13. It is seen that some words appeared to cause more difficulty than others. During the testing almost all wrong responses were recorded. These are set out in Tables 14 and 15.

The visual modality words indicated more words being confused for the group test than the individual test. There seemed to be more confusion between cup, coat and bus than for eyes and arm. It would appear that some children were recalling only an individual letter in the words, as coat was given as the responses to arm 9 times. The response of bus for arm 9 times was possibly because of the same length of the words. In the same way arm was the response for cup 9 times. In the individual test; box, desk, and cake gave most trouble with desk being responded to with both box and cake. There would appear to be confusion of the b and the d with box and desk.

During the teaching periods many of the children named the letters (not always correctly) on their own and used the letter names to

TABLE 13

Frequencies of correct responses *

G. L. M. T. (n = 33)					I. L. M. T. (n = 29)				
Word	Total	Modality			Word	Total	Modality		
eyes	25	V			cat	24		A	
wet	25		A		pig	22	V		
jet	20		A		mat	21		A	
snow	19	V			egg	21			C
net	16		A		cow	20	V		
sun	16			K	tree	19	V		
car	16			C	fat	18		A	
pet	15		A		bat	15		A	
fish	14			C	toy	15		K	
girl	14			C	man	14			C
dog	12			K	box	13	V		
pie	11			K	cake	13	V		
fork	11			K	sat	13		A	
arm	10	V			leg	10		K	
coat	9	V			milk	10			C
mop	9			C	hat	10		A	
key	8			C	tail	9			C
boat	8			K	door	8		K	
bus	7	V			baby	7		K	
let	7		A		hen	7			C
get	7		A		desk	7	V		
cup	6	V			lamp	5			C
duck	5			C	bed	4		K	
hand	4			K	head	4		K	

V = Visual Modality
A = Auditory Modality
K = Kinesthetic Modality
C = Combined Modality

* All subjects who completed at least one of the two tests.

TABLE 14

Frequency of Incorrect Responses with the G.L.M.T.

Stimulus Words	Visual Modality					
	arm	bus	cup	coat	eyes	snow
arm		9	4	9	4	4
bus	6		14	8	5	7
cup	9	15		10	3	3
coat	3	10	10		3	3
eyes	1	4		4		1
snow	6	5	3		1	

Auditory Modality

	get	jet	let	net	pet	wet
get		5	7	5	8	8
jet	2		1	2		5
let	3	8		5	1	6
net	3	3	2		7	7
pet	4	2	5			5
wet	1	2	1	1	2	

Kinesthetic Modality

	dog	pie	sun	boat	fork	hand
dog		5		9	6	4
pie	8		5	4	4	8
sun	4	5		7		5
boat	10	2	2		4	6
fork	3	6	2	8		9
hand	3	4	1	13		2

Combination Modality

	car	key	mop	fish	duck	girl
car		3	3	9	2	3
key	5		7	6	4	11
mop	8	6		7	7	9
fish	8	3	2		8	6
duck	13	4	4	7		9
girl	7	4	3	9	4	

TABLE 15.

Frequency of Incorrect Responses with the I.L.M.T.

Stimulus Words	Responses					
	Visual Modality					
	box	cow	pig	cake	desk	tree
box		8	3	3	8	3
cow	6		2	3	1	2
pig	2	1		6	1	
cake	7	6	4		10	3
desk	11	6	3	11		3
tree	7	4	1	3	2	
	Auditory Modality					
	bat	cat	fat	hat	mat	sat
bat		2	2	6	3	4
cat	2	1	1	2	0	1
fat	1	2		3	2	1
hat	4	4	3		4	8
mat	2	0	4	4		1
sat	4	4	1	3	3	
	Kinesthetic Modality					
	bed	leg	toy	baby	door	head
bed		6	5	8	9	4
leg	4		5	4	0	7
toy	0	2		9	1	1
baby	9	4	4		4	2
door	10	7	1	5		3
head	7	4	5	11	6	
	Combination Modality					
	egg	hen	man	lamp	milk	tail
egg		3	1	3	3	1
hen	2		6	4	5	5
man	3	3		6	3	3
lamp	3	3	10		1	6
milk	0	2	9	5		2
tail	4	3	7	2	4	

remember the word. In one instance a child used all capitals in writing the word from memory at the end of the kinesthetic teaching cycle, although he had been tracing lower case letters. Many children remarked that such and such letter was in their own names or those of their friends. The children's names were prominently displayed in the classroom on their own drawings etc. The same pattern of letter cues with confusion of b and d is revealed in the individual kinesthetic modality; door and baby; leg and head; toy and baby; door and bed; head and baby. The group test kinesthetic modality reveals the same kind of errors, only with the addition of word length cues, that is to say words of three or four letters; dog and pie; sun and pie. In this group hand and boat were greatly confused, with hand receiving only four correct responses for all subjects.

In the combination individual tests, apart from confusion of lamp and man the responses seemed more erratic. This is more true for the group test with confusion for car and fish; key and girl; girl and fish; being most prominent. These results suggest that the combination modality was more confusing than the other methods for some of these children.

The auditory modality responses show less differences between frequencies of wrong responses and would suggest more guessing. The low frequency of correct responses for get and let could have been due to less familiarity with the oral use of them or possibly the smaller interest appeal of the words.

The question of interest appeal of the words appeared to be important to some children, but no study was made of it. It is possible

that it could have influenced the different modality preferences indicated by the data. Tables 14 and 15 also indicate much guessing which was confirmed by the writer's own observations during testing.

Summary of Findings

1. It was hypothesised that some kindergarten children would learn written words more effectively through one particular modality or a combination of modalities. This was supported by the data.

2. The main hypotheses of this study, was that a group teaching technique would be as effective as an individual technique in determining kindergarten children's most efficient learning modalities. This was supported statistically in all but the visual modality. The correlations between the two tests were too low, however, to be of educational significance.

3. It was hypothesised that kindergarten children's preferred modalities would show no relationship to sex, intelligence, or school class. There was not sufficient evidence to support or reject this hypothesis but some trends were indicated by using children's highest scores in the modalities.

4. There were tendencies for the girls to prefer auditory and combination modalities and for the boys to prefer the combination modality the least, and the visual and auditory the most. The high intelligence group performed similarly to the girls and the low intelligence group to the boys, with no low intelligence group subjects preferring the combination modality. Class A and Class B showed little differences except in the auditory modality, where the group test was

most efficient for Class B and the individual test for Class A.

5. There were some significant differences for the means of total words learned in each modality with the auditory and visual modalities means being higher than the kinesthetic and combination modalities.

6. It was further seen that girls, the high intelligence group, and Class B learned more words by group teaching methods than did the boys, the low intelligence groups, and Class A respectively. All groups learned more words by the individual teaching methods than the group methods.

7. The last variable examined was the choice of words in each of the modality tests. Some words seemed to be easier to recognise than others, but it is not possible to say if this contributed to the variance between the tests or modalities. There is some evidence that letter knowledge or confusion contributed to the variance between words.

Summary of Conclusions

1. The evidence supported the hypotheses that some children learning to read are more efficient in one sensory input channel than another. In this study less than one quarter of the sample showed evidence of this although Mills (1955) and Rivkind (1958) found about one third of their samples showed this tendency. This modality preference appeared to have no significant relationship to sex or intelligence.

2. It was possible to use a group teaching technique to teach words to kindergarten children. The largest group taught in this study was eight children but this number could probably be extended if necessary.

3. The positive correlations between the modality results and total results of the group and individual tests suggest that the group test

could possibly be developed into a reliable method of determining children's modality preferences. The correlation coefficients derived for the tests used in this study, however, were too low for this group test to be considered a reliable indicator of children's preferred modalities.

4. The evidence is fairly clear that kindergarten children of approximately the same age are at varying stages of development with regard to readiness to begin reading.

5. Kindergarten children from middle class backgrounds similar to the study sample, learn written words more efficiently by individual teaching methods than group teaching methods, and this applies more to the boys and the lower intelligence groups.

6. These children who would appear to be representative of other Canadian middle class urban backgrounds had much knowledge of, and interest in letters and their names. It was estimated that approximately half of the children in the study were watching the Sesame Street programme on the Television at some time so that this could have been a cause.

7. The teaching of reading by means of a phonic based programme would be interesting and efficient for many of these children. It can be surmised that children of other similar cultural backgrounds would also be the same but more efficient means of selecting these children are needed.

8. The use of kinesthetic methods of teaching written words for kindergarten children would seen to be an inefficient method for almost all children.

9. Great caution should be exercised in the use of multisensory teaching techniques with some kindergarten children as they appear to cause some learning confusion.

Summary of Chapter IV

This chapter has examined the data to find evidence to support or reject the hypotheses of this study. It has discussed the findings and made conclusions based upon them.

CHAPTER V

SUMMARY, IMPLICATIONS AND SUGGESTIONS FOR RESEARCH

The Problem and Specific Purposes Restated

At this point it would seem pertinent to consider again the problem and the basic purpose of this study. It is assumed that a fundamental problem in reading is word recognition although it is recognised that this is only one facet of the total reading process. In the initial stages of learning to read, word recognition techniques must be taught at some stage. Most reading schemes in general use introduce words first, even though they may be in context.

It was seen, in the introduction to this study, that most authorities on the teaching of reading recognize that no one system of teaching reading has proved superior with all children. There is also strong support for the position that the child is the most important variable in the reading process, and that different methods of teaching reading may be successful with different children. Some teachers have reported very great success with specific methods but no teacher has reported one hundred percent success with a particular method with all children.

The study of the literature suggested that children may learn reading more efficiently through an individual sensory channel; that is with an emphasis in the teaching, on visual, auditory or kinesthetic methods of learning word recognition techniques. It was seen that learning methods tests based on the Mills (1955) model had proved helpful in diagnosing the preferred modality with children who had developed reading problems. This study attempted to extend the use

of this model to kindergarten children who had not received any reading instruction in school. An individual test is very time consuming and so this study attempted to produce and evaluate an efficient group learning test, (The G.L.M.T.) to determine individual kindergarten children's most efficient learning modalities.

An individual and a group test were designed and administered to 28 kindergarten children, mostly from middle class backgrounds. Each test took the form of teaching and testing procedures in each of the visual, auditory, kinesthetic and combined modalities. In the group test the children were taught in groups of six to eight children. In both tests the children were tested individually, immediately on completion of the teaching sequence and again 24 hours later. It was anticipated that the two tests would record similar results for each child. If this was so, then the differences between a child's scores in each modality of the group test could be used to determine his most efficient modality. This could be used as a guide to methodology in teaching him how to read.

Summary of Findings

An analysis of the scores obtained by the children in the four modalities with both tests showed that the tests were positively correlated with each other in all modalities and total scores, and that these were all significant beyond the 0.05 level of probability in all but the visual modality. Apart from the total scores, the correlation coefficients were too low to place much reliance on the individual children's scores on the group test to determine the best methods to

teach reading to individual children.

The scores showed most children responded differently in the four modality sub-tests of each test but only for two subjects were the same modality preferences significant in both tests. There were tendencies, however, for much more agreement between modality preferences on the two tests if highest scores in each modality had been used as the criteria of preference. In this case 15 out of 28 subjects recorded highest scores in the same modalities in both tests.

The modality trends indicated by the highest scores suggested some differences caused by sex and intelligence, but these were not significant, which supports a hypotheses of this study that modality preference has no relation to sex or intelligence.

Some of the factors which could have contributed to the differences between the two tests were seen to be; the children's individual efficiencies in group and individual teaching situations; the varying difficulties in the words to be learnt; and possibly the order in which the two tests were given. There seemed to be some advantage in having the individual test administered second. There may also have been differences relating to morning or afternoon attendance at school. It could have been possible for the children to have acquired some knowledge of letter names outside of school. Varying degrees of knowledge could have affected the scores obtained in the tests.

Limitations

The limitations and findings of this study have to be taken account of in considering any educational significance it may have.

1. Sample

It is limited by the small sample and the one school used in this study. Although two different classes were used they both used the same teacher and classroom. Further studies with other kindergarten children would be needed to establish the validity of these results.

2. Words

This study was limited by using different written words for the two tests. The difficulty of learning, or interest appeal of the words for kindergarten children was not tried beforehand because Mills type studies seemed to suggest that this was not important. The evidence from the results obtained in this study suggest that the words used may be an important variable for kindergarten children. Since randomization of the words used would present further problems in difficulty of learning it would have been better had means been found to rotate the same words between the two tests and modalities with different groups of matched subjects.

3. Environment

A further limitation with studies of this nature is that the experimenter has little control over the variables introduced into the classroom environment such as visitors or classroom routines so that one period is less favourable than another for testing with the same child. During the total of 10 teaching and testing periods for each child over a period of five weeks, it would be a coincidence if the same environmental conditions exactly recurred. A class teacher using the group test during a period of one week would be able to control some of these variables.

4. Validity

The most important limitation to the validity of the results lies in the extent to which the teaching techniques used in a particular modality ensures the use of that modality by the child in learning to recognize the written words. It was assumed in this study that the emphasis in the teaching technique used would produce more efficient learning in that modality. There was evidence in the study that this was not always true. The children used single letter cues in learning and recognizing the stimulus words. The voluntary naming of letters in the kinesthetic modality, the writing of words in capital letters after tracing them in lower case and the analysis of wrong responses, show that some children were using other than the taught modality to learn the words.

Educational Implications

The educational implications of this study are best seen by examining the use which a class teacher could make of the results obtained to teach reading to the subjects of this study. There was evidence from both tests that some children were more ready to learn written words than others. It would appear to be inadvisable to teach reading to those subjects with low delayed recall scores. This was also obvious during the testing as some children did not appear to be aware of the relationship between the oral word and its graphic symbols. Further tests of reading readiness should be made. A few children scored well on immediate recall and low on delayed recall. It is suggested that these children would benefit from more frequent

teaching of the same words. Some children, usually those with low scores, performed better on delayed recall than on immediate recall. Had more words been used in each modality it is possible that more children would have shown this tendency. MacAulay (1965) also reported the occurence of this phenomena in first grade children. A class teacher of kindergarten or first grade children should be aware of this possibility when recording immediate test recall scores.

The low delayed recall scores with the kinesthetic modality and the higher correlation between the two tests in this modality would suggest that the use of tracing and writing techniques would not be helpful in learning to read in the initial stages. The co-ordination and physical effort required in the writing of the words probably acted as a deterrent to learning. Some of the children in the study were not able to write out the words from memory in the time allowed. These children were allowed to trace the words from memory with their fingers. For only one subject (No. 20) was there evidence that this was an effective learning device and even he managed to do just as well by the visual technique.

Some subjects showed a marked strength in the auditory modality and the general high scores in this modality would suggest that an early emphasis on phonics for many of the children would be an effective learning aid. Even if the words were easier to learn than the other modality words, the use of the technique used in the study would appear to be effective.

There is evidence, which was supported by the experimenter's observations during the teaching sessions, that the combination of

methods in a single short teaching session was confusing and hindered learning for most children not of high intelligence.

The use of word configuration techniques in the visual modality appeared to be very confusing to most of the children and seemed to offer no aid to learning. Most of the subjects had great difficulty in matching the words and their gestalt. It is possible that with words of greater variation in length and configuration that it might be of some help, but is still of doubtful long term use since it has no applicability in trying to say a new written word.

There was evidence in the teaching and testing sessions that some children used the picture in the visual and combination modalities as an aid to remembering the word. If a child first gave say 'farmer' as the name for the picture of 'man' even after correction and teaching he responded with 'farmer' to the printed word 'man' on the delayed recall test. This happened with different words on several occasions but no record was made of the frequency since responses other than the words in the modality group were not recorded.

In summary, then, these results were not sufficiently conclusive to rely on the results of the G.L.M.T. to teach a child reading with emphasis on his preferred modality. An emphasis on visual and auditory modalities in the initial stages would appear to be best with most of these children. Use should also be made of the children's obvious interest in letter names.

The teacher's own personal observations, combined with these results, would determine if any of the modality preference trends shown in the study were significant aids in learning to read.

The general educational implications of this study support the assumption made in the research into the literature of related studies that some children do have a preferred modality (or modalities) in which more efficient learning of written words occurs. The techniques for establishing these still needs much research and refining but this study suggests that the use of different group modality teaching and testing techniques may provide a reliable method of doing this.

Implications for Classroom Practice and Further Research

This study has suggested lines of related research which might aid in the development of a more reliable group learning methods test for kindergarten children.

1. Evidence is needed about the best time in the school year to evaluate kindergarten children's most efficient modalities. In this study, would the children have had less knowledge of letters if it had been conducted earlier, and would more of the children have shown more definite modality trends earlier or later in the year ?
2. The study needs replication with other kindergarten children to see if the same kinds of results would obtain. Also studies need to be made with class teachers administering the group test since that is its ultimate aim.
3. The different results obtained for the individual and the group test by boys and girls and high and low intelligence groups seems worthy of further investigation.
4. Different kinesthetic teaching techniques could be examined to determine their effectiveness with kindergarten children.

5. The effectiveness of word gestalt teaching techniques needs further investigation.

6. The possibility of administering the group test in one day could be examined. This would control some of the variables that seemed to affect the results of this study but at the same time could introduce learning confusion between more of the words.

7. It would be of interest to compare the results of a group test with the results of sub-tests of commercial reading readiness tests that purport to measure aptitude or potential in particular sensory modalities.

8. An important area of research appears to be the choice of words for learning methods tests. This study showed that for various reasons some words appeared to be easier to learn than others. Three lines of enquiry are suggested:

a) The use of nonsense syllables compared with the use of real words.

b) The length and configurations of the words to be used.

c) The interest appeal to the children of the words to be used. It seems obvious that some oral words would have a stronger connotation than others to individual children but it is not known how this affects the learning of the written word. It is possible that printed, and possibly spoken words have positive negative or neutral appeal to children that has nothing to do with the actual meaning of the words. If this is so then it might affect the ease of learning to read words. It might also influence the choice of modality by which the word is best learned.

9. Further evidence is needed as to the possibilities of teaching young children to read by emphasizing their preferred modalities in the teaching process. Also evidence is needed on the possiblities of improving children's performance in their weaker modalities.

10. It would be interesting to pursue further the fact that some children appeared to prefer a group teaching technique to an individual one.

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APPENDIX A.

THE INDIVIDUAL LEARNING METHODS TESTS

The examiner will spend one day in the classroom previous to the experiment to enable rapport to be made with the children. The teaching and testing will be held in a small room opening into the classroom.

The written words to be taught and tested are as follows:

V.M.	K.M.	A.M.	C.M.
box	bed	bat	egg
cow	leg	cat	hen
pig	toy	fat	man
cake	baby	hat	lamp
desk	door	mat	milk
tree	head	sat	tail

The words for the V.M., K.M., and C.M., cards are formed from "Letraset" transfers-Futura Light-type, lower case letters, 48 pt, Mounted on four inch by two inch cream coloured cards. The V.M. and C.M. cards have the word and a simple black line picture drawn by a felt pen on one side and the word only on the reverse side. The A.M., cards have the consonants produced by "Letraset" Futura Bold, lower case letters in 72 pt, on one side of cream coloured one inch by two inch cards. One, three by two inch, card has the letters "at" in similar type. All the cards have been sprayed with a protective clear gloss coating to prevent finger smudging and stray marks appearing on them.

In addition for the V.M., there is a set of six blue, four inch by two inch cards with the gestalt of the V.M., words outlined in black

ink on them. Also there is one card with the word "tree" printed inside the gestalt.

For the K.M., and C.M., the words are also outlined by a medium width felt pen in letters two inches high on 11 by 8 inch white paper.

TEACHING PROCEDURES FOR THE FOUR METHODS

The Visual Method

1. Present the six picture cards to the child with the picture-side up. Ask him to look at the picture and the word and say what it is. Correct if necessary. Point out the word and help him to make sentences with it so that he understands the meaning.
2. Help the child to arrange the cards into groups of two or three to make meaningful sentences.
3. Turn the cards over and tell the child the spoken form of the word asking him to repeat it.
4. Help the child arrange the cards into three and four letter groups. Help him to say the words.
5. Turn the cards over and point out the individual written characteristics of the letters in each word without naming them.
6. Turn the cards over. Show the blue card with the gestalt drawn round the word "tree" and ask him to find the word card to match it. Now ask him to find the empty gestalt card to match them. Ask him to match all the words and gestalts. Help him to say the words.
7. Ask the child to guess the words and let him turn the cards over to check his accuracy. Do this three times, re-arranging the order of the cards for each set of six tries.

8. If fifteen minutes have not elapsed, repeat the teaching cycle starting at step 1. until exactly fifteen minutes have passed.

9. Administer the recall test by exposing the word side of the cards, one at a time, in random order, and asking the child to say the word. If no correct reply is received in twenty seconds mark the reply as wrong. Do not inform him whether he is right or wrong.

Phonic or Auditory Method

1. Show the child the letter cards to see if he knows the name of any of them.

2. Commencing with any letter known and then in order as follows m, b, h, c, f, s, teach the child the name and phoneme of the letters (c, is hard).

3. Help the child to say other words beginning with the same phoneme. Emphasize this phoneme and ask the child to repeat it after you.

4. Place the 'at' card in front of the child and tell him what it says, asking him to repeat it after you several times.

5. Place the letter card in front of the 'at' card and tell the child the spoken word, emphasizing the initial phoneme. Make sure the child knows the spoken word and ask him to repeat it.

6. Repeat steps 2 to 5 with the other five letters.

7. Play a guessing game with the child, with random groups of two letters and then random groups of three letters, placing them one at a time in front of 'at' and asking him to say the word. Give help where necessary.

8. If fifteen minutes have not elapsed repeat the teaching cycle

starting at step 2, until exactly fifteen minutes have passed.

9. Administer the recall test by placing the letter cards in front of 'at' one at a time in random order and asking the child what the word says. If no correct reply is received in twenty seconds mark it as wrong. Do not tell the child whether he is right or wrong.

Kinesthetic Method

1. Present one of the three letter word cards to the child and tell him the word, making sure that he understands the meaning.
2. Place the large lettered word in front of the child and show him how to trace it with his finger saying it as he traces it. The finger must be in contact with the paper.
3. Have the child repeat the tracing several times and saying the word until his finger is moving in easy rhythm.
4. Have the child repeat the tracing pattern on another sheet of paper while looking at the large word.
5. Have the child write the word from memory on the same piece of paper with a crayon. If he fails let him trace the written word again and then repeat until he is successful.
6. Have the child identify the same written word from the six word cards.
7. Repeat steps 1 to 5 for all the six written words.
8. Repeat step 2 with each of the written words showing the word card alongside each tracing word until fifteen minutes have elapsed.
9. Administer the recall test by exposing the word cards one at a time in random order and asking the child to name them. If no correct

reply is received in twenty seconds the word is marked wrong. Do not tell him whether he is right or wrong.

Combination Method

1. Present the six picture cards to the child, picture-side up. Ask him to look at the word and the picture and say what spoken word it represents. Make sure that he understands what the word means. Do this with all of the six words.

2. Point out the individual characteristics of the letters in the words. (tall letters, repeated letters and etc.)

3. Name and sound the initial letters of the words pointing to them as you say them. Have the child repeat after you. Emphasize the ending sounds while saying the words. Help the child to think of other words that rhyme with the words.

4. Repeat the six spoken words slowly as you stress the phonemes and point to the graphemes. Have the child repeat after you.

5. Present the large tracing words and have the child trace them with his finger in contact with the paper while saying them.

6. Have the child trace with his finger on another piece of paper while looking at the tracing word.

7. Have the child write out the word from memory on this piece of paper. Repeat the tracing and writing, if necessary, until he is successful. Ask him to sound out the words stressing the initial and ending phonemes.

8. Repeat step 7. until exactly fifteen minutes have passed.

9. Administer the recall tests with the word side of the cards in random order, as in the other tests.

APPENDIX B.

THE GROUP LEARNING METHODS TEST

The written words to be taught and tested are as follows:

Vis	Kin	Aud	Comb
arm	dog	get	car
bus	pie	jet	key
cup	sun	let	mop
coat	boat	net	fish
eyes	fork	pet	duck
snow	hand	wet	girl

The words for the V.M., and C.M., cards are formed from "Letraset" transfers in Futura Bold type, 72 pt, lower case letters, mounted on 5" by 9" cream coloured cards. The V.M., and C.M., cards have the word and a simple black line picture drawn with a felt pen, on one side, and the word only on the reverse side. The K.M., cards have the word only on one side. The A.M., cards have the initial consonants in the same type on, 2" by 2" cream coloured cards, and one card, 4" by 2" with the letters 'et' mounted near the left side. All the cards have been sprayed with a protective clear gloss coating.

For the K.M., and C.M., the words are also outlined with a medium width black felt pen, in letters 2" high, on 11" by 8" white paper.

In addition for the V.M., there is a set of six cream coloured 5" by 9" cards with the gestalt of the V.M., words outlined in black ink on them. There is also one card with the word "arm" printed inside the gestalt.

TEACHING PROCEDURES FOR THE FOUR METHODS

The children will be seated in groups of six or seven at a large table on three sides of the teacher for all the four methods.

The Visual Method

1. Present the six picture cards to the children with the picture-side up. Ask them to look at the written word and picture and say the spoken word it represents. Correct if necessary. Point out the written word and help the children to make sentences with it so that they understand the meaning.
2. Ask the children to help you arrange the cards into groups of two and three to make meaningful sentences.
3. Turn the cards over and let the children guess the spoken form of the words. Correct if necessary, and have all the children say the words.
4. Have the children count the letters and place them into groups of three and four letter words saying their names.
5. Turn the cards over (picture-side up) and point out the individual characteristics of the letters in the word. Dont name or sound the letters.
6. Show the card with the gestalt drawn round the word "arm" and have the children find the matching word card and the empty gestalt to match. Have them match the other words and gestalts.
7. Ask the children to guess what spoken words the written words represent and turn them over to check their accuracy. Do this three times rearranging the order of the cards for each set of six tries.

8. If twenty minutes have not elapsed repeat the teaching cycle starting at step 1 until exactly twenty minutes have passed.

9. Administer the recall test by exposing the word side of the cards in random order to the children individually. If no correct reply is received in twenty seconds score wrong. Do not inform him whether he is right or wrong.

Phonic or Auditory Method

1. Commencing with the letter card p and n, w, g, j, l, in order teach the children the name and sound of the letter (g, is hard). Do one letter then proceed to step 2.

2. Help the children say other words beginning with the same phoneme. Emphasize the sound and have them repeat it after you.

3. Place the 'et' card in front of the children and tell them what it says having then repeat it several times.

4. Place the letter card in front of the 'et' card and tell them the spoken word emphasizing the initial phoneme. Make sure they understand the spoken word and have then repeat it.

5. Repeat steps 1 to 5 with the other five letters.

6. Play a guessing game with the children, with random groups of letters and then three letters, placing them one at a time in front of 'et' and asking them the spoken word. Give help where necessary. Continue until exactly twenty minutes have passed.

7. Administer the recall test to individual children by placing the letter cards in front of 'et' one at a time in random order and asking the child what the word says. If no correct reply is received in

twenty seconds mark as wrong. Do not inform the child whether he is right or wrong.

Kinesthetic Method

1. Present one of the three letter word cards to the children and tell them the name, making sure that they understand the meaning.
2. Place the tracing word in front of the children and tell them its the same word. Show them how to trace it with their fingers in contact with the paper, saying it slowly as they trace.
3. Have the children repeat the tracing several times.
4. Have the children trace on another piece of unmarked paper looking at the tracing word.
5. Have the children write from memory on the same piece of paper with a crayon. If any children fail let them repeat the tracing and writing until successful.
6. Have the children identify the written word from the six word cards.
7. Repeat steps 1 to 5 for the other five words.
8. Play a guessing game with the word cards until exactly twenty minutes have passed.
9. Administer the recall test by exposing the word cards one at a time in random order, to individual children, and asking them the name. If no correct reply is received in twenty seconds score as wrong. Do not tell him whether he is right or wrong.

Combination Method

1. Present the six picture cards to the children, picture-side up.

Have them look at the written word and the picture and say what spoken word it represents. Make sure that they understand what the spoken word means. Do this with all six words.

2. Point out the individual characteristics of the letters in the words.

3. Name and sound the initial letters of the words pointing to them as you say them. Have the children repeat after you. Emphasize the ending phonemes while saying the whole word. Help the children to think of other spoken words that rhyme with the stimulus words.

4. Use the word side of the card and say the six words slowly as you stress the phonemes and point to them. Have the children repeat after you.

5. Present the large tracing words and show the children how to trace them, with the finger in contact with the paper, while saying the word.

6. Have the children trace on another piece of paper while looking at the written word.

7. Play a guessing game with the words until exactly twenty minutes have passed.

8. Administer the recall test with the word side of the cards in random order to individual children as in other tests.

APPENDIX C.

INDIVIDUAL LEARNING METHODS TEST--RECORD FORM

Name ..... Date ..... Class .....

Sex .... Age ..... D. B. ..... I.Q. .....

Visual			Auditory		
	Immediate	Delayed		Immediate	Delayed
1. box	.....		1. bat	.....	
2. cow	.....		2. cat	.....	
3. pig	.....		3. fat	.....	
4. cake	.....		4. hat	.....	
5. desk	.....		5. mat	.....	
6. tree	.....		6. sat	.....	
TOTALS	.....		TOTALS	.....	

Kinesthetic			Combination		
	Immediate	Delayed		Immediate	Delayed
1. bed	.....		1. egg	.....	
2. leg	.....		2. hen	.....	
3. toy	.....		3. man	.....	
4. baby	.....		4. lamp	.....	
5. door	.....		5. milk	.....	
6. head	.....		6. tail	.....	
TOTALS	.....		TOTALS	.....	

APPENDIX D.

GROUP LEARNING METHODS TEST--RECORD FORM

Name ..... Date ..... Class .....

Sex .... Age ..... D. B. ..... I.Q. .....

Visual			Auditory		
	Immediate	Delayed		Immediate	Delayed
1. arm	.....		1. get	.....	
2. bus	.....		2. jet	.....	
3. cup	.....		3. let	.....	
4. coat	.....		4. net	.....	
5. eyes	.....		5. pet	.....	
6. snow	.....		6. wet	.....	
TOTALS	.....		TOTALS	.....	

Kinesthetic			Combination		
	Immediate	Delayed		Immediate	Delayed
1. dog	.....		1. car	.....	
2. pie	.....		2. key	.....	
3. sun	.....		3. mop	.....	
4. boat	.....		4. fish	.....	
5. fork	.....		5. duck	.....	
6. hand	.....		6. girl	.....	
TOTALS	.....		TOTALS	.....	

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