EFFECTS OF PRESENTATION AND REINFORCEMENT ON THE RECOGNITION OF A WORD LIST BY KINDERGARTEN CHILDREN

by

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B.Ed., University of Victoria, 1970

A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in the Faculty of

Education

ACCEPTED
FACULTY OF GRADUATE STUDIES
[redacted]
DEAN
DATE 1 Oct 73

We accept this thesis as conforming
to the required standard

[redacted]

UNIVERSITY OF VICTORIA

September, 1973

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ABSTRACT

A sample of 120 kindergarten children, 60 boys and 60 girls, was taken to a learning task of recognising four words of known meanings. One group of 40 children, 20 boys and 20 girls, was presented the list by printed stimuli alone. A second group of 40 children was presented the list by printed stimuli and coloured photographs represented by the words while a third group of 40 children was presented the list by printed stimuli and objects represented by the words. One-half of the students in each group, 10 boys and 10 girls, received verbal reinforcement for correct responses while the other half of each group received material reinforcement (pennies) for correct responses. Trials to mastery and retention scores were analysed.

A three-way analysis of variance indicated no significant differences for either the main effects of method of presentation, sex, and type of reinforcement or for interaction effects of method of presentation, sex, and type of reinforcement.

Independent t tests comparing means between individual cells, calculated with the purpose of finding trends which might be useful in future research, showed the following significant results. Girls' retention scores with material reinforcement indicated that both the word card and

word-picture methods of presentation were better than the word-object method of presentation. Girls' trials to mastery scores with material reinforcement also favoured the word-picture method over the word-object method. Girls' retention scores in the word-object cell indicated that verbal reinforcement was better than material reinforcement. Boys remembered more words than girls in the word-object experimental condition with material reinforcement.

Two-way analysis of variance indicated no significant interaction effects between the combinations of the variables of types of reinforcement, methods of presentation, and sexes of children.

Conclusions reached on the basis of this study indicate that kindergarten children do not appear to be influenced by associational cues such as pictures and objects when learning to recognise words. Both reinforcements offered appeared to provide incentive to learn; neither reinforcement, however, appeared better than the other in facilitating the acquisition and retention of a list of words.

Great variability between individual children was in evidence. Further investigation into more efficient methods of learning new words appears warranted.

Examiners: [redacted]

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ACKNOWLEDGEMENT

The writer wishes to express sincere appreciation to Dr. L. O. Ollila, Chairman of the Supervisory Committee, for his guidance and support during the preparation of this thesis. The constructive suggestions and encouragement given throughout the study by Dr. P. O. Evanechko, Faculty of Education, are gratefully acknowledged. The writer also acknowledges the advice and criticism of Dr. B. N. S. Gooch, Faculty of Arts and Science.

Special appreciation is extended to the teachers of Fairburn, Lakehill, Craigflower, and Hampton Schools in Victoria for opening their kindergarten rooms to the writer.

CHAPTER 1

INTRODUCTION TO THE PROBLEM

I. The Problem

At the outset of learning to read, children are taught many words which they are expected to recognise instantly. It would be helpful to teachers and students alike if more efficient methods of teaching such words, a sight vocabulary, could be established. This study considers both the methods of presenting a list of words for more efficient mastery and the types of reinforcement as they affect such learning.

II. The Purpose of the Study

The process of reading, the deriving of meaning from arbitrarily appointed graphic symbols, the recognition and interpretation of these symbols, is an extremely complex task. Initially, in order for word recognition to occur, the beginning reader must exhibit capabilities in various developmental attributes such as mental age, visual and auditory discrimination, speech, language, motor abilities, and motivation to learn. Combined with the necessary experiential background, these factors assist the reader to derive meaning from the graphic symbols.

The complex nature of the reading task combined

with the necessity of the child's being in possession of developmental capabilities makes initial reading a difficult task for the beginner. Some writers such as Woodworth (1938) marvelled that even intelligent children learn to read fairly easily. The graphic symbols being two steps removed from the actual object (the symbols stand for words which in turn represent objects), the language being phonetically imperfect, and the eye being regimented into a left to right, top to bottom movement while previously it had been free to roam at will present many difficulties. As well, the beginning reader requires a greater memory since he has to remember the beginning of a passage through his struggles with word identification prior to finishing the passage.

In order to ease the task of word recognition, many writers have suggested the use of pictures or objects to identify word meaning. Labelling objects and attaching names to pictures has been suggested as an early reading experience by Jones (1971) and Karlin (1971). That new words will be more easily recognised if they are accompanied by a picture is a view expressed by Harris (1956), Tinker and McCullough (1968), and Chall (1967). Aukerman (1971) suggested the use of pictures in learning to recognise initial consonants.

However, there is disagreement on the effectiveness of the use of pictures in learning to read. Bloomfield and

Barnhart (1961) advanced a linguistic method of teaching reading which was notable for its lack of pictures. Studies done by Miller (1938), Samuels (1967), Ollila (1967), and Braun (1969) indicated that pictures and objects were, in fact, a deterrent to learning a sight vocabulary. It would appear that the object and picture stimuli were stronger than the word stimulus for some children, causing them to attend to the distracting stimulus. Santostefano, Rutledge, and Randal (1965) suggested that the inability to withhold attention from distracting stimuli is an important factor in reading disability. Samuels (1967) recognised that the less capable student was more affected by distractive stimuli and wondered whether the presence of pictures in reading primers was indeed a good practice.

Since learning to read presents a difficult task for him, it would seem reasonable that the beginner be rewarded for his successful attempts. Some form of extrinsic reinforcement has been suggested by Bloom (in Athey, 1971) and Staats (1964) as being effective with early readers. Other studies, Smith, Brethower, and Cabot (1969), Fischer (1963), Benowitz and Busse (1970), and Heitzman (1970) have supported the use of material reinforcement with various learning tasks.

Some studies found that the use of material reinforcers, as well as the use of pictures and objects,

presented a distraction. Pikulski (1970) concluded that in a sample of middle class children, fewer errors were made when subjects were given reinforcement of a social nature rather than either material reinforcement or knowledge of results. (See below, p. 56.) In an attempt to explain the poorer performance in a candy-reinforced study, Spence (1970) claimed that the children were distracted by the procedure involved in the reinforcement--the candy being dropped into a dish after a correct response. (See below, p. 59.) Pikulski agreed, reporting that in his study some children were greatly distracted by pondering the problem of whether or not to eat the candy reward immediately.

Several questions arise from the studies reviewed. Does a beginning reader learn more rapidly by having words presented alone, accompanied by a picture, or with an object? Does the beginning reader learn words more rapidly when he is given material reinforcement or verbal reinforcement? Does one type of reinforcement work better for boys and another for girls? Does one method of presenting words result in greater retention? Does the type of reinforcement affect the number of words retained? The purpose of this study is to investigate the effects both of methods of presentation and of types of reinforcement on the acquisition and retention of a word list by kindergarten boys and girls.

III. Hypotheses

The following null hypotheses will be tested:

1. There will be no significant differences in the trials to mastery of a word list between:
   a methods of presentation
   b sex of children
   c types of reinforcement
2. There will be no significant interaction effects in the trials to mastery of a word list on:
   a Method of Presentation X Sex
   b Method of Presentation X Type of Reinforcement
   c Type of Reinforcement X Sex
   d Method of Presentation X Sex X Type of Reinforcement
3. There will be no significant differences in retention scores between:
   a methods of presentation
   b sex of children
   c types of reinforcement
4. There will be no significant interaction effects in retention scores on:
   a Method of Presentation X Sex
   b Method of Presentation X Type of Reinforcement
   c Type of Reinforcement X Sex
   d Method of Presentation X Sex X Type of Reinforcement

IV. Assumptions

1. It is assumed that pennies will provide reinforcement for all children involved in the study.
2. It is assumed that praise and encouragement will provide reinforcement for all children involved in the study.

V. Definition of Terms

1. word-card method--a card bearing the printed word. The examiner will present the card, say the word, and have the child repeat the word.
2. word-picture method--a card as above accompanied by a picture of an object represented by the word. The examiner will present the word, say the word, present the picture, and have the child repeat the word.
3. word-object method--a card as above accompanied by an object represented by the word. The examiner will present the word, say the word, present the object, and have the child repeat the word.
4. material reinforcement--a reward in the form of money (new pennies) given in return for correct responses.
5. verbal reinforcement--a reward in the form of praise and encouragement: "very good" "well done" "let's try again" "good for you" "almost right"
6. mastery--two successive trials of correctly identifying the word list.

7. trials to mastery--the number of trials required to attain mastery of the word list.
8. retention score--the number of words remembered 24 hours after their being taught.
9. sight vocabulary--those printed words that the student recognises immediately that he sees them.
10. rate of acquisition--the number of trials required by the student to attain mastery of the word list.

VI. Limitations

1. The list of words is minimal and consists only of concrete nouns.
2. Socio-economic status has not been controlled.
3. Intelligence has not been considered.
4. The procedures employed (individual teaching and monetary reinforcement) are unlike those commonly used in early reading instruction.
5. Results are applicable only to schools and procedures similar to those used in the study.
6. Interaction of the children may have affected some of the experimental results.

VII. Significance

Achieving mastery of a sight vocabulary is difficult for many children. Many teachers use pictures and objects as a means of assisting children to learn new words. On the basis of research, the value of such materials may be

questioned. If the method of presentation shows a significant difference in favour of word stimuli presented alone, a re-examination of the use of pictures and objects in teaching a sight vocabulary would be needed.

Reinforcement is considered necessary to facilitate learning. However, the relative effectiveness of various types of reinforcement needs to be determined. Discovery of a method of reinforcement which provides for efficient learning of a sight vocabulary would be of great value. The results of testing the significance of verbal and material reinforcement as they foster learning of words may well indicate the need for more diverse systems of reward for children.

A greater percentage of boys than girls have been known to have reading difficulties. If an efficient method of presenting the reading task to boys can be determined, it may be possible to eliminate many of these difficulties. If a particular type of reinforcement results in more effective learning, a careful examination of the systems of providing motivation for boys and for girls would be in order.

VIII. Organisation of the Study

This study is presented in six chapters. The first chapter contains the statement of the problem and an indication of the purpose, of the hypotheses, and of the definitions, limitations, and significance of the study.

The second chapter consists of an outline of the theoretical construct which includes those parts of the reading process and conditioning theory which apply to the present study. A theoretical model of the process and methodology involved in this study is included.

Chapter Three contains the review of related literature. Included are global theories of reading, specific studies of cues used by children to recognise words, research reports of picture and object cues provided to foster word recognition, principles of operant conditioning as applied to human learning, and research results of providing a variety of reinforcements for different learning tasks.

The fourth chapter describes the experimental design and includes sections on the analysis of data, the sample and population, the selection and preparation of materials, and the procedures employed. Results of a pilot study are included.

Chapter Five consists of the results of the analyses of data. Observations of cues used by children to recognise the words are included.

The final chapter summarizes and presents a discussion of the results. Educational implications and suggestions for further studies complete the chapter.

CHAPTER 2

THEORETICAL CONSTRUCT

This chapter will present the theoretical background to the reading process as it is considered in this study and to the principles of conditioning and reinforcement specifically as they apply to word recognition. A model of the reading process and methodology involved in this study is included. (See Figure 1.)

I. The Reading Process

Authorities in the field of reading have suggested that the reading process can be divided into several steps. While early writers tended to regard reading as mainly involving perception of words (recognition of meanings and pronunciations), current writers regard reading as involving more than word perception. (See p. 20.)

Vernon (1954) saw perception as consisting of four stages, the first two being directly applicable to the early stages of word recognition which are being considered in the present study. First, the sensory receptors exhibit a vague awareness or a feeling that some stimulus is present. Second, there is a more complete awareness that the stimulus is connected with an object which exists in the visual field. Third, the visual stimulation rises from the

visual field, its important characteristics are identified, and meaning is attached. Vernon included some reaction or response as the fourth stage; other writers have identified one appropriate response as the naming of an object which was seen.

Anderson and Dearborn (1952) also described beginning reading in stimulus and response terms. Involved in the process is the addition of new stimuli to existing responses. Since oral language precedes written language, the child has already established some control over the structure of the language. Existing responses, therefore, are those verbal responses which the child produces in answer to auditory stimuli. A large repertoire of possible vocal responses necessarily must be in the child's possession before he is capable of discriminating that particular response which is appropriate to verbal stimuli. For example, in reply to a teacher's question, the child must give consideration to several possible answers before the one correct response can be given. In learning to read, discrimination of such verbal responses may be the intermediate step between visually perceived symbols and successful perception of meaning. Sounding out new words produces the auditory stimulus which evokes a significant response which is, in turn, conditioned to the visual stimulus of the printed word.

In order to facilitate the transfer of vocal

responses from oral stimuli to visual stimuli, the new stimuli (printed words) must be broken into small enough units (graphemes) so that the proper responses are evoked. A background in the many grapheme-phoneme stimulus-response (S-R) bonds is essential. Fine visual and auditory discrimination skills are often needed in that several letter stimuli can control a single response, or a single stimulus might control a variety of responses. In sight word recognition, peculiarities of letters or general word configuration will stimulate the correct oral response for a given word stimulus. Pictures and objects to be used may serve as additional stimuli to facilitate word recognition.

II. Conditioning

Conditioning theory might be considered as a method of easing, for the beginner, the difficult task of learning to read. A stimulus situation in the form of a printed word exists, causing a response (naming the word) which is connected to the stimulus by an associative bond. Learning involves the formation of many such new bonds.

Four major principles in S-R theory can be applied to the study presented here. First, reinforcement, defined as "That feature of the training situation which is necessary for the strengthening of the new response to the conditioned stimulus" (Hilgard and Marquis, p. 69.) is necessary for learning to develop. The acquisition of a sight vocabulary involves the development of new stimulus-

response bonds between the printed stimuli and verbal responses which, to be strengthened, require reinforcement. In the present study, reinforcement is of either a material or a verbal nature.

The second principle, extinction, involves a weakening of the response and is caused by a lack of reinforcement. Extinction was not of concern in this study.

The third principle, generalisation, is concerned with a single response to a variety of stimuli. Initial word recognition attempts illustrate this principle in that a single verbal response may be given to any of the different visual word stimuli presented. In this study, several children repeatedly gave the same verbal response to many of the different word stimuli presented to them.

Fourth, the principle of discrimination is concerned with the ability to differentiate successfully between irrelevant and relevant stimuli. With teaching and practice, the children's further attempts indicated successful discrimination taking place in that the graphic symbols of visual stimuli now evoked only those verbal responses which were correct. The children had learned to associate the verbal word with the printed word. Reinforcement served to strengthen the bond, and the cycle of learning continued.

Thorndike (in Dechant (1964)) formulated several laws which are applicable to behaviourist learning theory

when it is applied to beginning reading. The first law involved trial and error learning. Subjects continued to select responses from a series of possible responses until the appropriate one was found. In the present study, children remembered the four possible words, tried one as an appropriate response to the word stimulus, and, if correct, had learned by trial and error.

The second law was the law of readiness, dependent on maturational factors (motor abilities, mental age, visual and auditory discrimination) which control attention and motivation for the learning task. That the children involved in this study showed evidence of complete attention to the task presented indicated one aspect of readiness.

The third law was that of exercise, indicating that practice is necessary for learning to occur. Since it is a learned skill, reading requires practice which "must be both motivated and rewarded". (Dechant, p. 527.) In the present study, practice which produced word recognition was rewarded or reinforced.

The fourth law was the law of effect which states that when, by the trial and error method, a subject makes the correct response, this response tends to be repeated. The associative bond is thus strengthened. In both the verbal and the material reinforcement conditions of the

present study, subjects were aware of the correctness of their responses.

Because reading includes various levels of competence and various processes occurring at the same time, this study limits reading to the "textual response" level described by Skinner (1957) and Staats (1964) as occurring when verbal responses are controlled by visually presented verbal stimuli. In order to train such textual responses, a process suggested by Staats of presenting the written verbal stimulus, saying the word aloud, and having the child make a response which approximates the sound will be used. Reinforcement will be added to correct textual responses in order to facilitate word recognition.

III. Theoretical Model of Word Recognition and Methodology

Smith and Dechant (p. 438) emphasised that early reading instruction concentrated on word identification. This is the partial aspect of the reading process, coupled with reinforcement, which is considered in this study. A model of the process involved (Phase One) and the method being used to conduct the experiment (Phases Two and Three) is provided. (See Figure 1.)

In the first phase, that of teaching, the word-card, the word-card plus picture, or the word-card plus object stimulus is presented orally (S1) and visually (S2) to the child who will produce an echoic response (R1) to the sound

and sight of the word. Four words will be presented in this manner before the child advances to the second phase where he will be tested on his ability to recognise the words he has been taught in the first phase. The third stimulus (S3) is the word alone (the new visual stimulus) to which the child will apply various cues according to his sensory, perceptual, memorial, and cognitive capabilities in an attempt to respond correctly. If the response (R2) is incorrect, the child will be routed through a reteaching situation to the original stimuli again. If the response is correct, the child has recognised the word and will be given reinforcement of either a verbal or a material nature. Both reinforcements should result in a strengthened memory of the word, which will then be stored for later retrieval. The third phase, retesting, takes place 24 hours later when the new stimulus (S4), the printed word, is presented. A correct response constitutes a retrieval from the store of sight words.

Summary

This chapter presents the theoretical background of the word recognition aspect of reading from the behaviouristic point of view. Identification of new words presented visually involves the development of many S-R bonds. With reinforcement, the associative bonds are strengthened, thus facilitating the learning of sight words. A theoretical

model indicating the word recognition part of reading and the methodology involved in the present study completes the chapter.

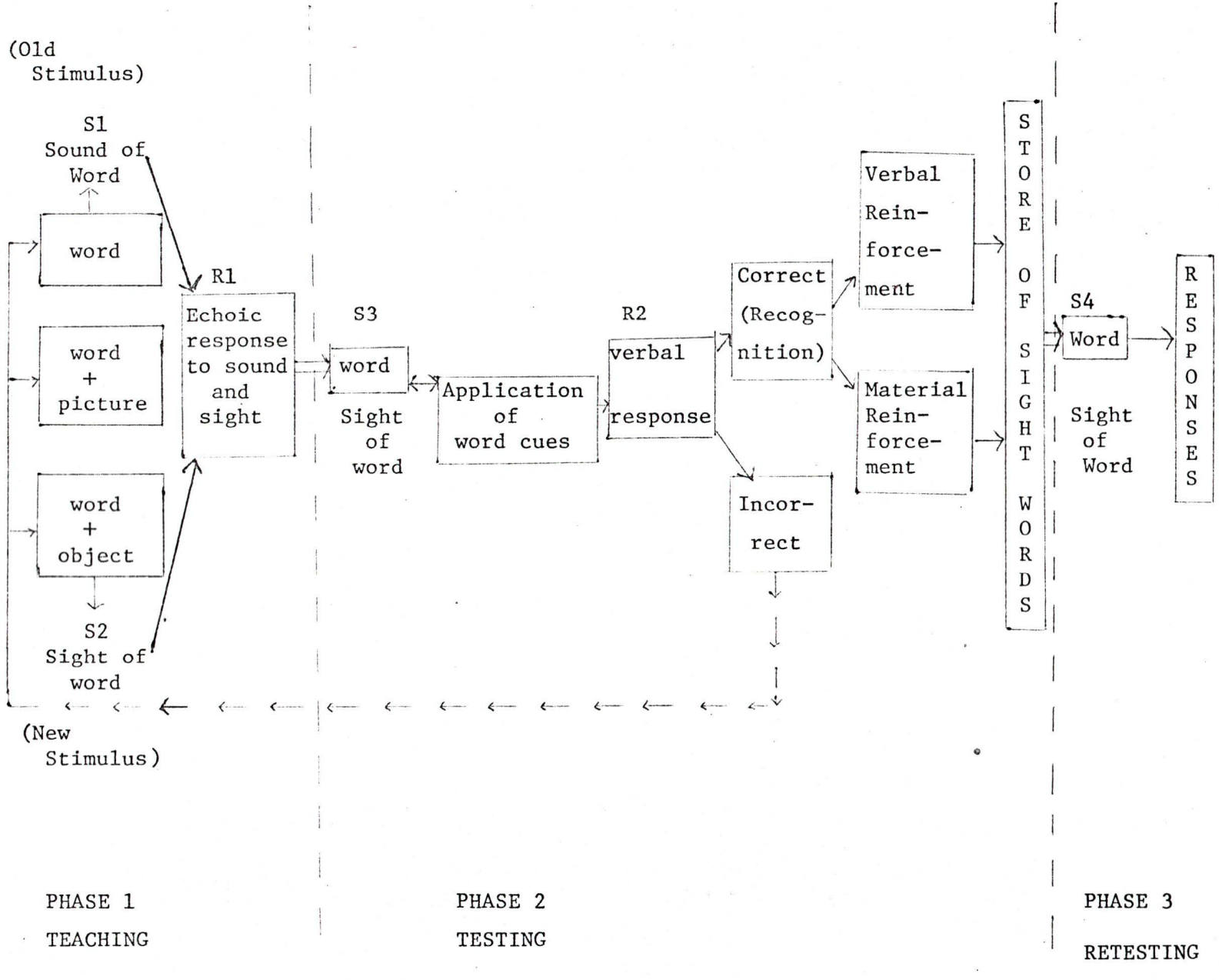


Fig. 1. Theoretical Model

CHAPTER 3

REVIEW OF RELATED LITERATURE

The review of the literature presented in this chapter is divided into several sections. The first section deals with theory relating to the reading process. The second section reviews research examining the different cues used by children to identify words. The third section examines studies dealing specifically with the use of pictures and objects as associational cues to word recognition. The fourth section considers the theory relating to conditioning as a means of shaping behaviour. The final fifth section reviews studies relative to the use of various methods of reinforcement for learning tasks.

I. The Reading Process

Reading involves both sensory and perceptual processes. Initially, reading is a sensory process involving visual skills to discriminate the ordered graphemes within words and auditory skills to relate phonemes to graphemes. When the basis for simple recognition has been set, more complex stimuli can be presented to the beginning reader. Learning to read, then, is an additive process. A behaviourist, in teaching reading, would begin with letters and gradually progress to words, phrases and sentences.

The most critical element of the reading process, however, goes beyond simple recognition to comprehension at which point meaning is derived from the graphic symbols. Information which is received by the senses is inadequate for comprehension because meaning involves not only the recognition of symbols but also the application of a wealth of experience in order for the reader to relate and interpret the meaning of words as intended by the writer. A commonality of experience between reader and writer is necessary if full understanding of the message is to occur. Reading, then, involves more than the learning of skills; it demands the presence of both experiential and conceptual background and of thinking. Reading is a two-way process whereby the readers simultaneously take information from the symbols and bring information to the symbols.

A cognitivist would agree that the necessary background for reading is the experience needed by the child to bring meaning to what is read:

> ...if he is given a good environment, with opportunities to grow, he is laying the foundation for a true understanding of the purpose and meaning behind the mechanical act of reading.
>
> (Athey, p. 90.)

A background in language competence is essential for the development of cognitive ability upon which reading impinges. A mind which is alert, active, and curious will search cognitively for information with reading being the

tool by which such information is acquired and communicated.

Ausubel (1969) suggested that both perceptual and cognitive processes are involved in reading. As a method for acquiring meanings by relating new meanings to the context of existing knowledge, reading is a cognitive process. If, however, meaning is already present, the reading is initially perceptual in that the potential meaning is perceived immediately, later to be cognitively adjusted to acquire underlying meanings.

The level of cognitive maturity possessed by the child directly affects the complexities of the learning tasks with which he can cope successfully. The cognitivist would suggest that beginning reading be taught with emphasis on letter recognition and grapheme-phoneme relationships in order to provide a logical basis to be applied by the child to the solution of the reading problem. By previous mastery of grapheme-phoneme regularities, the child is better prepared to cope with irregularities.

However, the establishment of grapheme-phoneme relationships is but the beginning of reading. Learning to read is

> ...a matter of learning to perceive the potential meaning in written messages and then relating the perceived potential meaning to cognitive structure so as to comprehend it.
>
> (Ausubel, p. 79.)

Ausubel regarded the conversion of written words into spoken

words before meaning could be developed as a necessary intermediate step in beginning to read. Recognition of words, according to Ausubel, is attained through the perception of an ordered relationship of graphemes and phonemes as well as through the child's knowledge of combinations which occur regularly. Information thus received must be reorganised in a cognitive structure before new insights and perceptions can be developed.

Gibson (1970) considered three phases in the reading process, roughly sequential but involving some overlapping. The first phase included learning to differentiate graphic symbols; the second, learning to decode letters to sounds; and the third, using higher order units of structure. While behaviourists may consider reading to be a discriminative response to printed symbols, "Such responses are not reading, however; reading involves decoding to speech. Letters are essentially an instruction to produce a given speech sound." (Gibson, p. 317.)

The linguist would agree that reading is an extension of the spoken language and therefore not to be considered in isolation but rather in its relationship to the spoken language. Fries (p. 375.) suggested that the beginning reader already has great control of his native language, with the main concern being that he understands what he hears. An identical meaning must be obtained from that which is read. Of concern in reading is the process

whereby the reader is able to obtain those identical meanings.

> The process of learning to do reading is the process of learning to transfer the already achieved ability to get meanings from talk in a time sequence to a new ability to get the same meanings from seeing representations of this same talk in a direction sequence on a surface. His reading progress and achievement is most realistically measured with his respective language achievement as the base.
>
> (Fries, p. 375.)

Spencer (1961) visualised the reading process as involving four sequential segments combined into one continuous process. Initially, the stimulus, defined as anything which has the power to activate sense receptors, exists. Second, that act of stimulation or reception, the actual sensing, occurs when non-neural impulses are changed into neural impulses and are transmitted to the brain. The core of the process, perception (See p.10) follows as the third stage and is identified as "the process of creating meaning and giving significance to that which is sensed." (Spencer, p. 5.) The last stage involves the expressive act in which a response occurs to the reading which was done in stage three. The reader has already sensed and interpreted the stimulus; now he must adjust or modify his behaviour in some way as a result of his reading. The first and second stages may be viewed as a behaviourist psychologist's

approach to reading while the third stage is seen as a cognitive psychologist's approach.

Gray (1960) viewed reading as consisting of four aspects - perception, understanding, reaction, and assimilation - theoretically arranged in concentric circles. The central core of the reading act is word perception in which an arousal of meaning and association of pronunciation occurs. Surrounding and including perception is the second aspect, understanding or comprehension, which results in a clear grasp of what is read. The third aspect represents the reader's reaction to what was read and necessarily involves both perception and comprehension. The final step of the process, assimilation, occurs when the new ideas attained by the reader are fused with the old ideas. The degree of reading proficiency, therefore, includes and depends upon the reader's competence in each component.

In applying his four aspects to the act of reading, Gray included in word perception the sensory process of impressions received by the retina, relayed as nerve impulses to the brain where, if the words are well known, their pronunciations and meanings are recognised immediately. If immediate recognition does not follow, several methods of word attack might be applied to the words by the reader. Repetitions of the stimulus result in additional memory images which foster instantaneous perception demanded of sight words.

Gray envisioned the aspect of comprehension as including three separate levels of understanding - the literal meaning whereby the reader obtains a clear idea of what was read, an expansion of meaning in which a fuller grasp of the intended message is obtained, and an understanding in which the reader is able to grasp implications and significances which may not be apparent overtly. Gray's levels of comprehension involve the ability to "read the lines, to read between the lines and to read beyond the lines." (Gray, p. 17.)

Reaction and assimilation, Gray's third and fourth aspects of reading, begin immediately that the reader develops an inquiring attitude. Ideas possessed by the reader serve as a screen through which new ideas are filtered. Many mental processes must occur before the reader can relate the old and the new in such a way as to develop new insights and expanded ideas. Creativity is involved in the last three sections of Gray's model.

Gray's view of comprehension with its understanding of an intended message may be considered in relation to the psycholinguistic view of reading. The concern of the psycholinguists is not only with the science of linguistics but also with the method by which individuals learn to use their language. Goodman (1968) viewed reading as the receptive phase of communication which, to be complete, requires the reconstruction of a message through the inter-

action between the reader and the symbolic form of the language. As he strives for meaning from the message, the reader must "actively bring to bear his knowledge of language, his past experience, his conceptual attainments on the processing of language information encoded in the form of graphic symbols in order to decode the written language." (Goodman, p. 1.)

Like a pure linguist, Goodman considered reading lists of words only name-calling and not complete reading. True reading is accomplished only through an active involvement of the reader with the word patterns, intonations, inflections, and pattern markers - those which the child already knows in his speech. A complete new set of cues for recognising words in print must be developed.

Goodman suggested that reading, as the reconstruction of the symbolic form of the spoken word, can be considered on several levels of proficiency. The earliest level of beginning reading is involved with visual discrimination of letters, letter patterns, and word shapes followed by recoding into phonemes, phonemic patterns, and word names as aural input which is again recoded as oral language before encoding (the perception of meaning) takes place. The second recoding to oral language may result in approximations to sounds from which, based on past experience with language patterns and context, meaning is decoded. This provides the basis for Goodman's view of

reading as a psycholinguistic guessing game in which thought and language interact. With added competence, the reader can eliminate the mediatory aural recoding step, and the process of reading will become telescoped so that decoding will result immediately from larger structural units.

The psycholinguistic guessing game may be applied to the present study. Some children were capable of visually discriminating the elements of the word and recoding these elements into separate sounds. By using their knowledge of the patterns of the language, these children tentatively encoded the word message.

Summary

This section has presented the reading process on several levels of behaviour - as a sensory, perceptual, and cognitive process. Many of the levels have been related to diverse schools of thought on the reading process. Behaviourists view reading as an additive process of developing new S-R bonds. Linguists see reading as an extension of oral language with specific discernible structures and patterns which can be objectively examined. Cognitivists consider reading as thinking, dependent on the reader's cognitive ability to organise and perceive meanings. Psycholinguists extend the linguists' view in an examination of reading as a communication skill involving decoding and encoding.

Children come to school with varying competencies in oral language. A transferral of these competencies to understanding written symbolic language is necessary. Reading represents a coding of oral language to symbolic language which must be recoded by the child to oral language again before the message can be deciphered.

Only a limited portion of the reading process is applicable to the present study. The perceptual process described by Ausubel (See p. 28 .) may be considered as applicable here in that the meanings of the words were already understood by the kindergarten children. An elementary level of Gibson's three phases and Spencer's four stages in the reading process may also be applied to reading as done by this study's subjects. However, only the first two of Gray's four aspects of reading can be considered as being relevant. Perception and understanding were evident in the recognition of sight words; reaction and assimilation may follow when new words are decoded.

II. Cues for Word Recognition

Many researchers have attempted to determine exactly which prominent details within a word are attended to in order for a word to be recognised. Numerous cues including outline configuration (Tinker and Paterson, 1940), letter-sound relationships (Marchbanks and Levin, 1965), little words in big words, familiar words, recurring letter group patterns, dominating and domineering letters (Wilson

and Fleming, 1938), first letter (Timko, 1970), initial and terminal letters (Levin, Watson, and Feldman, 1964), internal details, length of word, first half of a word, trivial details within a word, and a combination of cues (Davidson, 1935) are reported.

Research indicates that the cues used by children to identify words vary. Foote and Havens (1965) studied the configuration of a word as it affected perception. The three main patterns under consideration were descending letters, ascending letters, and flat letters as they appeared initially or terminally. The authors concluded that "the overall structure of words, as defined by the shape of their composite letters, affects perception. Word configuration thus became the most important cue." (Foote and Havens, p. 154.) Morrison (1968) agreed that this is so, but imposed a limitation: "...configuration clues along with picture clues are of value primarily in the very early stages of reading before the child has met enough words to become confused by their similarities in shapes." (p. 319.)

Other investigators maintained that word configuration is but a minor cue. Marchbanks and Levin (1965) conducted a study using 50 kindergarten and 50 first grade students to discover the bases used by such children to recognise words. The authors attempted, as well, to determine whether the same cues were used by both sexes (both non-readers and readers) and whether the same cues

were used for short and long words. Subjects were presented with a learning task of delayed matching-to-sample items, composed of three- and five-letter nonsense words. In the trigram series, words on a response card varied with the cue being shape, initial letter, medial letter, or terminal letter. In the quingram series, similar cues were considered for shape and for each of the five letters. Results indicated that on both short and long nonsense words, the initial letter was used most often as the primary cue and the terminal letter as the secondary cue. The least used cue appeared to be configuration. Although almost all subjects used the initial letter as the most salient cue, two interesting variations were observed. Kindergarten boys often used the last letter as the primary cue with the first letter being the secondary cue, while first grade girls, like the majority, used the initial letter most frequently, but used the second letter as the secondary cue.

Timko (1970) conducted a study using 40 first graders to compare initial letters, terminal letters, and geometric shape as cues related to word recognition. Forty nonsense trigrams were exposed to subjects for five seconds. Subjects were then asked to select from vertically positioned responses the one nonsense word which most resembled the one which they had seen previously. Results indicated a significant difference favouring the identical

letter factor as the most often used cue for word recognition. An examination revealed that identical initial letters were chosen more often than identical terminal letters. No significant variation was found for word configuration or sex.

Nodine and Hardt (1970) investigated the role of letter-position cues in learning to read words. Under study was the influence of mastery of letter discrimination, the recognition of words by associating letters and letter combinations with speech sounds, letter position, and size of letter set. The sample of 64 kindergarten children was individually presented with the task of judging whether four-letter nonsense words were matched or unmatched according to their letter sequences. High and low confusion pairs of letters were embedded within the words thus presented. Forty-four pairs of words containing 11 pairs each of matched high confusion letters, matched low confusion letters, unmatched high confusion letters, and unmatched low confusion letters were presented. Although the time required to discern irregularities in pairs of words increased when the letter sequence involved a high confusion pair, the accuracy of the judgment was not affected. Children with high readiness scores, as measured by the Metropolitan Readiness Test, tended to respond faster and more accurately than those with low readiness scores. Although girls tended to respond more quickly than boys, the

accuracy with which they did so was equal. The authors concluded that children in this study depended greatly on the peculiarities of individual letters when making discriminations.

In considering which individual letters stand out most legibly, thereby having the highest cue value, Anderson and Dearborn (1952) agreed that initial and terminal letters were most prominent. Another point advanced was that letters directly on the fixation point are in the area of clearest vision and that therefore they would have a high cue value. Masking or interference by other letters causes unclear vision. For example, if the eye fixates on the o in the following sequence: tos, the t and the s are seen easily. However, in the sequence: nteohsx, with the fixation on the o, the t and s have vanished since the letters before and after have interfered with their clear visibility. (Woodworth, p. 720.) This would account for initial and terminal letters being used as cues.

Children, however, do not always perceive letters as adults do. "The younger the child, the more he tends to react to peculiar characteristics of words rather than to the general form or shape of the word." (Smith and Dechant, p. 205.) Rather, children will respond to that which appeals to them. Minute details will escape them, and if the material is not interesting, they will invent something. Ascending, descending, vertically straight, and

curved letters do not help the child as they help the adult. The presence of familiar letters, a prefix, a suffix, or some other letter group will frequently come to stand for the entire word. Inaccuracies in word recognition will thus result. It is necessary for the child to progress toward the adult form of perception whereby cues from word form, verbal context, phonics, structural analysis, and syllabication are used.

> Word perception involves matching the visual symbols with the sound of the spoken word and the meaning represented by the printed symbol. Therefore, there must be correct discrimination of the sounds represented in a word and precise visual discrimination of both total word form and details of its structure.
> (Tinker, p. 84.)

Some question has arisen as to the advisability of providing additional cues to task learning in that some cues may provide a distracting stimulus from the task at hand. Silverman, Davids, and Andrews (1963) showed that incorrectly coloured colour words (e.g. "green" printed in red block letters) were less accurately and more slowly recognised by 15 year old boys who were less capable than those who were more capable. It appeared that boys with higher intelligence were less easily distracted than those with low intelligence.

Santostefano, Rutledge, and Randal (1965) experimented with one group of 24 boys from third to sixth

grades who were disabled readers and a second group of 23 boys of similar age and intelligence who had no reading disability. (See above, p. 3.) The examiners attempted to determine whether a specific cognitive process accounted for the disability. Under question were the processes of focussing-scanning (manner of distributing attention equally between objects being compared), leveling-sharpening (manner of processing on-going changing stimuli), and constricted-flexible (manner of handling a stimulus field which contained contradictory background information). Results indicated that only the constricted-flexible process appeared implicated in reading disability. The researchers suggested that the inability to withhold attention from distractions is an important factor in reading disability.

None of the kindergarten subjects in the sample used in the present study could be defined as disabled readers. However, the ability to maintain attention on a printed word regardless of the background pictures, objects, or rewards may well relate to the speed with which printed words are recognised. Further, the constricted-flexible cognitive process as described by Santostefano et al may well influence the memory for such words.

Summary

The studies reviewed in this section indicate that beginning readers most frequently use initial letters as

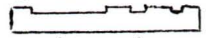
cues to recognise words. A variety of other cues used include terminal letters, ascending and descending letters, and word shape.

The present study attempts to utilize many of these cues. One word pair in the list presented to the subjects differed in initial letter, ascending and descending letters, and word configuration. Both initial and terminal letters, word configuration, and length were identical in the other pair of words. It was necessary for subjects to discriminate internal letters by considering peculiarities of individual letters.

III. Use of Pictures and Objects as Cues to Word Recognition

Various authors have indicated the value of providing pictures and objects as cues to teaching new words. Harris (1956) presented a method of teaching beginning readers new words accompanied by a picture in order to ensure that the readers understood the meanings of the new words thus presented. Tinker and McCullough (1968) indicated that an initial store of sight words is obtained by the look-say method. New words are presented one at a time with a picture of what the new word stands for - the child is either told the new word or guesses what it is. Karlin (1971) suggested labelling of objects in a classroom as a beginning reading experience. Aukerman (1971), in presenting the Schoolfield, Timberlake, and Buckley Phono-

visual Method as an approach to beginning reading, noted that learning to recognise initial consonants is accomplished through the use of pictures. The transition to beginning sounds in primers is thus made easier. Spache (1964), on recognition of words in context, claimed that such recognition is enhanced by an accompanying picture. He further listed the means by which children discriminate among words:

1.	unusual length	grandmother
2.	shape	 beautiful
3.	base word	smile in smiled
4.	context	The kitten likes to drink
5.	picture clues	
6.	compound words	milk/man
7.	initial letters or sounds	
8.	internal details	apple look

(Spache, p. 336.)

Lunzer (1968) warned that in the use of pictures in an educational system such as teaching children to read "...there is a danger that...[the children] may not notice the main features with which words are associated." (p. 29.)

Samuels (1967) performed a study involving two experiments in which he examined the effects of pictures on learning to read four words. The first experiment involved 30 non-readers in a clinical setting. Subjects were randomly assigned to three treatment conditions, no picture, a simple picture (black and white drawing), and a complex picture (a colourful picture from a primer which contained more than the single illustration of the word).

Learning trials were individually presented, with the word cards being exposed for four seconds each. In order to score a point, the subject had to give the correct response before the examiner did. After each learning trial, a test trial was conducted using the word stimuli only. No knowledge of results was given during the test trials. After ten alternate learning and testing trials were completed, results indicated that in the learning trials significantly more correct responses were given by the picture groups than by the no-picture group. However, in the testing trial, significantly more correct responses were given by the no-picture group than by the picture groups.

In the second experiment, 52 first graders were pretested on 50 words. On the basis of their scores on the pretest, the subjects were placed into two matched groups. A 106 word story, using the 50 pretest words, was written and made into individual books by the examiner. One group received books containing a blank left face with the text on the right face. The other group had books containing a picture instead of the blank page. Although both groups received identical classroom instruction, they were unable to see each other's books. A post-test was administered after instruction to both groups. Results showed that the type of book made no difference in the reading acquisition of better readers. However, reading acquisition of poor readers was significantly greater in the no-picture group

than in the picture groups. It would appear that these results substantiate those of the study of Silverman, Davids, and Andrews (See above, p.33.) in indicating greater distractibility of those students who were less capable readers.

Ollila and Olson (1972) investigated the effectiveness of picture and object cues on the learning of a word list by 150 kindergarten boys and girls. Subjects were placed into three treatment groups, with each subject being presented with four words ("ball", "horse", "telephone", and "pencil") by the word alone, the word plus picture, or the word plus object method. Testing was done with word-card alone and continued until mastery (one trial of correctly recognising all four words) was attained or until 20 trials had been given. The number of trials taken to master the list constituted the subject's score. By using an analysis of variance to test the difference of means between methods of presentation, the authors found no significant differences for girls. However, boys' scores revealed a significant difference favouring the word alone method of presentation. Thus, conclusions tend to support Samuels' contention that pictures present a distracting element.

Ollila and Olson's study extended that of Samuels by the addition of an object as another associational cue. The present study gives a further extension by considering

not only the three methods of presentation but also the effects of two types of reinforcement on the rates of learning and retention of kindergarten children. Mastery was defined by Ollila and Olson as one successful trial of correctly recognising the four words presented; the present study requires two consecutive successful trials to attain mastery.

McMorland (1972) considered the variable of methods of presentation and list type in his investigation of the rates of acquisition of 60 kindergarten children. Each child was individually taken to a task of mastering a dissimilar list of words ("ball", "horse", "telephone", and "pencil") and a similar list of words "ball", "nail", "pail", and "belt"). Thirty children were presented with the word alone while the other 30 children were presented with the word as well as a pictorial representation of the word. Mastery was achieved when a perfect score was obtained on two successive trials. An analysis of variance indicated a significantly greater ease of acquisition for the dissimilar list than for the similar list. No significant differences were found between the two methods of presentation for either sex.

Other studies do not reach as conclusive results about the use of pictures as cues to word recognition. King and Muehl (1965) investigated the effectiveness of different cues presented to children learning lists of dissimilar and

similar words. A sample of 210 children with a mean age of 70.9 months was assigned to 10 experimental groups as shown in Table 1. The picture group was trained with the printed word on a page accompanied by a simple, black-line drawing reflecting the word. The auditory group was trained with only the printed word on a page but was told what the word was. The echoic group, after being told the word, vocally responded to the word. The object of the experiment was to investigate which cue, or combination of cues, was most effective in facilitating or interfering with word acquisition. The examiners computed the mean number of correct responses for each training group on twelve trials. By using a three-way analysis of variance, they found significant differences between the two list types, with the similar words being more difficult to learn, between trials by kinds-of-word interaction, with a faster learning rate for the dissimilar words, and interaction between training methods and kinds of words, favouring the picture method for similar words and the auditory method for dissimilar words. No significant differences were found between intelligence or sex. The authors concluded that the method of word presentation involved in acquiring a sight vocabulary should vary with the degree of similarity between words. For highly similar words, learning was facilitated when a picture cue or auditory cue was provided. For dissimilar words, a single cue or combination of cues provided little

TABLE 1

Training Groups

Training: Printed Word +	Kinds of Words	
	Dissimilar	Similar
Picture	Group 1	Group 2
Auditory	Group 3	Group 4
Picture + Auditory	Group 5	Group 6
Auditory + Echoic Response	Group 7	Group 8
Picture + Auditory + Echoic Response	Group 9	Group 10

(King and Muehl, p. 165.)

difference, although the authors noted a tendency to favour the auditory-word method of presentation. King and Muehl cautioned against dispensing with pictures in presenting new words because, to a beginner, words may be seen as being highly similar. An additional cue in the form of a picture could, at times, be helpful. (See pp. 2, 35-36, 44.)

The present study used both similar and dissimilar words in the list to be taught. However, the main purpose was not to test the ease of acquisition as it varied with the similarity of words, but to test both ease of acquisition and retention of words as they varied with the use of pictures, objects, and reinforcements.

Braun (1969) investigated the effectiveness of pictures, auditory input, and interest loading as cues in acquiring and retaining a word list. Words were prejudged as being of high interest for boys or for girls. Two hundred forty kindergarten subjects were stratified on the basis of sex and ability and were assigned to treatment groups of 60 subjects, 15 boys and 15 girls of high ability and 15 boys and 15 girls of low ability. Treatments were designated as follows: BWAV (boy word, auditory visual), GWAV (girl word, auditory visual), BWA (boy word, auditory), and GWA (girl word, auditory). The last two groups were not presented with a picture. Each child was exposed to a learning and test cycle until he could respond successfully on two successive trials or until 15 trials had been

completed. The average trials to mastery constituted the acquisition score while, 24 hours later, the number of words retained constituted a retention score.

Findings indicated that significant mean differences were found for both boys and girls on the number of trials to acquisition between auditory and auditory-visual groups. When the interest loading variable was considered, significant differences were found for high ability girls. Interest loading with the AV treatment group was significant for low ability boys and girls. Findings on retention measures showed significant differences between auditory and auditory-visual treatment for boys, favouring the auditory treatment. Overall interest loading effects favoured the sex which was associated with the interest loading. The author concluded that children of both high and low ability had a lower level of discrimination when the stimulus was presented with a picture, with low ability subjects appearing to be most affected. A tendency to differential discriminability on the interest loading variable appeared to be more strongly related to low ability subjects. Retention scores indicated that the sex of the learner was related to the interest loading.

Preceding Braun, Harris (1968) studied the ability of 240 kindergarten children to acquire and retain interest loaded word lists under two methods of presentation, VA (visual auditory) in which the child saw the word, heard it,

and said it, and VVA (visual visual auditory) in which the child saw the word, saw a picture, heard the word, and then said the word. Words were presented until two successive trials were correct or until 15 testing cycles had been presented. Retention was tested 24 hours later. Acquisition results indicated that the VA method was better than the VVA method. No significant differences between sex, word type, ability, or method of presentation appeared on retention results. It would appear that the presence of a picture cue interfered with acquisition but did not interfere with retention. (See p.42.)

The present examiner, like Braun and Harris, attempted to present various cues to assist children to recognise sight words. A slight variation occurred between Braun's VVA condition and that used in the present study. Rather than seeing the word, seeing the picture, and then hearing the word, subjects in this study saw and heard the word simultaneously and only then saw the associational cue. Interest loading was considered in the selection of words for this study.

Hartly (1970), using 127 first graders who had had no reading instruction, further investigated types of cues associated with recognition of similar and dissimilar words. Six treatment groups were formed by random assignment of boys and girls of each ability level as determined by the Murphy-Durrell Readiness Test. Three groups received the

similar list presented by printed word alone, by printed word with a picture cue, or by a context cue in the form of a sentence containing the printed word. The remaining three groups received the dissimilar list presented in the three different ways, one way per group. Each subject was given one list per day for four days, in ten study and test trials. Retention was tested 24 hours later. A transfer test on four real and four nonsense words was given on the fifth day. Results on the learning trials indicated that for similar words, the word-only group was most successful. With dissimilar words, the word plus context cue group was most successful. Sex differences appeared related to ability in that high ability boys were better on the similar list while high ability girls were better on the dissimilar list. Low ability boys and girls both performed better on lists of maximal contrast. As in King and Muehl's study (See above, p.39.), Hartley's study indicated that pictures had a positive effect in that the group with both graphic and picture stimuli received the highest overall scores in the transfer test whereas the graphic stimulus group received lowest scores. The authors would therefore question the wisdom of discontinuing the use of pictures in learning to read lists of words.

Hartley's study considered similarity of lists, recognition cues, and retention scores as does the present study. This study further considers reinforcement as it

affects both recognition and retention of words.

Summary

All studies reviewed in this section considered the provision of associational aids to word recognition in the forms of pictures, hearing the words, echoic responding to the words, and hearing the words used in sentences. The present study considers objects as well as pictures, hearing, and echoic response as they affect the acquisition of four words. List type was a consideration of several studies. McMorland (See above, p. 39.), King and Muehl (See above, p. 39.), and Hartley (See above, p. 44.) concluded that similar lists were more difficult to learn, while Braun (See above, p. 42.) and Harris (See above, p. 43.) found that interest loading of words was related to the sex associated with the interest loading. The present study includes both similar and dissimilar word pairs in the list to be mastered. An attempt was made to select words which would be of interest to boys and/or girls.

The present study differs from that of Hartley in that no consideration is given to levels of intelligence. Like Braun and Harris, the present examiner considers both acquisition rates and retention scores. As well, reinforcement, not considered in the studies reviewed, is introduced as a second variable.

IV. Conditioning

Early behaviourists such as Pavlov, Watson, and Thorndike believed that learning is a change in behaviour as a result of some experience. Skinner's early experiments with animals launched a theory of "reward psychology" (Bugelski, p. 83.) by which selected experiences would produce previously designated changes in behaviours. In order to control rigidly the experiences presented to animals, Skinner devised a laboratory situation of observation boxes. Hungry rats and pigeons were placed in boxes where certain responses were necessary in order to obtain food. When the required responses were performed (pressing bars or pecking at target disks) the animals received pellets of food, thus being rewarded or reinforced for their actions. When the behavioural changes were well established, Skinner further manipulated the animals' actions. Reinforcement was given only when the required response was performed at the time that a bell sounded.

The basic principles of Pavlovian conditioning can be applied to the results of Skinner's experiments with rats. Reinforcement of the level pressing response resulted in increased frequency of action. Extinction resulted if reinforcement was not given. In the initial stages of responding by lever pressing and bell ringing, the rat showed generalisation in which it rapidly pushed the lever regardless of whether or not the bell rang. Discrimination

became evident when the rat learned to press the lever only at the time the bell sounded.

Skinner, continuing the work of Thorndike in operant conditioning, further applied reward psychology to language behaviour, thus beginning an important influence on education. Imitative verbal behaviour is shaped by the addition of some reinforcing agent in the presence of a given stimulus, thus strengthening the stimulus-response bond and facilitating the production of the required response when the stimulus is given again. Skinner's operant conditioning principles applied to language behaviour are not completely accepted.

Although the experiments were done with hungry animals in laboratory situations, Skinner's findings can be applied to classroom learning. Strict control of all variables, of course, is impossible. By manipulating reinforcements, teachers can bring about desired behaviours. In early training, reinforcement of every correct response is desirable; in later stages when learning has been well established, a gradual reduction of reinforcements is advisable. Skinner warned against unplanned or random reinforcement in that in such cases the activity which immediately preceded the reward would be strengthened. Rewards, therefore, must be contingent upon only the evocation of the desired responses. Carefully planned behavioural objectives are advocated.

Skinner did not emphasise the difference between primary and secondary reinforcers. A more important consideration is that that which is given as a reinforcer is indeed reinforcing. Edibles, the primary reinforcer in Skinner's experiments with animals, are not given, usually, as rewards in an ordinary classroom. Secondary reinforcers such as attentive behaviour, praise, gifts, money, privileges, and knowledge of results are considered reinforcing.

Staats (1964), in considering operant conditioning and reinforcement principles as they might be applied to language arts, made the distinction that although reading is really speech in visual symbolic form, the difficulties of learning to read are greater than those of acquiring speech in that while speech acquisition is a gradual process from babyhood on, usually reinforced with praise and encouragement, reading acquisition involves often a sudden confrontation with great difficulty. Staats suggested that:

> First it should be possible to reduce the aversive nature of the onset of formal training by having it introduced more gradually. In addition, the introduction of positive reinforcers into such an extensive program would change the situation in the direction of making it more positively reinforcing.
>
> (Staats (1964), p. 77.)

Dechant (1964) presented some principles on reinforcement which might be considered by the classroom

teacher if conditioning theory is to be applied. Initially, reinforced behaviour tends to recur, comes more easily, and is more permanent. Punishment is included as reinforcement but of a negative nature in that punishment serves to suppress a response rather than to weaken it. Reward, a positive reinforcer, is preferable in its greater efficiency and lack of undesirable side effects. For some children, the knowledge of a good performance, success, and failure may be effective reinforcers. A caution is given in the use of reward in that it should not be so dominant as to become the goal rather than as a means to the goal. Dechant advised that intrinsic reward of learning is preferable to extrinsic reward.

Staats (1968) agreed that intrinsic reinforcement is superior to extrinsic reinforcement but suggested that reading, especially in the early stages, is not self-reinforcing:

> The learning task is arduous, long-term, and concentrated in training trials. It is work. For the behavior of attending and studying to be maintained, some type of extrinsic reinforcer system must be introduced. The system is introduced solely for that purpose and in this sense it is not only extrinsic but also is artificial - the system is not based upon the natural reinforcers that occur in the child's extra-school life.
>
> (Staats (1968), p. 530.)

As the child gains proficiency in the reading task, he will become intrinsically rewarded.

Reading, however, is difficult to reward extrinsically, in that reading usually occurs in a group situation whereas extrinsic reinforcement is usually given on an individual basis. As well, it is difficult to reward the inward action of reading - all that can be rewarded is the result of reading, that which is observable. However, "As a consequence of the use of reinforcement for reading, very rapid learning should occur." (Staats (1964), p. 79.) If this is so, teachers might consider the types of reinforcements available in a typical school situation - learning itself, teacher's attention, grades, privileges, games, recess, approval, or some form of extrinsic reward - and their application to learning to read.

A caution is given, however, in that a great deal of consideration must be given to the particular type of reinforcement offered since what is rewarding to one child may not necessarily be rewarding to another:

> In fact, we need to know with much more accuracy what kind of reinforcements (intrinsic, extrinsic) work with what kinds of groups, and why. If operant theory is to be useful to teachers and other practitioners, much more precise information is needed on the value of different kinds of reinforcers and about optimum scheduling of reinforcement for rapid learning and for retention.
>
> (Athey, p. 98.)

One purpose of the present study is to attempt to find whether the appearance of one particular type of extrinsic reinforcement--money--works as well as the kind of reinforcement more usually used with school children, praise and encouragement.

Summary

Skinner's early experiments with animals in a laboratory situation indicated that behaviour could be manipulated through operant conditioning involving reinforcement of desired behaviours. Shaping learning behaviours can be accomplished in a classroom situation despite the lack of strict control of variables such as existed in the Skinner box. Both extrinsic and intrinsic reinforcement strengthen learned behaviours; a material reward may be effective in the early stages of learning to read.

V. Reinforcement

Many different types of reinforcing agents have been used in many different kinds of tasks. Birnbrauer, Wolf, Kidder, and Tague (1965) defined token reinforcers as

> ...tangible objects or symbols which in and of themselves probably have little or no reinforcing value. However, they may be exchanged for a variety of other objects which are reinforcing.
> (p. 220.)

A sample of 17 retarded children aged 8 to 14 years were subjected to a token reinforcement study in which the tokens were discontinued for some time and then reinstated. Results indicated that most of the subjects, after reinstatement of reinforcement, completed more work and made fewer errors than at any previous time.

Zigler and Kanzer (1962) assumed that correctness forms ("right" and "correct") of verbal reinforcement were more reinforcing for middle class children than for lower class children while praise forms ("good" and "fine") of verbal reinforcement were more reinforcing to lower class children than for middle class children. Socio-economic class was determined by the use of Warner's Index of Social Characteristics (Warner, Meeker, and Eells, 1949.) A study with 20 middle class and 20 lower class children in second grade, matched on chronological age, upheld their assumption.

Miller and Estes (1961) studied the effects of three levels of incentive--knowledge of results, one cent, and 50 cents--on a discrimination learning task. They concluded that there was no difference between the one cent and 50 cent groups but that both these groups made more errors than the knowledge of results group.

The previous three studies indicated that with certain groups of children, reinforcement of several kinds was effective. Since a system of token reinforcement was

more complicated to initiate, the present examiner chose verbal reinforcement (both praise and correctness forms as used by Zigler and Kanzer--see p. 53) and material reinforcement (pennies) to provide incentive for kindergarten children.

Concerned with ranking types of reinforcement, Witryol et al (1965) tested 120 children of six different age levels, both sexes, of two socio-economic groups--upper and lower (based on fathers' occupations as professionals or manual workers)--and concluded that "Material reinforcements were generally accorded higher rank positions, but verbal incentives increased in value with age." (p. 240.)

Terrell and Kennedy (1957) studied the effects of four methods of reinforcement on a discrimination learning task of choosing the larger of pairs of three-dimensional objects and on a transposition problem involving the use of larger figures. The sample included 80 four- and five-year olds and 80 nine-year olds placed in four treatment groups. One type of reinforcement--candy, verbal praise, reproof for incorrect responses, or beans to be traded later for candy--was given to each group. A fifth group served as a control group which, by a flashing light indicator, became aware of the correctness of their responses. Results indicated that the candy reinforced group required only one-half as many trials to reach success as did the nearest competitor, the verbal praise group. On the transposition

test, the candy reinforced group scored significantly better than the others. Age did not appear to be a significant variable. The authors concluded that material reinforcement is more effective than verbal reinforcement in facilitating learning. Witryol et al indicated that material reinforcement has a higher rank than verbal reinforcement for young children; Terrell and Kennedy further supported material reinforcement for kindergarten children, such as are in the sample of the present study.

Fischer (1963) investigated the sharing process as affected by two types of reinforcement in a sample of 24 nursery school boys and girls whose mean age was 50 months. Subjects were given either two or six marbles, then shown a picture of someone who had none, and asked whether they would like to share their marbles. If subjects shared, they were reinforced either materially with bubble gum or verbally with "that's nice" or "good". No comment was made if the child did not share. Results indicated that the material reinforcement was more effective than praise, that the more marbles a child possessed, the more he was willing to share, and that a strong correlation existed between intelligence and the rate at which sharing was learned.

Bloom (in Athey, 1971) suggested that the early stages of learning to read should be consistently rewarded by some extrinsic reinforcement. In later stages of reading,

extrinsic forms may be discontinued in that reading will acquire its own intrinsic reward.

Heitzman (1970) favoured token reinforcement in a study conducted with 60 Negro migrant and Caucasian primary children registered in a six week summer session. Social behaviours such as paying attention as well as academic behaviours, reading and spelling skills, were rewarded with red bingo markers which were accumulated to trade for toys, candies, and other small articles. Pre- and post-test data on the Wide Range Achievement Test indicated that the treatment group of 30 children scored significantly better than the control group of 30 children.

Pikulski (1970) tested the effects of three types of reinforcers on the learning of a word list by 24 Negro children from a lower socio-economic group and 24 white children from a middle socio-economic group. Six cards were prepared, with one side having a word with a picture (for training purposes) and the other side having the word only (for testing purposes). Testing was done until mastery was achieved - correct identification of all six words on two consecutive trials - or until 20 trials had been completed. If test responses were correct, reinforcement was given materially in the form of M and M candy, socially in the form of praise and smiling approval from the examiner, or knowledge of results in the form of instantly showing the child the picture side of the card. If test responses were

incorrect, the social reinforcement group was given the single word "no" to indicate incorrectness, and the material reinforcement group heard a buzzer ring. Results indicated that the middle class children made significantly fewer errors under the social reinforcement condition than either of the other two groups. The knowledge of results and material reinforcement groups did not differ significantly, although the material reinforcement group showed somewhat poorer results. For the lower class, a significant interaction was found between sex and reinforcement. Girls made significantly fewer errors under social reinforcement than under either material reinforcement or knowledge of results. While results indicated that material reinforcement was less facilitating to the learning task, the author explained that:

> In some cases it appeared that the child's preoccupation with the candy, deciding whether to eat it or not, etc., was extremely distracting and contributed to a poorer performance.
>
> (Pikulski, p. 521.)

Benowitz and Busse (1970) investigated the effect of a material reward (a box of crayons) on a learning task involving spelling. Two lists of 15 words each were chosen from standardized tests used in fourth grade. Subjects were 101 Negro fourth graders from two urban ghetto schools. During the first week, the first spelling list was taught for 20 minutes a day for the first four days. Two of the

four participating classes were chosen randomly to be told on each of the four days that they would be given a box of crayons for doing well on the Friday test. The other two classes were used as control groups for the first week. During the second week, the second list was taught, but the reward condition was transferred to the control classes. The classes which had received rewards the previous week now served as control groups. Mean gain scores for each subject were calculated by subtracting the score attained in the control condition from the score attained when in the material reward condition. While the Mann Whitney U test indicated no significant differences in mean gain scores for either boys or girls, subjects in the material reward group in week one showed greater gain scores than subjects in the material reward group in week two. For both boys and girls, the material reward treatment resulted in a significantly higher mean number of words correctly spelled than did the control treatment. The authors concluded that lower class children perform better when given material rewards.

The previous three studies indicated that both school learning tasks and social behaviours can be quickly and effectively learned if reinforcement is given. The effectiveness of several different types of reinforcement varied with the subjects' social class and sex. The present study considers the effect of two kinds of reinforcement, material and verbal, on a school learning task, recognising

and remembering a list of four words, by kindergarten children.

Other studies which showed general conclusions favouring material over verbal reinforcement were by Nickell and Travers (1963) who noted that the kindergarten girls in their study differed in their preference for verbal reinforcement and by Smith, Brethower, and Cabot (1969) who found a monetary reward produced a high rate of work and systematic achievement with retarded first grade readers.

Cameron and Storm (1965), testing three groups--Indians, lower class whites, and middle class whites--with material reinforcement (Smarties) and non-material reinforcement (white flashing light), found that material reinforcement produced no significant differences for all classes. In the non-material reinforcement group, the middle class whites performed better than the Indian or lower class whites. No significant differences were found between the Indian children and lower class children.

Spence (1970) and Pikulski (1970) concluded that the material reinforcement produced a poorer performance than did symbolic reinforcement but added that:

> The results of the present study provide some support for the hypothesis that the inferior performance of material reward groups in certain experiments is brought about by the distracting effects of the reinforcement procedures.
> (Spence, p. 110.)

For this reason, an attempt was made by the present examiner to minimize the distracting element of the material reinforcer itself as well as the method of its presentation. Money was chosen because it was considered to be less distracting than candy. A concern was felt that manipulation of the reward by subjects would be distracting. It was decided that the giving of the reinforcement must be done in such a way that no handling by the subject during the experiment itself was necessary. Yet, some method of assuring the child that the accumulating pennies were indeed his property had to be made. (See Chapter Four, Reinforcement Procedures.)

Staats (1964) reported a study by Staats, Staats, Schutz, and Wolf which used a reinforcement system of small edibles, trinkets, or tokens which might be exchanged for small toys. A small group of words was presented singly, in sentences, and in short paragraphs to three- and four-year old children. Subjects were encouraged to say the words as they looked at them. Eight 40 minute training sessions were held. The number of words learned by each child during each session was recorded. The first group, consisting of three four-year olds, was given social reinforcement initially. Two subjects requested cessation of the training sessions after 15 minutes had elapsed, and the third subject requested cessation after 15 minutes of the second session. At this point, reinforcement of a material nature was

introduced with the result that reading behaviour was sustained for the remainder of the training sessions. The children acquired 16, 17, and 17 words which they could recognise in each of the three ways by which the words were presented. The second group, of three other children, was given the alternate treatment of material reinforcement for two training sessions and then no reinforcement. Reading behaviour disappeared within three or four sessions with the provision of no reinforcement. When reinforcement was reinstated, learning resumed for two of the three subjects. Staats concluded that:

> ...when reading was reinforced, attentional and work habits were strong and new words were learned rapidly, but both types of behavior deteriorated when reinforcement was not forthcoming. Thus, it would appear that under more appropriate conditions of reinforcement, even very young children are capable of sustained work activities and can learn complex verbal skills.
>
> (p. 124.)

To a kindergarten child, the learning to read of several words under the direction of a stranger may present a forbidding task. Incentive in the form of praise or money appeared to provide sufficient motivation for the children not only to attend to but also to master the list of words presented to them.

Summary

The studies reviewed in this section considered different types of reinforcement given for various tasks to subjects of different ages, levels of intelligence, and cultures. The present study considers the provision of reinforcement specifically for a school learning task, as did the studies of Heitzman (See above, p. 56.), Pikulski (See above, p. 56.), and Benowitz and Busse (See above, p. 57.). Levels of intelligence were considered by Birnbrauer et al (See above, p. 52.) and Smith et al (See above, p. 59.). Differing cultural groups were involved in studies done by Cameron and Storm (See above, p. 59.), Pikulski, Heitzman, and Benowitz and Busse, while socio-economic status was considered by Zigler and Kanzer (See above, p. 53.), Witryol et al (See above, p. 54.), Pikulski, and Cameron and Storm. The present study differs in that no consideration is given to levels of intelligence, cultural groups, or socio-economic status. No attempt is made to discover what may or may not be reinforcing to each subject. The types of reinforcement offered--material and verbal--are similar to those given by Pikulski, Fischer (See above, p. 55.), Terrell and Kennedy (See above, p. 54.), and Nickell and Travers (See above, p. 59.). Generally, the research reviewed indicates the effectiveness of material and verbal reinforcement. Two researchers, Spence and Pikulski, considered the method by which material reinforce-

ment was given. The present examiner attempts to provide for minimal distraction from the method of reinforcing.

CHAPTER 4

EXPERIMENTAL DESIGN

The purpose of this study is to determine the relationship among three methods of presentation and two types of reinforcement on the learning of a word list by kindergarten boys and girls. Topics to be discussed in the chapter include the design, the analysis of data, the population and sample, the results of a pilot study, testing, the selection and preparation of materials, and the procedures employed.

I. Design

One hundred twenty kindergarten children, six groups of boys and six groups of girls, were individually presented with a list of four known words. Two groups, one of boys and one of girls, were presented the list by a word card method. Two similar groups were presented the list by a word-picture method, and two further similar groups were presented the list by a word-object method. Of these groups, one half received verbal reinforcement and the other half received material reinforcement. Subject grouping for the experiment is illustrated in Table 2.

Each child was taken individually to a learning task where he was taught and required to recognise four

TABLE 2

Subject Grouping for the Experiment

Group	Sex	Method of Presentation	Type of Reinforcement
1	M	word card	verbal
2	F	word card	verbal
3	M	word card	material
4	F	word card	material
5	M	word - picture	verbal
6	F	word - picture	verbal
7	M	word - picture	material
8	F	word - picture	material
9	M	word - object	verbal
10	F	word - object	verbal
11	M	word - object	material
12	F	word - object	material

words correctly on two successive trials. A retest was given 24 hours later to test the number of words retained. All teaching, testing, and retesting was done by the examiner.

II. Analysis of Data

A three-way analysis of variance was used to determine, first, the main effects of sex, of methods of presentation, and of types of reinforcement, second, the first order interactions of sex by method of presentation, sex by type of reinforcement, and method of presentation by type of reinforcement, and third, the second order interaction of sex by method of presentation by type of reinforcement on both the acquisition (number of trials to mastery) and retention (number of words remembered) of the word list. An illustrative model for the analysis is presented in Figure 2.

To determine whether any significant differences existed between independent means within the cells, *t* tests were used. Further *t* tests determined whether any significant differences existed between selected collapsed measures.

A two-way analysis of variance was used to test the significance of interactions of combined variables.

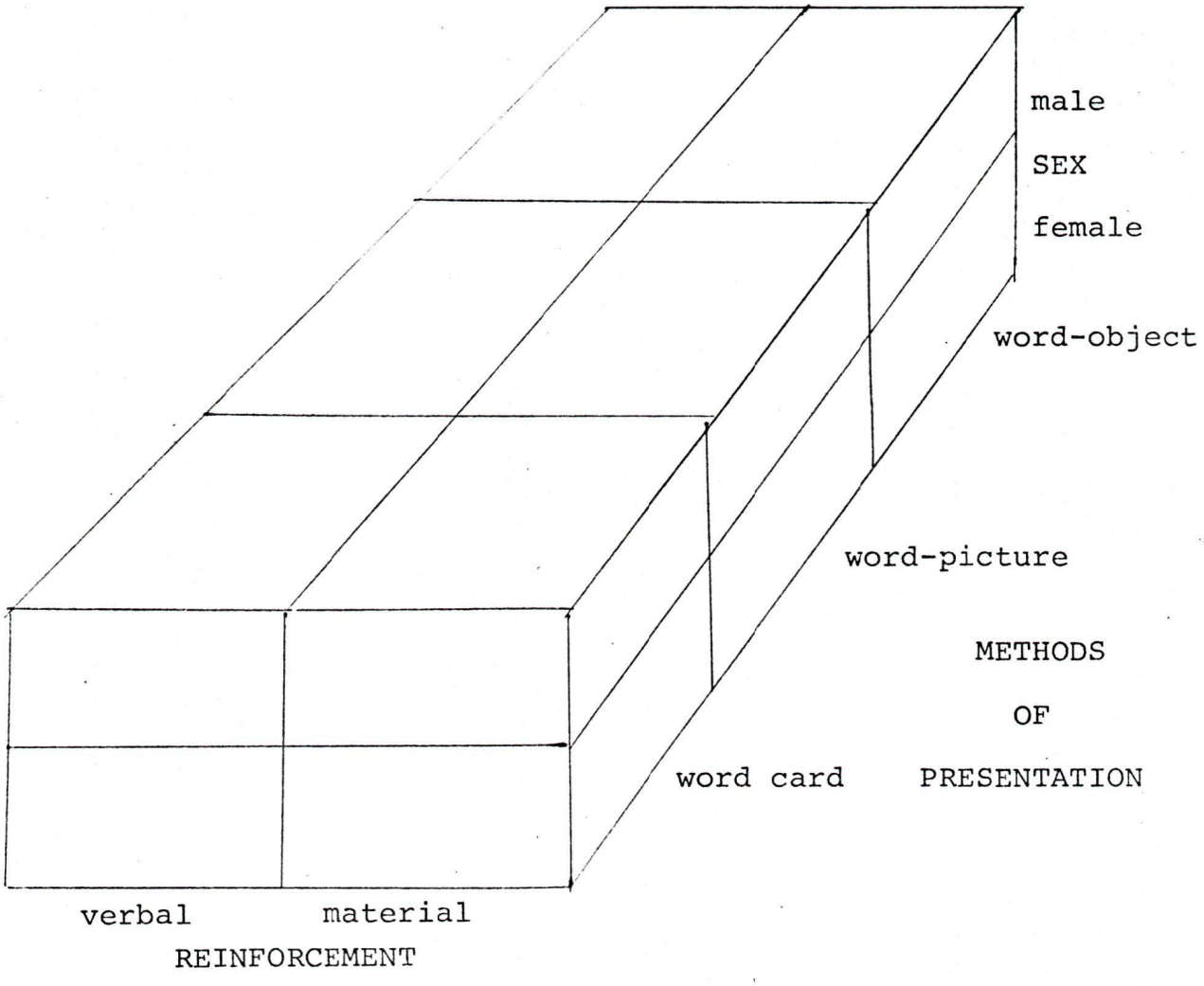


Fig. 2. Model of the Three-Way Analysis of Variance

III. Population and Sample

The population consisted of public school kindergarten children similar to other children in the three schools from which the sample was taken. The sample consisted of 120 children, 60 boys and 60 girls, from three schools in Greater Victoria. Total enrolment in the kindergarten classes in these schools was 139, fairly evenly divided between morning and afternoon classes. The enrolment in the sample is shown in Table 3.

Separate alphabetical lists of boys and girls were made of each of the six classes. The lists were then numbered, the numbers randomly drawn without replacement, and the children represented by those numbers assigned to each of the experimental conditions. Drawing continued until the required 120 children were assigned. The remaining 19 children were randomly selected to complete an alternate list from which substitutes were drawn because of failure to master the list in 20 trials (five substitutes), absenteeism (eight substitutes), ability to read (one substitute), and incomplete data (one substitute). Two additional alternates were needed for an emotionally disturbed girl who did not speak and for a boy who, because he was in kindergarten for a second year, spent the afternoons in a first grade classroom. Substitutes were matched on the basis of sex, method of presentation, and type of reinforcement. An attempt was made to match subjects on morning or afternoon attendance

TABLE 3

Enrolment in Sample

School	Kindergarten Enrolment	Morning Attendance	Afternoon Attendance
1	46	23	23
2	34	18	16
3	59	31	28
Total	139	72	67

but proved impossible because of the limited sample available.

IV. Pilot Study

A pilot study, conducted with a kindergarten class in a Victoria public school, served to acquaint the examiner with the handling of materials, to estimate the amount of time required for the study, and to determine the difficulty of the task of learning the words. Teaching and testing were both done in the medical room of the school. Prompt cards were made so that the examiner could maintain consistency in giving instructions to subjects. Techniques of presenting words, pictures, and objects, scoring procedures, and methods of reinforcing were developed so that testing could proceed smoothly.

Although statistical procedures were carried out on the data accumulated, results were completely invalid because of the changes in experimental variables. It became apparent that several revisions were needed. Originally objects were arranged, in order of their being presented, on the nurse's couch and were covered with a blanket during testing. Groping for a specific object and not revealing the other objects proved inefficient. An easier method of retrieving objects for reteaching in the word-object experimental condition needed to be developed. It was decided that a bag large enough to contain all objects would allow for efficient retrieval of a single

object without revealing the other objects. It became necessary to develop verbal reinforcement to include praise. The subjects indicated some lack of enthusiasm for the task when only knowledge of results was given. It became necessary to revise the word list to be taught. The original list of words ("horse", "house", "stone", and "stove") proved too difficult in that of the first 24 subjects tested, only 13 were able to master the list. A tally of the errors made revealed that the word "house" caused the greatest difficulty. Because the two alternate words, "skirt" and "shirt", appeared to be on the same level of difficulty as "house" and "horse", it was decided that an entirely different word should be substituted. The word "apple" was then chosen and the revised list became "horse", "apple", "stone", and "stove". Subsequent testing of the remaining 13 subjects in the pilot study group revealed only one who could not master the revised list.

Of interest were several comments made by boys during the course of the pilot study. One boy repeatedly spelled out the letters of the words, but in "horse", he called the h an n. When his error was pointed out, he rapidly checked the word "stone" to look again at the n. No further errors were made with "horse". When asked how he now knew "horse", he replied that an h was really an n with a tail on it and since a horse had a tail too, he could remember it. "Stone" was remembered by another boy because

the n had a hill and stones were found on hills. In "stove", however, the v had a hole which reminded one boy of the hole (the oven) in his mother's stove; hence he was able to recognise the word "stove".

V. Testing

Efforts were made to provide privacy during testing in the actual study. In most schools, testing took place in the medical room although in some instances libraries and staffrooms had to be used. Interruptions included various medical crises, both student and staff interruptions, and announcements over the public address systems. However, it should be noted that interruptions such as classroom noises were not present, and therefore, in the opinion of the examiner, fewer disturbances were present during teaching and testing than there would have been in a regular classroom.

Testing for retention, 24 hours later, was done under somewhat different conditions. Individual testing took place in the relative privacy of the playhouse or the cloakroom in the kindergarten room rather than in a separate room in the school. Distractions, however, were minimal in that other children were elsewhere occupied. Test cards were shuffled and randomly selected rather than being put into pre-selected random order before being presented to the children. Subjects were not informed about the correctness of their responses nor were they given

material or verbal reinforcement. A count was made of the number of words retained and this count constituted a retention score.

VI. Selection and Preparation of Materials

Word List Selection

The words selected were, of necessity, nouns which could be easily depicted by pictures and by actual objects. As such, they represented a limited portion of sight words presented to a beginning reader. An attempt was made to maintain pairs which were alike in configuration, initial consonants, and length. The necessity of dispensing with one pair of similar words was revealed during the pilot study. An attempt was made to obtain words which were, in the opinion of the examiner, of a high interest level to both sexes and within the speaking vocabularies of kindergarten-aged children.

The review of research (See pp. 39-42.) indicated that similar words were more difficult to learn than dissimilar words. It was felt that the more difficult task should be presented in order to test better the effects of reinforcement and methods of presentation. Initial letters appear to present the strongest cue to word recognition. An attempt, therefore, was made to force keener visual discrimination by changing internal details only.

The word list chosen from first grade lists in *A Basic Vocabulary of Elementary School Children* (Rinsland, 1945) is

given in Table 4. The first four words were to constitute the list, with the next two being possible substitutes in the event that a great many children knew the words prior to the test. Since it caused the greatest difficulty in the pilot study, the word "house" was eliminated and the word "apple" substituted, thus breaking the letter-change pattern. The revised list now contained one pair of similar words and one pair of dissimilar words.

Order of Word Presentation

Each word was numbered alphabetically from one to four and drawn randomly for order of presentation for each trial. This order of presentation was maintained for the word-picture and word-object trials.

Selection of Type of Reinforcement

The review of the literature revealed that both verbal and material reinforcers were effective in facilitating learning. Originally, it had been decided by the examiner that knowledge of results would be adequate verbal reinforcement. This would include "yes", "no", "correct", or "incorrect" responses from the examiner. The pilot study revealed the necessity for more praise and encouragement. Additional comments were included. (See p. 78.)

For material reinforcement, it was decided that new pennies would provide adequate incentive. In order to

TABLE 4

Word List

Word	Rinsland Rating* (Grade One)		Alteration
house	1a1	900	middle letter, u to r
horse	1a3	248	
stove	1b2	55	internal letter, v to n
stone	2b	14	
skirt	3a	8	internal letter, k to h
shirt	1b4	38	
apple	1a3	245	

*Rinsland Rating:

1. The first number represents thousands.
2. The letter represents either the first or second five hundred of the thousand.
3. The second number indicates the hundred of the first thousand words.
4. The last number represents the frequency of occurrence in Rinsland's sample.

Using the word "apple" as an example and reading from right to left, "apple" is found in the third one hundred of the first five hundred of the first thousand words used by first grade children. It occurred 245 times in Rinsland's sample of first grade words.

minimize the distracting effect of reinforcing with objects which could be manipulated, the reward was placed on an envelope bearing the child's name, the envelope being placed directly in front of the child.

Preparation of Materials

The word cards were made of Bristol board, cut into rectangles four inches by ten inches, and lettered with commercially prepared Prestype Futura Demi lettering. The cards were then plasticized for protection from smudging or other distinguishing marks.

Objects were then purchased with the basic criteria being ease of handling, accuracy of representation, and a rough proportional scale.

Thirty-five millimetre slides of the objects were taken by the examiner. These were then enlarged to 8 inch by 10 inch coloured photographs. After the pilot study exposed the necessity for a revised word list, new eight by ten coloured photographs were taken by the Audio/Visual Department of the University of Victoria. These were then encased in plastic folders for protection. (See Appendix A for sample materials.)

VII. Procedures

Word Card Method

The child was called by name. The examiner said, "I would like to play a game with you to see how quickly you

can learn some words. Let's see if you already know some of them." Each child was pretested to see if he already knew the words. The teaching continued with, "I want you to look very carefully at each word. The first word is 'horse'. What is the word?" When an echoic response was given, the next word was presented in a like manner. Teaching continued until all four words had been presented and were placed on the table in vertically positioned similar and dissimilar pairs.

"Some of these words look very much the same. Can you point them out to me? Good! Now look very carefully at these words to see where the differences are. Can you point out the differences in those two words?" If the child was unable to point to the differences, no help was given but he was again urged to look very carefully.

Word-picture Method

Teaching procedures followed a similar format to that given in the word card method of presentation with the exception that in each case, the printed word was shown to the child and he was told what the word was before the picture was shown and placed immediately above the word. "This is the word 'horse' and this is a picture of a horse."

Word-object Method

A similar procedure was followed except that the actual object was used instead of the picture.

Reinforcement

During verbal reinforcement, the child was given praise and encouragement. Phrases such as "well done" and "good for you" were used for correct responses; "let's try again" and "almost right" were used for incorrect responses.

During material reinforcement, a roll of new pennies and a package of blank envelopes were on the examiner's left side. Since the child could recognise it, his name was printed on the envelope so that he knew it was his. That envelope was then placed in front of the child. The child was told that he would receive one of the new pennies for every word that he could recognise correctly. During the testing phase, pennies were piled up on the child's envelope. The examiner refrained from making verbal comment if the response was correct. Following the testing, the child's pennies and a letter to his parents (see Appendix B) were sealed inside the envelope, to be given to the teacher until it was time for the child to go home.

Testing

1. Pictures and objects were placed in a bag out of sight.
2. The word cards were shuffled in the order designated for trial one.
3. If any response was incorrect, the cards were immediately reshuffled in the order designated for trial two.

4. If an initial response was correct, the next word was presented. If all words were correctly identified, the cards were reshuffled in the order designated for the second trial.
5. Testing continued until mastery had been achieved with two successive trials of correctly recognising the word list or until 20 trials (as used by Ollila (1967) and McMorland (1972)) had been completed without mastery.
6. Subjects who were unable to master the list were replaced by a substitute from the alternate list.

Scoring

Scoring was done by checking successful recognition of words and circling those words which were not recognised. The score attained was the number of trials taken before the child attained mastery. (See sample score sheet, Appendix C.)

Retesting

The test for retention was given 24 hours after the original testing and teaching had been completed. The four words were shuffled for each retest situation. The score attained was the number of words correctly recognised. One

subject moved during the testing period and had to be removed from the sample because of incomplete retention data.

Summary

This chapter indicates in detail the design of the experiment including methods of grouping subjects and the means by which the data were analysed--the three-way analysis of variance and *t* tests. The population of kindergarten children and the sample taken from it are described. The results are indicated of a pilot study which was conducted to develop efficient handling of materials and to test experimental conditions and which revealed the necessity for making several alterations. The selection and preparation of word cards, pictures, objects, and material reinforcements as well as the procedures of teaching, testing, and retesting of the word list are presented. A statement about the method used to score the tests completes the chapter.

CHAPTER 5

ANALYSIS AND RESULTS

This chapter will present the results of the study to test the effects of methods of presentation and types of reinforcement on the learning and retention of a word list by kindergarten boys and girls. The results of the three-way analysis, t tests between independent means, and two-way analysis will be given. Comparisons will be made between means of mastery scores and retention scores on selected variables.

It was predicted that there would be no significant differences as a result of the main effects of sex, methods of presentation, and types of reinforcement or the interactions of sex by method, sex by reinforcement, method by reinforcement, and sex by method by reinforcement. (See null hypotheses, p. 5.)

I. Three-Way Analysis of Variance

Descriptive data indicating the number of trials to mastery attained by boys and girls under each method of presentation and each type of reinforcement are given in Appendix D. A summary of the data for the three-way analysis of variance for trials to mastery is presented in Table 5. An examination of the summary of data for trials

TABLE 5

Summary of Data for Three-Way Analysis of Variance
(Trials to Mastery)

Source of Variation	df	MS	F	p
Rows (reinforcement)	1	15.41	1.05	.32
Columns (methods)	2	.41	.03	.97
Layers (sex)	1	.67	.05	.83
Rows X Columns (Reinforcement by Methods)	2	28.96	1.97	.17
Rows X Layers (Reinforcement by Sex)	1	2.41	.16	.69
Columns X Layers (Methods X Sex)	2	39.03	2.66	.09
Rows X Layers X Columns (Reinforcement by Sex by Methods)	2	18.31	1.25	.31
Error	18	14.69		
Total	119			

to mastery, as related to the hypotheses made in the first chapter (See p. 5), reveals that as a result of this study:

1. There are no significant differences in the main effects of sex, methods of presentation, and types of reinforcement on the number trials to mastery of a word list.
2. There are no significant interaction effects among the variables of sex, methods of presentation, and types of reinforcement on the number of trials to mastery of a word list.

Descriptive data indicating the number of words retained 24 hours after the learning-testing treatment are presented in Appendix E. A summary of the data from the three-way analysis of variance for retention is presented in Table 6. An examination of the summary of data for retention scores reveals that as a result of this study:

1. There are no significant differences in the main effects of sex, methods of presentation, and types of reinforcement on retention scores.
2. There are no significant interaction effects among the variables of sex, methods of presentation, and types of reinforcement on retention scores.

Conclusions reached on the basis of this study indicate that the null hypotheses presented on page five may be retained.

TABLE 6

Summary of Data for Three-Way Analysis of Variance
(Retention of Words after 24 Hours)

Source of Variation	df	MS	F	p
Rows (reinforcement)	1	.008	.004	.95
Columns (methods)	2	2.57	1.40	.27
Layers (sex)	1	3.67	2.00	.17
Rows X Columns (Reinforcement by Methods)	2	3.96	2.15	.15
Rows X Layers (Reinforcement by Sex)	1	1.88	1.02	.33
Columns X Layers (Methods by Sex)	2	1.42	.77	.48
Rows X Columns X Layers (Reinforcement by Methods by Sex)	2	2.77	1.51	.25
Error	18	1.84		
Total	119			

II. t Tests--Comparisons of Mean Scores

Means and standard deviations were calculated for trials to mastery and retention scores for each method of presentation, each type of reinforcement, and each sex. Data are presented in Tables 7A and 7B. Despite the lack of statistically significant differences as a result of the three-way analysis of variance, t tests were calculated with the purpose of precisely pinpointing the cells where significant differences in means might occur. The results of the t tests comparing the mean scores of both dependent variables--trials to mastery and retention--are presented in Tables 8A to 8E.

Significant differences were found between the following means:

1. Girls' retention scores under the picture-object method comparing verbal and material reinforcement significantly favoured verbal reinforcement at the .02 level. (See Table 8A.)
2. Girls' retention scores under material reinforcement comparing word-card and word-object methods significantly favoured the word-card method at the .05 level. (See Table 8C.)
3. Girls' retention scores under material reinforcement comparing word-picture and word-object methods significantly favoured the word-picture method at the .005 level. (See Table (8D.)

TABLE 7A

Means and Standard Deviations For Trials to Mastery and Retention of a Word List by Kindergarten Boys

	Verbal Reinforcement				Material Reinforcement			
	Trials to Mastery		Retention		Trials to Mastery		Retention	
Method	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Word Card	7.1	3.8	3.2	1.1	5.2	3.6	3.3	0.9
Word - Picture	6.9	3.9	2.5	1.4	6.4	3.9	2.9	1.3
Word - Object	5.1	5.2	2.8	1.4	4.5	3.3	3.0	1.2

TABLE 7B

Means and Standard Deviations for Trials to Mastery and Retention of a Word List by Kindergarten Girls

	Verbal Reinforcement				Material Reinforcement			
	Trials to Mastery		Retention		Trials to Mastery		Retention	
Method	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Word Card	6.6	4.3	3.0	1.5	4.4	4.0	2.7	1.3
Word - Picture	6.4	6.1	2.3	1.4	4.3	2.5	3.2	1.1
Word - Object	5.7	3.4	2.9	1.2	8.7	6.1	1.5	1.3

TABLE 8A

Probability of Mean Differences Between Verbal and Material Reinforcement

Sex	Method	Probability (2 tailed test)	
		Trials to Mastery	Retention
boys	word-card	.26	.83
boys	word-picture	.78	.52
boys	word-object	.76	.74
girls	word-card	.25	.64
girls	word-picture	.32	.13
girls	word-object	.19	.02*

TABLE 8B

Probability of Mean Differences Between Word-Card Method and Word-Picture Method

Sex	Reinforcement	Probability (2 tailed test)	
		Trials to Mastery	Retention
boys	verbal	.91	.24
boys	material	.48	.44
girls	verbal	.93	.30
girls	material	.95	.38

* $p \leq .05$

TABLE 8C

Probability of Mean Differences Between
Word-Card Method and Word-Object Method

Sex	Reinforcement	Probability	
		Trials to Mastery	Retention
boys	verbal	.34	.49
boys	material	.65	.55
girls	verbal	.61	.87
girls	material	.08	.05*

TABLE 8D

Probability of Mean Differences Between
Word-Picture Method and Word-Object Method

Sex	Reinforcement	Probability	
		Trials to Mastery	Retention
boys	verbal	.39	.64
boys	material	.26	.86
girls	verbal	.75	.32
girls	material	.05*	.005*

* $p \leq .05$

TABLE 8E

Probability of Mean Differences Between Boys and Girls

Reinforcement	Method	Probability	
		Trials to Mastery	Retention
verbal	word card	.79	.74
verbal	word - picture	.83	.76
verbal	word - object	.76	.87
material	word card	.64	.26
material	word - picture	.17	.59
material	word - object	.07	.02*

* $p \leq .05$

4. Girls' trials to mastery scores under material reinforcement comparing word-picture and word-object methods significantly favoured the word-picture method at the .05 level. (See Table 8D.)
5. Retention scores under the word-object method of presentation and material reinforcement comparing boys and girls significantly favoured the boys at the .02 level. (See Table 8E.)

III. t Tests--Comparisons of Collapsed Mean Scores for Mastery and Retention

The mean scores on the dependent variables of trials to mastery and of retention were amassed in three different ways for comparison purposes. Such collapsed mean scores were obtained by first, combining scores for boys and girls, second, combining scores for methods of presentation, and third, combining scores for types of reinforcement. Analyses using t tests ($p \leq .05$) resulted in no statistical significance. Data for the means thus compiled are presented in Tables 9 to 14. Observations on the data follow.

Combined Sex Variable

An examination of the boys' and girls' combined mean scores on the trials to master variable (Table 9) reveals that the fastest recognition appeared to occur

TABLE 9

Mean Trials to Mastery Scores (Boys and Girls Combined)

Reinforcement	Methods					
	Word Card		Word - Picture		Word - Object	
	$\bar{X}$	p	$\bar{X}$	p	$\bar{X}$	p
verbal	6.9	.10	6.65	.34	5.4	.43
material	4.8		5.35		6.6	

TABLE 10

Mean Retention Scores (Boys and Girls Combined)

Reinforcement	Methods					
	Word Card		Word - Picture		Word - Object	
	$\bar{X}$	p	$\bar{X}$	p	$\bar{X}$	p
verbal	3.1	.80	2.4	.12	2.85	.17
material	3.0		3.05		2.25	

TABLE 11

Mean Trials to Mastery Scores
(Methods of Presentation Combined)

Reinforcement	Boys		Girls	
	$\bar{X}$	p	$\bar{X}$	p
verbal	6.37	.33	6.2	.72
material	5.37		5.8	

TABLE 12

Mean Retention Scores (Methods of Presentation Combined)

Reinforcement	Boys		Girls	
	$\bar{X}$	p	$\bar{X}$	p
verbal	2.8	.47	2.7	.46
material	3.1		2.5	

under the word-card method with material reinforcement. A trend ($p \leq .10$) appears to indicate that material reinforcement may produce faster learning than verbal reinforcement for children learning words by the word-card method of presentation.

Table 10 indicates results for retention scores. No significant differences were found as a result of the application of *t* tests on scores of both trials to mastery and retention when girls' and boys' mean scores are combined.

Combined Method of Presentation Variable

When the mean scores for the methods of presentation were combined (Tables 11 and 12), no significant differences resulted on either the trials to mastery or retention variable.

Combined Type of Reinforcement Variable

When the types of reinforcement were combined for the trials to mastery scores (Table 13), a trend ($p \leq .11$) appears to indicate that boys learn more quickly than girls with the word-object method of presentation. Similarly, it appears that boys retain more words than girls ($p \leq .11$) when they have been taught by the word-object method of presentation. (See Table 14.) Neither difference is, however, significant.

TABLE 13

Mean Trials to Mastery Scores
(Types of Reinforcement Combined)

Sex	Methods of Presentation					
	Word Card		Word - Picture		Word - Object	
	$\bar{X}$	p	$\bar{X}$	p	$\bar{X}$	p
boys	6.15	.61	6.65	.34	4.8	.11
girls	5.5		5.35		7.2	

TABLE 14

Mean Retention Scores (Types of Reinforcement Combined)

Sex	Methods of Presentation					
	Word Card		Word - Picture		Word - Object	
	$\bar{X}$	p	$\bar{X}$	p	$\bar{X}$	p
boys	3.25	.31	2.7	.91	2.9	.11
girls	2.85		2.75		2.2	

IV. Two-Way Analysis of Variance--Interaction of Combined Variables

Two-way analysis of variance, computed to determine interaction effects between the combinations of the variables of reinforcement, method, and sex, revealed no significant interactions. Results of the two-way analysis are presented in Table 15.

V. Cues

Children were questioned as to the specific cues they used in order to recognise a word. Most children tended to use a particular letter. The words "apple" and "horse" were most often recognised by their initial letters. Some children recognised "apple" because of the double letter. The word "stove" was recognised by the point of the v. Those who recognised "stone" usually did so because of the n. Many of the children were able to recognise and call letters by name; some tended to spell the words before saying them.

Summary

No significant results were found for the main effects or interactions of sex, methods of presentation, and types of reinforcement on the trials to mastery or retention scores on the word list.

Significant differences were found between independent cells as follows:

TABLE 15

Summary of Data for Two-Way Analysis of Variance

Probability of Interaction Effects

--Reinforcement, Method, Sex--

(Mastery and Retention)

Source of Variation	Probability	
	Mastery	Retention
Reinforcement by Method	.21	.10
Reinforcement by Sex	.72	.30
Sex by Method	.13	.43

1. Verbal reinforcement was better than material reinforcement in the word-object method for girls' retention scores.
2. The word card method was better than the word-object method under material reinforcement for girls' retention scores.
3. The word-picture method was better than the word-object method under material reinforcement for girls' retention scores.
4. The word-picture method was better than the word-object method under material reinforcement on girls' trials to mastery scores.
5. Boys retained more words than girls under the word - object method with material reinforcement.

Observations indicate "horse" as the word presenting the least difficulty and "stone" as the word presenting the greatest difficulty.

CHAPTER 6

SUMMARY AND CONCLUSIONS

The purpose of this study was to investigate the effects of the provision of both associational cues in the forms of pictures and objects and incentive in the form of verbal and material reinforcement on the recognition and retention of four words by kindergarten boys and girls. Twelve groups of ten children were presented with the task of correctly recognising the word list on two consecutive trials. A three-way analysis of variance indicated no significant differences for main effects or interaction effects of sex, methods of presentation, and types of reinforcement on either dependent variable of number of trials to mastery or number of words retained after 24 hours. Further comparisons of means between independent cells were calculated by the use of t tests and resulted in several significant differences. (See p. 85.)

I. Methods of Presentation

King and Muehl (See p. 39.) advocated the use of pictures in early reading for some children; Samuels (See p. 36.) and Braun (See p. 42.) have questioned their use for some children.

> ...while it may be justifiable to employ pictures to provide

> vicarious background experience, it seems reasonable to question the effectiveness of presenting sight vocabulary with illustrations since the picture may well compete with the word stimulus for the attention of the learner.
>
> (Braun, p. 430.)

The different procedures which were used in this study may have been responsible for the lack of support given to Braun in that pictures and objects did not tend to distract the learner's attention from the printed word to any significant degree. On the contrary, by examination of the mean scores, the provision of these additional cues under verbal reinforcement appeared to facilitate the rapidity of acquisition of the four words. Considering that reinforcement of a verbal nature is most often used in the classroom, it would seem advisable to continue the use of associational cues, not only as an aid to attaining a sight vocabulary but also as an aid to motivation and attention.

The cell containing data of materially reinforced girls under the word-object method of presentation is involved in each significant mean score difference as found by the use of t tests. Examination of the scores of these subjects revealed that they required the greatest number of trials to reach mastery and were able to retain the smallest number of words. Two factors may have contributed to the difference. Two of the ten subjects in this cell came from homes in which a foreign language was spoken, a factor which

may have influenced their having greater difficulty with the words. A third subject appeared intrigued with the object of the stove and had to be firmly diverted several times from a discussion of its features to paying more attention to the learning task. The resulting maximum number of trials to mastery required by this subject certainly contributed to the significant differences in means when this cell was compared with others.

II. Reinforcement

Extrinsic reinforcement applied to an early reading task, as advocated by Staats (1968), receives some support from observations of the results of this study. Such support, however, is not statistically significant. If one does not consider the atypical cell, an examination of the mean scores appears to reveal the trend that both boys and girls, under all methods of word presentation, were able to reach mastery of the learning task more quickly under material reinforcement than under verbal reinforcement.

When retention scores are considered, it appears that boys remembered more words when they had been learned under material reinforcement, regardless of the method by which the words were presented. While the money reward appeared as appealing to boys as to girls in the initial learning-testing situation, it seemed to foster greater retention for boys than for girls.

Significant mean differences were found on

retention scores of girls under material reinforcement favouring the word-card over the word-object method of presentation and favouring the word-picture over the word-object method. It is possible that the pennies and objects served as double distractions during learning which may have resulted in lesser retention. In the treatment cell with material reinforcement removed and only one of the distractions--the objects--present, it was observed that girls retained significantly more words. The rate of learning of materially reinforced girls under the word-picture method was significantly greater than for a similar group under the word-object method. The objects, particularly the stove, may have proved more appealing than the pictures, thus producing a greater distraction. Boys' retention scores were significantly greater than those of girls when both sexes were taught under the double distractive influence of objects and pennies. This would indicate that perhaps boys were less affected by distractions than girls or that the objects were more appealing to girls than to boys.

III. Observations of Word Difficulty

Observations indicated that greater difficulty was shown with mastering the word "apple" than "stove". (Appendix F, Table 16A) However, when one considers word difficulty according to sex (Table 17), it appears that "apple" was easier for boys while "stove" was easier for

girls. This raises speculation on the interest loading of words. Of the two words, "stove" would be more appealing to and hence easier for girls and "apple" more appealing to and hence easier for boys. Thus, Braun's conclusion on interest loading effects favouring the sex associated with the interest loading receives some support from observations from this study.

Boys and girls both found "horse" easiest to master, perhaps because of their familiarity with its meaning, and "stone" most difficult. The concept of "stone" was evident although several children mistakenly called it "rock".

The potential cues present in a word provide one basis for evaluating its ease of acquisition. The word "apple", as the second most difficult word to remember, is of some interest in that it possesses at least three of Spache's listed cues (See p. 36.) which should help to make it distinctively easier to discriminate from the other words. First, the initial letter, determined to be the most important cue to recognition, is a letter with which each child had had experience. Second, the fact that one letter appeared twice would serve to distinguish it from the other words. Third, although configuration is seemingly a weak cue, the word "apple" possesses a unique configuration in that three levels of height, rather than two as in the other three words, are evident.

IV. Observations of Sex Differences

While more boys than girls supposedly require remedial help in reading, it is surprising that the boys in this study made fewer total errors than the girls (See Appendix F, Table 18). However, they exhibited a much greater degree of difficulty with the similar word pair than the girls did. Boys had 30% more difficulty with similar words than dissimilar words, while the girls had only a 7% difference. King and Muehl (1965) suggested that associational cues affected the rate of learning of dissimilar words. Evidence here appears to corroborate their conclusion - boys under verbal reinforcement showed greater difficulty with similar word pairs, but they learned more readily with the availability of extra cues than without them.

V. Limitations and Implications

The applicability of findings must be considered in light of the sample and variables used in this study. Approximately 10% of the kindergarten-aged children in the sample came from culturally different backgrounds. The finding that in this sample of kindergarten children, the efficiency of learning and retaining a sight vocabulary seemed unaffected by the materials used is applicable only to similar children in similar schools. Findings are

dependent, in part, on the particular types of reinforcement and the specific words used.

Consideration must be given to other limitations stated in the first chapter. Since intelligence of the children was not considered, the results may not apply, necessarily, to all levels of capabilities of children of all ages. Teaching was done on an individual basis, and therefore the effectiveness of specific experimental conditions could be seen on an individual basis.

Since no significant overall differences were found among the methods of presentation and types of reinforcement used in teaching the list of words to kindergarten children, it might be desirable for the teacher to incorporate several methods and reinforcements in the teaching of sight words. Individual differences in learning, however, were apparent in the study. A combination of methods of presentation and types of reinforcement thus would not only provide added interest and motivation for all pupils, but would include the particular presentation and reinforcement which are best for each individual. Careful observation by the teacher might reveal the most effective combination for a specific group of children or for each child. Flexibility in changing presentations and reinforcements may be necessary if teaching for rapid mastery and long retention is to be efficient.

Most of the kindergarten children tested were

capable of mastering the word list. However, observations indicated that many of the children at this age level were not aware, immediately, of the differences between greatly similar words. It may be necessary for the teacher to point out, specifically, these differences before successful recognition can be attained.

It appears that kindergarten children have the ability to make fine visual discriminations. Reading experiences may well be presented to them successfully if careful consideration is given to methodology and principles of reinforcement.

VI. Conclusions

A summary of the conclusions reached on the basis of the study follows:

When children are presented with words representing familiar concrete objects, it makes no significant difference to their rates of learning or retention of words whether the words are presented by word-card, word-picture, or word-object methods.

There were no significant differences found for interaction effects of method, reinforcement, and sex. Significant differences were found among five independent cell mean scores. Girls' retention scores with material reinforcement indicated that the word-card method was better than the word-object method and that the word-picture method was better than the word-object method. Girls' trials to

mastery scores with material reinforcement also favoured the word-picture method over the word-object method. Girls' retention scores in the word-object cell indicated that verbal reinforcement was significantly better than material reinforcement. The word-object method coupled with material reinforcement favoured boys over girls on the retention variable. It appeared that when fewer distracting stimuli were present, the retention score was greater. Boys seemed less affected by possible double distraction than girls.

Wide variation was evident among sex, method, and reinforcement when independent means were considered. No single method of presentation or type of reinforcement was best for the rate of learning and ability to remember words for all children.

The rate of learning and retention of the four words presented in this study were not affected, for most children, by the verbal or material reinforcement offered. All but five children in the sample were able to master the list. The effectiveness of reinforcements offered may have accounted partially for this success.

VII. Suggestions for Further Study

1. Repeat the study using words chosen by the subjects themselves as those words they would like to learn to read (the language experience approach).

2. Repeat the study using a tactile method of presentation -- sandpaper or raised letters.
3. Repeat the study using different types of reinforcement -- perhaps allowing the child to choose the type of reinforcement he wants.
4. A comparison of methods of word presentation and types of reinforcement as they apply to various levels of intelligence might be made. Since intelligence tests at this age level are largely pictorial, a significant correlation between high intelligence and a picture method might be anticipated.
5. In this study, each word within each trial was presented only until an error was made. If all four words were presented at every trial, regardless of error, a comparison might be made of the rates of learning between two such methods.
6. The study might be repeated with various socio-economic groups.

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APPENDICES

APPENDIX A

Word Cards Used in the Study

horse

Apêndice

stone

stoves

APPENDIX B

Dear Parent,

A note of explanation:

Your child has been given pennies for correct answers on a learning task. This was part of a study to examine whether kindergarten children given material rewards would learn a list of four words more quickly than those children given verbal encouragement.

(Mrs.) L. E. Strachan

University of Victoria

APPENDIX C

SCORE SHEET

NAME_____ FEMALE_____
DATE_____ MALE_____

METHOD OF PRESENTATION:

WORD CARD_____
WORD PICTURE_____
WORD OBJECT_____

METHOD OF REINFORCEMENT:

MATERIAL_____
VERBAL_____

INSTRUCTIONS: Circle the word which is missed and check each successful trial.
Mastery is achieved with two successive successful trials.

1. horse 2. apple 3. stone 4. stove

TRIAL	ORDER OF PRESENTATION	SUCCESS
1	4 1 2 3	
2	2 1 4 3	
3	3 4 2 1	
4	3 2 4 1	
5	4 2 1 3	
6	3 2 4 1	
7	2 3 1 4	
8	2 4 1 3	
9	3 1 2 4	
10	2 3 1 4	
11	1 2 4 3	
12	4 1 3 2	
13	2 1 4 3	
14	2 4 1 3	
15	2 1 3 4	
16	3 1 4 2	
17	1 3 2 4	
18	1 2 3 4	
19	2 3 4 1	
20	1 4 3 2	

Total Trials to Mastery _____

APPENDIX D

Data for Analysis of Variance with Three-Way Classification

Trials to Mastery Under Three Methods of

Presentation Reinforced by Two Conditions

	n > 1					
BOYS	METHOD OF PRESENTATION					
	WORD CARD		WORD - PICTURE		WORD - OBJECT	
VERBAL	6	9	8	11	7	2
	7	4	12	2	2	2
	12	6	7	11	2	5
	12	2	4	9	19	4
	2	11	3	2	3	5
MATERIAL	3	11	6	5	2	5
	4	2	2	2	2	2
	3	2	4	12	4	2
	12	4	5	8	6	11
	5	6	14	6	2	9
GIRLS						
VERBAL	2	2	2	5	5	9
	8	2	16	4	10	8
	13	6	19	5	3	6
	5	13	3	2	2	2
	5	10	6	2	10	2
MATERIAL	15	7	7	4	8	9
	2	3	2	2	2	3
	2	2	4	5	6	3
	2	4	2	9	10	8
	3	4	2	6	18	20

APPENDIX E

Data for Analysis of Variance with Three-Way Classification

Retention Scores Under Three Methods of

Presentation Reinforced by Two Conditions

n > 1

BOYS	METHOD OF PRESENTATION					
	WORD CARD		WORD - PICTURE		WORD - OBJECT	
VERBAL	3	4	4	4	4	4
	2	2	1	1	2	4
	4	1	1	4	2	0
	4	4	3	1	2	4
	4	4	2	4	2	4
MATERIAL	2	4	1	2	4	3
	4	4	4	4	1	2
	4	4	2	1	4	4
	4	2	4	4	1	4
	2	3	4	3	3	4
GIRLS						
VERBAL	4	4	0	1	1	2
	4	4	4	1	4	4
	2	0	4	2	3	4
	4	4	4	2	3	1
	3	1	3	2	3	4
MATERIAL	4	2	4	1	0	2
	0	2	4	3	2	2
	4	2	4	4	4	1
	4	3	2	4	2	2
	2	4	2	4	0	0

APPENDIX F

WORD ERRORS

Errors made by those subjects achieving mastery over the word list were grouped according to individual words. Percentages of errors for each word were then calculated (Table 16A). Similar errors were tabulated for those subjects who did not achieve mastery (Table 16B). Tabulations were made solely for the purpose of observation; no statistical calculations were done.

It appeared that the order of difficulty varied with the subjects who achieved mastery and those who did not. Those who mastered the list had the following order, from hardest to easiest: "stone", "apple", "stove", "horse". Those who did not master the list had the following order: "apple", "stone", "horse", "stove".

Errors were further broken down into errors made by boys and by girls and percentages were again calculated (Table 17). No statistical computations were done. Of those who mastered the list, girls made 52.2% of the total errors while boys made 47.8%. For the girls, the order of difficulty of words from hardest to easiest was: "stone", "apple", "stove", "horse". For the boys, the order of difficulty from hardest to easiest was: "stone", "stove", "apple", "horse".

Errors were also grouped according to those made by each sex on the two dissimilar words and the two similar

words. Errors thus grouped are shown in Table 18. Both boys and girls showed a greater difficulty with similar words than with dissimilar words. However, girls showed a trend toward having less difficulty than boys with similar pairs and more difficulty than boys with dissimilar words.

APPENDIX F

TABLE 16A

Word Errors and Percentages for Subjects Achieving Mastery

	horse	apple	stone	stove
Total errors	59	105	165	100
Percentage per word	13.8	24.5	38.5	23.3

TABLE 16B

Word Errors and Percentages for Subjects Not Achieving Mastery

	horse	apple	stone	stove
Total errors	19	39	24	14
Percentage per word	19.8	40.6	25	16.4

TABLE 17

Errors According to Sex

	horse	apple	stone	stove	total
Boys					
Total errors	33	38	89	45	205
Percentage	16.1	18.5	43.4	22	47.8
Girls					
Total errors	26	67	76	55	224
Percentage	11.6	29.9	33.9	24.1	52.2

APPENDIX F

TABLE 18

Errors Grouped by List Type

	Dissimilar list	Similar list	Total
Boys	71	134	205
percentage	34.6	65.4	
Girls	93	131	224
percentage	41.5	48.5	
Total Errors	164	265	429
Total Percentage	38.2	61.8	

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EFFECTS OF PRESENTATION AND REINFORCEMENT ON THE RECOGNITION OF A WORD LIST BY KINDERGARTEN CHILDREN

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