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Effects of Sensori-Motor Reinforcement on Alphabet Letter Discrimination Tasks

Leona Magnus Peters
Utah State University

EFFECTS OF SENSORI-MOTOR REINFORCEMENT ON ALPHABET LETTER DISCRIMINATION TASKS

by

Leona Magnus Peters

A thesis submitted in partial fulfillment
of the requirements for the degree

of

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in

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Approved:

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Major Professor

_____
Committee Member

_____
Committee Member

_____
Dean of Graduate Studies

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Leona Magnus Peters

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ABSTRACT

Effects of Sensori-Motor Reinforcement on

Alphabet Letter Discrimination Tasks

by

Leona Magnus Peters, Master of Science

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Major Professor: Dr. Carroll Lambert
Department: Child Development

Recent research studies indicate the importance of sensory input in the development of perceptual skills. Learning the alphabet, an abstract symbol system, is considered a perceptual task. The major purpose of this investigation was to determine the effect of a visual experience reinforced by a sensori-motor experience in improving the ability of kindergarten pupils to perceive the configuration of alphabet letters and the order of these letters in a word.

Two separate kindergarten classes were selected as the experimental and control groups. The learning task was individualized through the use of each subject's own name.

Each subject in both groups was provided a daily visual perceptual experience with his own name through the use of a visual model card. In addition, each school day during the twelve day program, the experimental group received approximately five minutes of sensori-motor experience with the alphabet letters in their own names to tactfully reinforce the visual experience.

The results of the data collected indicate that the Ss in the experimental group showed greater improvement scores than the control group. On the positioning task, the experimental group showed a 6.3 per cent greater improvement score at level I and a 8.3 per cent greater improvement score at level II. On the ordering task, the experimental group showed a 13.9 per cent greater improvement score at level I and a 30.6 per cent greater improvement score at level II. Subjects performing at level I worked with their first names and subjects performing at level II worked with their first and last names.

The hypotheses were supported. The use of three dimensional moveable alphabet letters to build their own names increased the subjects perception of these abstract symbols through increased visual tactual sensory input.

(78 pages)

INTRODUCTION

Before or during the process of learning to read, every child is confronted with recognizing that each of the 26 abstract symbols in the English alphabet is different from the other 25, even though that difference is ever so slight. The ease with which the individual child is able to perceive these small differences in alphabet letters determines to a great extent the amount of success the child has in mastering the skill of learning to read. This ability to recognize some salient feature of each letter is fundamental whether he learns to read by the phonetic approach or the whole word method. Another factor of utmost import that the child must learn is that these symbols must be arranged in a definite order to spell a certain word.

The perception that, in our alphabet system, a circle is an o and a circle and a tall stick placed close enough so that they touch is a d takes place in the brain not in the fingers or eyes, etc. The fingers and eyes are a sensory media that transmit the image of the symbols in our alphabet system to the brain where the symbols are interpreted to represent a given sound.

Most young children do learn the alphabet through the visual media without noticeable difficulty. This fact has led to the erroneous viewpoint that learning the alphabet is a unilinear developmental process contingent on readiness alone and that all children will learn the symbols through the visual media

when they are interested enough to be motivated to pay attention and are, therefore, "ready."

The idea of reinforcing the visual media with a tactile experience is not new. Montessori (1912) advocated touching the alphabet letters while looking at them to fix the images more quickly through the cooperation of the senses. After a brief surge of interest in the education of the senses at the turn of the century, educators lost interest in this approach. However in the past decade, there has been renewed interest in the role that sensory input has in the process of perception. One example of a current application of a multi-sensory learning approach is O. K. Moores's "responsive environment's laboratory." Pines (1966). This program incorporates visual and auditory sensory input through the use of a programmed electric typewriter. The results of this and other recent investigations point to the value of simultaneous cross-modal sensory experiences in the process of perceptive learning.

Almy and Miller (1966) points out that Piaget has repeatedly emphasized the importance of visual and sensori-motor activity to develop the child's perceptual abilities.

Not all children learn to read. Lack of adequate perception has often been identified as a major cause of inversions, reversals, rotations, and incorrect spatial orientations of alphabet letters. Research has been vigorous in attempting to determine the role that various sensory inputs play in formulating the correct perception required to accurately and consistently

perceive the alphabet letters. There is also general agreement that many young children fail to recognize the importance of the order of letters in words.

Recognition of all of the alphabet letters is a skill that kindergarten pupils are expected to master in the school district where the author teaches. In the classroom the first alphabet letters that the child encounters in an organized, systematic way are the alphabet letters contained in the child's own name. It is common practice for the teachers in the district to teach the recognition of the child's name by presenting a visual experience with the printed name each day in the routine of taking attendance. Some children learn to recognize their own name immediately; however, some children have difficulty in attaining this skill until much later in the year.

This study was initiated in an attempt to measure what effect a multi-sensory approach would have on the ability to perceive accurately differences in the letters of the alphabet, and the ability to recognize the order of letters in a word. The alphabet letters studied were limited to the alphabet letters contained in each child's own name.

Within the structure of the study, it was assumed that measurable gains made by the control group would be due to the perceptual learning provided by the visual experience program. It was further assumed that measurable gains made by the experimental group would be a result of the perceptual learning made possible by the same visual experience program and the added sensory input of the sensori-motor reinforcement program.

Statement of the Problem

The purpose of this study was to determine if a sensori-motor reinforcement experience would improve the ability of kindergarten children to attend to the configurations of alphabet letters and the order of letters in a word.

The following hypotheses were made in this study:

1. There will be a measurable difference between the experimental population and the control population in the ability to order the letters correctly to spell the subject's own name after the completion of a systematic sensori-motor reinforcement program.

2. There will be a measurable difference between the experimental population and the control population in the ability to position the letters correctly to spell the subject's own name after the completion of a systematic sensori-motor reinforcement program.

Definition of Terms

Working definitions of terms in the context of the authors usage in this study.

haptic perception - learning through the sense of touch, employing active manipulation of an object by the fingers and hands.

ordering - placing the alphabet letter units in proper sequence from left to right to build a word.

perception - the act of receiving sensory impressions and interpreting and identifying these sensory impressions by correlating them with previous experiences. The recognition and integration of stimuli is a process that occurs in the brain, not in the fingers, eyes, etc. For instance, perception requires thought and reason, seeing does not.

positioning - placing the alphabet letter symbols in the correct spatial orientation so that the symbols consistently communicate a definite English alphabet letter.

Sensori-motor - refers to motor responses initiated by sensory stimulation.

tactile - perceived through the sense of touch.

visual perception - the process of discriminating and learning through the medium of the eye.

REVIEW OF LITERATURE

Role of Sensory Input in Perceptual Learning of Alphabet Letters

There has been great interest in the role of sensory input in the percepbual process of discriminating alphabet letters. There is varied opinion concerning which sensory media increases perceptual learning to the greatest degree. Activity in research has been directed to the important question of whether certain experiences contribute to discrimination skills or whether acuity in discrimination is a developmental process that is dependent on maturation. Visual input is discussed by Shaw (1964) who states that from a purely physical point of view, children's eyes are efficient enought for them to learn abstract symbols at 12 months of age. The visual media for perception is there, but the child has not yet developed the ability to understand what is perceived. Therefore if the input through the visual media does not transmit information to the brain that can be interpreted, sensory learning will not take place. Keislar (1964) postulates that learning to discriminate one letter from another is not an automatic process; the child at age four can begin to discover the critical dimensions of letters (sticks, curves, circle, etc.). Wheelock and Silvardi (1967) states that discrimination is learned and can be improved by direct training. J.J.Gibson

(1966) states that perceptual learning should not be considered as an enrichment process but as an education of attention to the critical features of the alphabet letters. Gibson states the education of the senses has often been the aim of individuals concerned with the intellectual growth and development of the young child. Gibson prefers to refer to the education of the senses as the education of the perceptual systems.

Supporting the developmental point of view, studies done by Zaporaphets (1965) indicate that haptic explorations used in tracing the contour of objects were definitely more organized and accurate as the child matured. Using films to construct a "Kinogram" (a plot of movements) Zaporaphets (1965) also reports that visual inspection of objects was more inclusive and efficient with age progression.

Vernon (1957) stresses the role of visual perception in letter recognition. He states that research indicates a normal child of ages five to six can perceive simple forms without great difficulty. The problem is the extent to which he can remember accurately the small differences between a number of similar shapes as are found in the alphabet letters.

Fries (1965) concludes that letters must be identified as contrasting shapes and this must be practiced until the child's recognition reactions to the significant features are automatic.

Scholnick, Osler and Katzenellenbogen (1968) states that practice in making perceptual discriminations in pictures and solid objects will transfer to other new learning tasks such as the task of learning the letters in the alphabet.

Gibson, Gibson, Pick and Osser (1962) used letter-like forms to test for improvement in discrimination tasks performed by children ages four to eight. It was their conclusion that improvement is the result of learning to detect invariants in the alphabet letters; which is a perceptual learning task.

Greene (1968) discusses the role of tactile sensory input. Greene conjectures that since touch is the only tangible physical contact we have with objects, it is probably the most important sense we have. He stresses the tremendous need for tactual experiences in the development of the young child. The more sensory impulses the child's brain receives, the greater the visual-tactual development and the quicker skills in discrimination are achieved.

Discussing the importance of visual input, Hunt (1964) points to the study of Dennis and Dennis in 1940 with the Hopi children who were reared on cradleboards with the activity of their arms and legs restricted, but whose eyes were exposed to a rich variety of visual sensory input. These children who were restricted to the visual media were walking at the same age as the children reared with no motor activity restrictions.

Abravenel (1968b) reports that growing research literature indicates Soviet developmental psychologists increased interest in the role of haptic exploration in the process of learning during ontogenesis.

Abravenal (1968a) refers to studies done by Piaget and Inhelder (1956) which direct our attention to the issue of ontogenetic changes in perceptual and exploratory activity. They observed that between the ages of four and one-half and five and one-half, on the average, shapes that are integrated

into our symbolic alphabet system are accurately recognized and differentiated. Their studies of haptic explorations indicate that the sensori-motor approach to learning alphabet symbols at the kindergarten age level is valid and productive.

Gibson (1966) reports that during the fifth year, haptic attention to the subteleties of the spatial distribution is greatly refined.

Spiker (1960) postulates that learning the names for an object is basic and facilitates the learning, whereas, Gibson (1963) contends that learning a name for each letter is an association process, a secondary stage.

Pick, Pick and Thomas (1966) found in a developmental study that comparisons including breaks in the figure, closure, or rotations (all of which are characteristics of our alphabet system) were more efficiently differentiated by haptic explorations.

Studies conducted by Birch and Lefford (1963) enabled them to conclude that five year old children are able effectively to equate visual with haptic information in their perception about 90.2 per cent of the time. Birch and Lefford (1963) report that Piaget and Inhelder (1956) found that accuracy in discrimination was greatest when the initial perception was haptic, then visual. In early childhood this could be expected because haptic perception would involve the child more and direct the attention through action, whereas, visual perception could be very inactive with the sensory input greatly reduced.

Pick, Pick and Thomas (1966) found in their studies that there is a cross-modal transfer of perceptual learning from visual discriminations to

tactual discriminations and from tactual discriminations to visual discriminations.

Abravenel (1968b) states that there are important developments in perceptual activity at around five years of age and the process of intersensory patterning is also undergoing rapid change at this age.

Elkind and Weiss (1967) found that in a study involving eighty-five children, ages five to eight, that the tendency to explore an unstructured array of familiar figures increased with age. The tendency to explore a structured array was equally demonstrated at all ages. The results were interpreted as supporting the theory that visual and motor explorations are interrelated and an unorganized visual encounter did not stimulate haptic exploration at an early age, because the task was too difficult visually. From this research, Elkind postulates that patterns of visual explorations are, in effect, motor activity skills.

Characteristics of Difficulty Encountered in Perception of Alphabet Letters and Word Order

Research in the role of visual and haptic perception often has been directed to the confustion caused by similarities in certain alphabet letters. Dunn-Rankin, Leton and Shelton (1969) report that empirical studies have shown that rotations are a major source of confusion in young children. The letter features that are critical for discrimination of the letters b-p, b-q, d-p, b-d, p-q, u-n are often reversed in the process of visual perception. This confusion persists,

as shown when 315 second grade Ss (subjects) were asked to judge which of the 21 most commonly used lower case letters were most similar. They listed b-d-p, c-e, and n-u. Birch and Lefford (1967) supports this view with his studies that show that visual recognition of shape is well developed by age 5. Errors made in discrimination of figures were due to a failure in correct spatial orientations. De Hirsch, Jansky and Langford (1966) defines reversal discrimination as a higher level of visual perception functioning than differentiating distinctly different features as the circle found in O and the stick found in P. Popp (1964) and Gibson (1966) describe the reversals and rotations as the most confusing differentiation tasks. Vernon (1959) found that five year old children were often unable to see differences between a shape and its mirror image even when it was pointed out to them. This confusion persists up to ages eight or nine in some children.

Gibson, Gibson, Pick and Osser (1962) did an interesting study using Roman Jakobson's concept of distinctive features of phonemes and assumed that solid objects and graphemes have "distinctive feature" characteristics that could be used in discrimination. They found that in early stages of letter discrimination, object permanence (the fact that an object is the same upside down or facing left or right) resulted in a high rate of errors in discriminating letters that are related to reversals and rotations. The kind of perceptual learning that is required is a process of isolating and focusing on those unique features of each letters that are both invariant and critical. The role of perceptual learning is to help the child pay attention to those distinctive features that determine how the letter is constructed. Vernon's observations support the findings of

Gibson et al. Vernon (1957, p. 16) states that:

> on one characteristic of the child's perception there seems to be general agreement: that he does not observe, or only observes and remembers with difficulty, the orientations of shapes and their order or direction in a sequence. That he overlooks the orientation of shapes is naturally to be expected, since one of the things which he has to learn in early childhood is that objects retain their identity when their spatial position and orientation are changed.

Vernon does not indicate what exact age of child he is referring to, but he was describing beginning readers.

Presenting a contrasting point of view, in a study including 49 kindergarten children, Hendrickson and Muehl (1962) concluded that training in attending to the directional differences between b and d facilitated learning the names for these letters. He suggests that the lack of the realization that direction is critical in discriminating the two may be as important a factor as perceptual rotation.

Wohwill and Weiner (1964) states that discrimination of shape orientation in children is a refined aspect of the more general area of the development of shape perception. He reports that studies show that the ability to discriminate reversals of shape in alphabet letters is increased greatly during the fifth year of life.

Birch and Lefford (1967) defines the process of perceptual analysis: when the individual has the ability to discriminate between identical forms or those that differ in their spatial orientation, as is the case of b-d, u-n, etc. This capacity is of a higher strata than gross discriminations required in the discrimination of structurally different letters.

Vernon (1957) reports that Bowden found that children could easily read words upside down and did not notice the transformation of letters within the words, for instance, "nettims" for "mittens." Vernon reports that 46 per cent of the errors in word matching by five year olds were reversals. The spatial order of printed letters has been found to be a difficult skill for children. Ability to perceive order is one of the vital forces in word recognition.

Vernon (1960) reports that along with the perception of letter shapes the five year old child often does not perceive the relationship of order in which the letters occur in a word. Piaget and Inhelder (1956) showed that young children do not readily perceive order, for instance, the order of beads on a string. Vernon (1959) found that even when five year old children learn which letters belong to a word, they may not remember what the order should be.

The Role of the Sensori-Motor Reinforcement Program in the Learning Process

The following literature contributed to the selection of the instruments and the structure of the reinforcement program to increase perceptual learning.

Gibson (1963) opposes the traditional view that perception begins on a two dimensional plane and progresses to a three demensional plane. As a result of the findings in experiments with hooded rats, Gibson was able to hypothesis that discrimination of three dimensional objects is primary and

that ontogenetically development progresses toward discrimination of form in a two dimensional media. This view would support introducing the alphabet to young children using the three dimensional movable letters rather than using printed alphabet letters in two dimensional form.

Birch and Lefford (1963) support working with movable alphabet letters in lieu of printing because writing is concerned with Kinsethetic movement which does not reach the level of accuracy characteristic of visual-haptic integration at the kindergarten level.

Zaporaphets (1965) reports that research with young Russian children has shown that manipulation of objects increases the understanding of the relationship of the parts of the objects. A combination of manipulation and visual exploration facilitates visual analysis. Active touch employing plastic or plywood letters assist the children in making the subtle discrimination required for letter recognition.

Abravenel (1966) states that through directed haptic exploration, the child tends to acquire more efficient strategies in determining the critical features of objects.

Gotkin (1967) advocates the use of three dimensional letters in first introductions of the alphabet to provide a sensori-motor experience to utilize a multi-sensory reinforcement approach.

Montessori (1912, p. 264) describes her program to engage the co-operation of the senses through a multi-sensory approach to learning the letters of the alphabet.

> At this point we present the cards bearing the vowels painted in red. The child see irregular figures painted in red. We give him the vowels in wood, painted red and have him superimpose these upon the letters painted on the card. (Montessori, 1912, p. 264)

The consonants are painted in blue and the same procedure is followed.

Morra (1967) points out that the Montessori method is primarily known for the emphasis placed on the "education of the senses" but success of that emphasis is dependent on another Montessori view that the basic unit of learning is the individual experience.

Alley and Carr (1968) call attention to the work of Roach and Kephart who outlined a three stage continuous developmental pattern necessary for the integration of information. Initial stage--motor movement patterns. Second stage--perceptual organization. Final stage--concept formation. All three are interrelated and interdependent.

Chittenden (1969) interprets Piaget's stress on the central role of active exploration to suggest a model for optimum learning which includes three stages.

Stage 1--Launching period (teacher directed)

Stage 2--Prolonged period of learning or equilibrium (child works on his own)

Stage 3--Consolidation or Digesting phase (teacher directed)

It is in Stage 2 where the sensori-motor activities are self-enforcing to the eventual conceptualization of the shape perception. Children must be allowed a maximum of activity on their own, directed by means of materials which permit these materials to be cognitively useful.

Piaget (1966) reports that there are two levels in a sensori-motor experience with objects; (1) acting on objects in order to find out something from the objects themselves (unique shapes of individual alphabet letters); (2) acting on objects to learn from the process (ordering the letters). Around the ages of seven or eight, these actions of ordering enumerating and grouping become "internalized" as concrete logical operations.

Almy, Chittendon and Miller (1966) state that Piaget's theory leaves no question as to the importance of learning through activity. Demonstrations and pictures clearly do not involve the child as meaningfully as his own manipulation and experimentation.

Summary of Review of Literature

The literature reviewed in the role of sensory input in perceptual learning indicates that letter discrimination does improve with age due to increased perceptual abilities, which allow the child to perceive unique features of alphabet letters that are invarient and critical.

Visual and tactual sensory input do support and reinforce each other in perceptual development.

Reversals and rotations have been identified as the errors that are most common in early alphabet letter discrimination. Research in the area of difficulty in perception of alphabet letters and word order indicates that the principle of "object permanence" is a major cause of the errors made in letter discrimination. Perceptual analysis is required to identify invarient

features of each alphabet letter. Visual and tactual sensory input will improve the acuity of the perceptual analysis.

It is essential to teach young children the order and direction of letters in a word. Word building, which compels the child to observe each letter unit, forces him to notice the order and direction.

The literature reviewed in the role of the sensori-motor reinforcement program indicates that the inclusion of sensori-motor activity into the process of perceptual learning has been substantiated by theoretical and empirical studies. Perceptual learning is prerequisite to attaining concepts.

Chittenden's (1969) model of optimal learning was integrated into the design of this study.

METHODS AND PROCEDURE

Setting

Two kindergarten classes in a small suburban school district in Roselle, Illinois were selected for this study. This residential community is populated by middle class white families. There are three elementary school buildings within an area of two and one-half miles. The Parkside and the Spring Hills schools have a morning and an afternoon kindergarten class. Lincoln school has a morning kindergarten class only. This study includes the morning kindergarten class at Lincoln school and the afternoon kindergarten class at Spring Hills school.

The kindergarten classrooms at the Lincoln school and Spring Hills schools are identical in size and design. The rooms are standard elementary classrooms and consequently contain less space than recommended as essential for a kindergarten program. Standard equipment in each room includes five child size tables that seat six children, child size chairs, one wall of low open shelves, one sink, a 10 x 12 rug, piano, limited doll house area, small unit block area, painting easel, puppet screen, a teacher's desk and a filing cabinet. The manipulative toys, library books and children's supplies are organized on the open shelves.

The enrollment is limited to thirty children per class with one teacher.

The morning classes are held for two and one-half hours, five days a week. The afternoon classes are held for two and one-quarter hours, five days a week.

Sample

The pupils in this study were assigned to their particular school on the basis of the geographic location of their family residence. Chronological age is the only factor in admittance to the kindergarten program. As defined by Illinois law, a child is required to be five by December 1 of any particular school year. There is no pre-school readiness test administered. There is no ability grouping so that on the entrance date each kindergarten class is comprised of all of the children in a certain geographic area who range from 4-9 to 5-8. The only exception would be any children who would be older due to retention in kindergarten from the previous year. In the two classes studied, there were no children who were repeating kindergarten so that at the time of the study, the Ss ranged in age from 4-10 to 5-9.

The control and experimental group were matched only by age and similarity of social class of the families. The control and experimental group are representative of every kindergarten class in the district due to the existing policies of the Board of Education in determining which child is included in a particular kindergarten class.

Since this study is action research, as described by Best (1959) and the findings are to be evaluated in terms of local applicability, not in terms of

universal validity, the two groups were judged to be adequate to serve as a control and experimental group.

The entire morning kindergarten class of thirty children at the Spring Hills school was selected as the control group. The author was not the classroom teacher of these Ss, but did conduct the pre-test and the post-test and instructed the co-operating classroom teacher in the procedure to be followed during the study.

Twenty one Ss (twelve girls and nine boys) completed the visual perceptual program and the sensori-motor reinforcement program in the experimental group.

In the control group, twenty seven Ss (sixteen girls and eleven boys) completed the visual perceptual program.

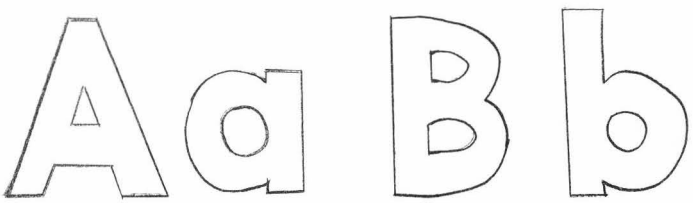
Instruments

Movable Alphabet Letters:

The same movable alphabet letters were used in the pre-test, post-test, as a pattern for making the visual models, and as the instrument in the sensori-motor reinforcement program. Visual models were used by each of the subjects in the visual perceptual program and the sensori-motor reinforcement program.

The alphabet letters, obtained from an early childhood education supply catalogue, were white cardboard with a green velour coating on the reverse side. The movable manuscript letters were in lower case except the initial letter of the name or names which was a capital letter.

Below is the actual size of the upper and lower case letters:



Level I, Pre-test and Post-Test Set:

The level I pre-test and post-test set consisted of: a blank three by nine inch strip of dark paper and an envelope containing the movable alphabet letters in each Ss own first name.

Level II, Pre-test and Post-Test Set:

The level II pre-test and post-test set consisted of: two blank three by nine inch strips of dark paper and an envelope containing the movable alphabet letters in each Ss own first and last name.

Visual Models:

The visual models were prepared by tracing around the movable letters with a thin tipped black felt pen. Each Ss name was printed in this manner on a separate yellow card. Following is an example of a name printed on a visual model for level I.

Level II visual models contained the first and last name.

Pilot Study

Gotkin (1967, p. 82) has stated "most middle class children are well on their way to mastery of the alphabet before entering kindergarten and teaching the alphabet to them is often unnecessary."

However, the experience of the author in teaching middle class kindergarten children has been that most children come to school unaware of the order and position of the alphabet letters in their own names. If their parents have taught them their name, it is most often printed in capital letters or in improperly formed manuscript letters.

In order to test a few middle class children who would have backgrounds similar to the Ss to be used in the main study, pupils enrolled in the 1969 summer session at the Edith Bowen Laboratory school at Utah State University were used in the pilot study. The author requested that the classroom teacher in the kindergarten select the children who would fit the following requirements. The children selected should not have attended kindergarten for the year preceeding the summer session or have attended the Child Development Laboratories at Utah State University. There were five children who met these requirements. They were used as Ss in the Pilot Study.

The five children came as a group to the table in the classroom. The author gave each of the Ss an envelope containing the movable alphabet letters that were needed to build his name. The Ss were then instructed to spell their names with the alphabet letters. The performance is as shown below:

Table 1. Performance on pre-test by five Ss in pilot study

Name	Age		Performance
	Years	Months	
Jenny	4	6	Jenny
Angie	4	8	iɘgnA
Nancy	4	9	yncdN
Craig	5	3	ɐCiɑr
Dean	5	4	ɓɒnO

Girl 4-6 placed the five letters of her name in perfect order and position.

Girl 4-8 placed the five letters of her name in nearly perfect mirror image except for the last two letters of her name; these letters were reversed. This subject placed three letters with the white side up (correct) and two letters with the green velour side up (wrong). This caused the "e" to be backwards.

Girl 4-9 placed the five letters in a nearly perfect mirror image pattern with the third and fourth letters reversed. She used all of the letters right side up.

Boy 5-3 was completely confused by the task. He had a most bewildered expression on his face. He studied the green and white sides carefully,

turning them over several times, but showed no glimmer of recognition. He placed the five letters in his name in a scrambled mass indicating that he was unaware of any order or orientation of alphabet letters.

Boy 5-4 placed the four letters of his name on the table with the green velour (wrong) side up in a disorganized irregular semi-circle. He looked at both sides and worked with the letters after the other Ss had left the table, but he was unable to orient and order the letters so that they would spell his name.

Three of the five children recognized the movable alphabet letters in their own names as symbols that could be used to build their name. Only one S was able to perfectly spell her name. The other two revealed that they recognized the alphabet letters contained their names, but they were not sure of the order within the name. Each of these two Ss began building their name from right to left instead of from left to right. They each reversed two letters in their names.

The other Ss were unaware of the purpose of the abstract symbols used to spell their own names.

The pilot study supported the idea that using the child's own name would have several advantages. Each Ss ability and progress could be measured individually even though the study would be conducted in a total group situation. Each child would have intrinsic motivation to learn the letters in a word that has positive identification value for the child.

The pilot study also revealed several weaknesses in the directions given to the children and the opportunity to observe the Ss working with the instrument

suggested to the author that the structure be modified in the following ways:

The author concluded that the subjects should be instructed to place the white side (correct) of the letters up before beginning to order and position the letters. This would eliminate the possibility of the letter becoming totally an unrecognizable symbol that is not contained in our alphabet. The perceptual difficulty of this task was made clear to the author when she tried to record the reversed symbols created by having the green velour side up. The task of copying a symbol that was reversed was tedious and not at all an automatic perceptual process that is involved in printing an "e" or any other symbol in our alphabet.

The disorganized way that the letters were placed on the table pointed to the need for a guide to place the letters on. The author decided to use a three by nine inch strip of dark paper.

The enthusiastic tactile activity displayed by the Ss who were obviously unfamiliar with the abstract symbol system reaffirmed the use of the movable alphabet letter to aid in fixing visual perception on the configurations of each letter and at the same time reinforcing the visual experience with the sensorimotor experience.

The results of the pilot study supported the original design of the study which included two levels of performance. Ss who were able to perfectly build their first names with the movable alphabet letters in the pretest would be pre-tested at level II. Level II would require the Ss to work with the movable alphabet letters in their first and last names.

This structure would allow for a further measurement of the effect of the sensori-motor reinforcement program for children, who had adequate perception of the alphabet letters in their first name to perform perfectly on the level I pre-test, but were unfamiliar with the alphabet letters contained in their last name.

Main Study

The main study was of an experimental design. A pre-test and a post-test was administered to the control and experimental groups at the beginning and conclusion of the reinforcement program. Each school day during the twelve day reinforcement program, the Ss in the control group and the experimental group were subjected to a visual perceptual experience with the alphabet letters in their own name. In addition, each school day during the study, the experimental group received approximately five minutes of sensori-motor experience with movable alphabet letters to reinforce the visual experience. The effect of the sensori-motor reinforcement program is the variable that was measured.

The study was structured to involve the control and experimental subjects at two performance levels, level I and level II. At level I, Ss worked with the alphabet letters in their first name only. At level II, Ss worked with the alphabet letters in their first and last name. Ss who demonstrated perfect performance on level I pre-test were required to perform at level II.

The pre-test and post-test for the control group and the experimental group involved identical instruments. The procedure was nearly identical but differed in the following way. In the pre-test, all of the Ss participated in the level I task on the first day. On the following day, only those subjects who performed perfectly on the level I task on the previous day, participated in the level II task. On the post-test, both level I and level II tasks were completed on the same day with those children, who had been performing at level I and those who had performed at level II during study, working at their respective levels.

Pre-test and post-test tasks

Level I --to position and order the movable alphabet letters to spell the Ss own first name on a blank three by nine inch strip of dark paper.

Level II--to position and order the movable alphabet letters to spell the Ss own first and last name on two blank three by nine inch strips of dark paper.

The study began on the eighth school day and concluded on the twenty-fourth school day of the 1969-70 school year. The pre-test was conducted on the first four days, the visual perceptual and the sensori-motor reinforcement program was conducted daily for the next twelve days, and the post-test was conducted on the last two days of the study.

Pre-test level I

The Ss were seated at their regular classroom tables with six children at each rectangular table. Three children were seated on each side.

The author gave these general instructions to the entire group. "I am going to give you each an envelope that contains the alphabet letters in your first name. The letters in your envelope will be different than those in the other envelopes at your table because they are just for you. Do not open your envelope until all of the children have received an envelope and I tell you to take the letters out."

The author issued each Ss his own level I test set. The envelopes were labeled with the child's name written in cursive so that the author could readily read the name but the Ss would not be able to use it as a visual model.

The Ss were then instructed to: (1) place the letters on the table with the white side up. The author demonstrated with an extra letter. After all of the Ss had completed this task, the Ss were instructed to (2) move the alphabet letters to spell their own first name on the strip of paper.

As each S completed the task to his own satisfaction and the author was sure that the S was finished, the author quietly suggested that the S leave the table and go to the rug. The author recorded the data after all of the Ss had left the area.

Those Ss who performed perfectly on the level I pre-test task participated in the level II pre-test task on the following day. Those children who did not participate in the level II pre-test task were taken to another room by another teacher so that the Ss would not be distracted.

Level II

The Ss were again seated at their regular classroom tables.

The author gave these general instructions to the entire group. "You did an excellent job on your first name yesterday; today you will receive an envelope that has more alphabet letters in it. There are enough letters to spell your first and last name. Do not open your envelope until all of the children have received an envelope and I tell you to take the letters out."

The author issued each S his own level II set. The Ss were then instructed to: (1) place the two strips of paper on the table so that they are not touching each other. (2) place the letters on the table with the white side facing up as you did yesterday. After this task was completed by all the Ss, the Ss were instructed to (3) use the letters to spell your first name on one strip of paper and your last name on the other strip of paper.

The author again recorded the data after all the Ss had left the area.

Visual perceptual program

The Ss in the control group and the experimental group were subjected daily to a visual perceptual experience with their own name. Each school day during the twelve day program each S was shown a visual model of his own name. This procedure was incorporated into the routine of taking attendance. Those Ss participating at level I were shown a visual model card of their own first name and those Ss participating at level II were shown a visual model card of their own first and last name.

The teacher said the name while showing the visual model card to the entire class, then each of the Ss came individually to the teacher and picked up his own visual model card and placed it in a container where all of the cards

were kept until the next day when the attendance again was taken, following the same procedure.

Sensori-motor reinforcement program

Each school day during the sensori-motor reinforcement program, the experimental group received approximately five minutes of sensori-motor experience to reinforce the visual experience. The procedure was as follows. Each S received a folder containing the visual model appropriate to his level and an envelope containing the individual movable manuscript letters required to spell his own name.

The Ss were seated at their regular classroom tables. The author distributed the folders to the Ss. The folders were kept closed on the table until all of the Ss had received their folders. The author then instructed the Ss to use the movable alphabet letters to spell their own names. The movable white letters fit exactly within the outline of the letters printed on the visual model.

The sensori-motor reinforcement program was administered as a total group experience but the Ss were encouraged to proceed at their own pace. Suggestions for strategies to be used were made by the author but all children were not expected to adhere to the order given; (1) "try to fit the white letters on top of your printed name; (2) try to place the letters directly below to spell your own name; (3) try to build your own name without the use of the card. Turn the card over so that you cannot see the printed name.

Use the card to check your name if you are not sure how the letters should be placed."

Twenty-one subjects completed the sensori-motor reinforcement program in the experimental group (12 girls and 9 boys). Fourteen Ss (8 girls and 6 boys) participated at level I. Seven Ss (4 girls and 3 boys) participated at level II. Three Ss were eliminated from the study due to perfect performance on the pre-test skills at level I and level II. Since these Ss demonstrated perfect performance in the order and orientation of the alphabet letters in their first and last names, there could be no valid measure of progress made as a result of the sensori-motor reinforcement program. These three Ss worked with the numerals and alphabet letters required to build their addresses during the reinforcement program since the study was designed to provide the experience in a total group. Only those Ss who made one or more errors in positioning or ordering the alphabet letters in his own name were included in the study.

In the control group, twenty-seven Ss (16 girls and 11 boys) completed the visual experience program. Twenty-two Ss (12 girls and 10 boys) participated at level I. Five Ss (3 girls and 2 boys) participated on pre-test level I and level II. Two Ss were elminated from the study due to extended absences during the study. One subject was eliminated due to perfect performance on the pre-test.

Aside from eliminating those pupils who performed perfectly on the pre-test, there was no attempt to classify the Ss previous experiences with

the abstract symbol system, our alphabet. The purpose of the study was to ascertain if all kindergarten pupils who were not sufficiently familiar with the alphabet letters in their own name to order and position the letters perfectly could, in fact, make measurable gains in perception of the abstract symbol system after a systematic sensori-motor reinforcement program.

It was not possible to control the preschool experiences with alphabet letters, however, it was assumed that results of previous experience were measured in the pre-test.

During the study, the following conditions were instituted in an attempt to standardize the experience with alphabet letters that the pupils were exposed to in the classroom.

The study was conducted as early in the school year as possible. It was felt that the class would need to be familiar with routine and to have had some experience in following directions as a group before the pupils could adequately function as individuals within a total group situation. The study began on the eighth day of school after the beginning of the school year.

Experience with alphabet letters and their names was limited to those described in this study. The Ss in both the control and experimental group had no other experiences in the classroom with their names or alphabet letters during the course of the study.

In a carefully planned effort to limit the scope of the study to the visual-tactual variables, the teachers made a deliberate effort not to introduce the auditory variable. At no time during the study, did the teachers verbally direct the Ss attention to the configuration or orientation of

any letter or the order of letters within a word. The perception required for order and orientation was to be taught by the instruments in the study and not by teachers. Presumably the perception required to utilize an abstract symbol system in name building would be learned through the visual media experienced by the control group or learned through the multi-sensory approach of the sensori-experience reinforcing the visual media as experienced by the experimental group. Within the structure of the study, it was assumed that measurable gains made by the control group were due to the visual experience provided. It was further assumed that measurable gains made by the experimental group would be a result of the learning made possible by the visual and tactile feedback provided by the sensori-motor reinforcement program.

FINDINGS

In order to test the hypotheses, it was essential to choose an instrument that could teach perception of alphabet letters through the visual and the visual-tactual media. A method of teaching children individually to build their own names with movable alphabet letters was designed at the Institute for Developmental Studies and is described by Powledge (1967). This method and the materials employed were the basis for the design of this study. The method and the materials have some of the desirable qualities of a teaching machine including immediate corrective feedback, pacing the progress of each individual according to his ability and individualizing the task for each S. These elements help maximize the effect of sensory input due to the visual-tactile variable while minimizing the effect of the teacher variable. The nature of the method and materials provides for intrinsic motivation rather than relying on external reward necessary for extrinsic motivation.

The major thrust of this study was to measure the effect of a sensori-motor reinforcement program in directing the Ss attention to the configuration and orientation of alphabet letters and their order within a word. The child's own name was the word used for each S.

Presumably, the correct perception of alphabet letters would be increased through the visual and tactual media provided by the visual experience program and the sensori-motor reinforcement program. All Ss

participated in the visual experience program. Only the Ss in the experimental group participated in the sensori-motor reinforcement program.

The hypotheses predicted that a sensori-motor reinforcement program would permit the Ss in the experimental group to show greater improvement than the Ss in the control group in the ability to order and position the alphabet letters in their own names.

The results of the data collected support the hypotheses. After the completion of a systematic sensori-motor reinforcement program, the experimental group did show greater gains than the control group in the ability to correctly order and position the alphabet letters in their own names.

The individual data sheet was constructed to record the pre-test and the post-test performance of each subject. An example of the information recorded and the method of recording is shown in Table 2.

As shown in Table 2 this S was able to order and position the six letters in his first name perfectly, at level I. This qualified the S to participate at level II. When the four letters in his unfamiliar last name were added, the S was unable to discriminate the letters contained in his first name from those contained in his last name and consequently, at level II, his pre-test error score for ordering was seven.

On the pre-test, at level II, this S also had an error score of two for the positioning task. The a was reversed and the d was inverted. It is interesting to note that neither the lower case a or the lower case d are contained in the Ss first name. The conjecture was made that this S

Table 2. Information recorded on the individual data sheet.

Experimental group X Control group_____ Number 18

Age 5-5

Sex Boy

First name-- Level I

Name	D	e	n	n	i	s						
Pre-test	D	e	n	n	i	s						
Post-test												

First and last name--Level II

Name	D	e	n	n	i	s		M	e	a	d	
Pre-test	D	M	n	e	i	p		n	ɐ	s	e	
Post-test	D	e	n	n	i	s		M	e	a	d	

Discrimination of Letters

Number of incorrectly ordered letters

Level I Pre-test_____ Post-test_____ Improvement_____

Level II Pre-test 7 Post-test 0 Improvement 7

Number of incorrectly positioned letters

Level I Pre-test_____ Post-test_____ Improvement_____

Level II Pre-test 2 Post-test 0 Improvement 2

had experiences with his first name so that he was familiar with the alphabet letters, but the symbols in his last name were unfamiliar to him and, adding the additional letters of his second name added such complexity to the task that he regressed. This subject had perfect performance in the post-test after the completion of the sensori-motor reinforcement program.

Information for each of the Ss was transferred from the Individual Data sheets to the raw score data tables according to the following classifications: (1) performance, level I or II; (2) experimental or control group, and; (3) positioning and ordering task. Data for this S is recorded in Table 11 and Table 15 in the Appendix. By noting the data for subject 18b, the reader can compare the individual data sheet and the information that has been transferred to the raw score tables.

The raw score data listed in the Appendix was compiled in the following categories:

Table 8 Positioning task raw score data for each level I subject in the control group

Table 9 Positioning task raw score data for each level I subject in the experimental group

Table 10 Positioning task raw score data for each level II subject in the control group

Table 11 Positioning task raw score data for each level II subject in the experimental group

Table 12 Ordering task raw score data for each level I subject in the control group

Table 13 Ordering task raw score data for each level I subject in the experimental group

Table 14 Ordering task raw score data for each level II subject in the control group

Table 15 Ordering task raw score data for each level II subject in the experimental group

The learning task to be accomplished by each S was determined by the length and the combination of the alphabet letters in the Ss own name. The varying difficulty of the configuration and the orientation of each individual alphabet letter has been noted by numerous authors, Dunn-Rankin, Leton and Shelton (1969), Birch and Lefford (1967), de Hirsch, Jansky and Langford (1966), Popp (1964), Gibson (1966), Vernon (1959) and Gibson et al (1962). However, no index of difficulty has yet been established. This aspect of the learning task can not be compared between the two groups. For this reason the progress made by each child can only be considered as descriptive data and does not have inference to the progress that would be made by other Ss with different letter combinations in their names.

The length of the Ss names can be compared. The Ss in the control and experimental groups were not selected as matched sets, but the groups were compared by the mean number of letters used by each group and by the mean error score of each group of the pre-tests.

Table 3 compares the mean number of letters contained in the names used by each group.

Table 3. Comparison of the number of letters in the names of the experimental and control groups

	Range				
	low	high	Letters	Subjects	Mean
LEVEL I --first names					
Control group	3	7	113	22	5.1
Experimental group	4	8	74	14	5.2
LEVEL II--first and last names					
Control group	9	12	52	5	10.4
Experimental group	8	15	74	7	10.5

The mean score for each group was calculated by totaling the number of letters and dividing by the number of subjects.

The mean listed in Table 3 indicate how nearly identical the average number of letters in the Ss names in the experimental group and the control group are. At both levels, the names of the Ss in the experimental groups averaged .1 more letters than the names of the Ss in the control group.

One of the assumptions of the study was that the pre-test would measure the ability to order and position the alphabet letters in the Ss own name at the beginning of the study. It was further assumed that this ability would reflect the previous experience each S had with these letters.

Table 4 was constructed to show the average number of errors made by each group of the pre-test.

Table 4. Comparison of pre-test error scores

	Errors	Subjects	Mean
	ORDERING		
Level I--first names			
Control	78	22	3.5
Experimental	43	14	3.0
Level II--first and last names			
Control	19	5	3.8
Experimental	37	7	5.6
	POSITIONING		
Level I--first names			
Control	36	22	1.6
Experimental	15	14	1.0
Level II--first and last names			
Control	7	5	1.4
Experimental	6	7	.8

The mean error score was calculated by totaling the number of errors for each group on each task and dividing by the number of Ss.

The means in Table 4 relate that the experimental group averaged .5 fewer errors per S at level I, but averaged 1.8 more errors per S at level II on the ordering task. On the positioning task, the experimental group averaged .6 fewer errors at level I and .6 fewer errors at level II.

Table 5 was constructed to show the percentage of improvement each group made within itself on the ordering task.

In Table 5 the percentage figure for the pre-test was obtained by dividing the total pre-test error score for each group by the total number of letters used by that group. The percentage figure for the post-test was obtained by dividing the total post-test error score for each group by the total number of letters used by the group. This method adjusted for the different number of subjects and letters used in each group. Percentage improvement scores were obtained by subtracting the per cent figure for the post-test error scores from the per cent figures for the pre-test error scores.

Table 5 shows that the level I control group made an 11.3 per cent improvement score in the ability to place the letters of their first name in the correct order from left to right. The level II control group showed a 15.4 per cent improvement in the ability to order the letters in their first and last names. Improvement was expected as a result of the visual experience program that the control group participated in.

The level I experimental group made a 25.2 improvement score in the ability to order the letters of their first name. The level II experimental group

Table 5. A percentage comparison of the improvement from pre-test to post-test on the ordering task

	Total Subjects	Total Letters	Total Error Score				Total Improvement	
			Pre-test		Post-test			
			No.	Per Cent	No.	Per Cent	No.	Per Cent
LEVEL I								
Control	22	113	78	68.0	63	56.7	15	11.3
Experimental	14	74	43	58.1	17	22.9	26	25.2
LEVEL II								
Control	5	52	19	36.5	11	21.1	8	15.4
Experimental	7	74	37	50.0	3	4.0	34	46.0

showed a 46.0 per cent improvement in the ability to order the letters in their first and last names.

On the ordering task, the improvement score for the experimental group at level I, first names only, was 13.9 per cent higher than the improvement score for the control group. At level II, first and last names, the experimental group improvement score was 30.6 higher than the control group on the ordering task.

Table 6 was constructed to show the percentage of improvement each group made within itself on the positioning task.

The percentage figures for Table 5 and Table 6 were calculated by the same method. This method is delineated immediately following Table 5.

Table 6 shows that the level I control group made a 12.4 per cent improvement score in the ability to correctly position the letters in their own first name. The level II control showed a 1.6 per cent lower score on the post-test than on the pre-test. The improvement that was expected as a result of the visual experience program was shown for the Ss working with their first names only but the visual experience program failed to improve the ability to position the letters correctly for the Ss in the control group who were working with their first and last names.

The level I experimental group made a 18.7 per cent improvement score in the ability to position the letters in their first names. The level II experimental group showed a 6.7 per cent improvement in the ability to position the letters in their first and last names.

Table 6. A percentage comparison of the improvement from pre-test to post-test on the positioning task

	Total Subjects	Total letters	Total Error Score				Total Improvement	
			Pre-test No.	Per cent	Post-test No.	Per cent	No.	Per cent
LEVEL I								
Control	22	113	36	31.8	22	19.4	14	12.4
Experimental	14	74	15	20.2	1	1.5	14	18.7
LEVEL II								
Control	5	52	7	13.4	8	15.0	-1	-1.6
Experimental	7	74	6	8.1	1	1.3	5	6.7

On the positioning task, the improvement score for the experimental group at level I, first names only, was 6.3 per cent higher than the improvement score for the control group. At level II, first and last names, the experimental group improvement score was 8.3 per cent higher than the improvement score for the control group on the positioning task.

In summary, according to the data collected and the interpretation of the data, the experimental group showed greater improvement scores than the control group in the ability to order and position the alphabet letters in their own names. Due to the visual experience program, the control group improved in three areas, but failed to show improvement at level II in positioning the letters in their first and last names. The experimental group made even higher gains in all four areas, due to the visual experience program reinforced by the sensori-motor program.

One of the limitations of the study was that the instrument of measurement constructed to test changes in the ability of children to improve performance in ordering and positioning alphabet letters has not been standardized nor has the reliability and validity been established. This is an action type study, designed to measure only the improvement within the group.

DISCUSSION

The study was designed to be conducted in two sequential phases. Phase one would limit the Ss to superimposing the movable alphabet letters on the intact printed name on the visual model card for six consecutive days. During phase two, the Ss would order and position the movable alphabet letters directly below the intact printed name for six consecutive days.

The first day of the study, the author realized the implications of the limitation on perceptual learning that would be imposed by this design when used with a group instead of individual children. It was clear that a more individualized, self-motivated developmental approach would be necessary to maintain the high level of interest and active tactual manipulation demonstrated by the Ss. Intrinsic motivation was essential if extrinsic motivation was removed by requiring the subjects to work individually within a total group situation. The benefits of the selected materials and methods would have been lost if the procedure had not been altered.

The variable to be tested was the perceptual learning of letter configuration and the order of letters in a word provided by the sensori-motor experience using the movable alphabet letters and the visual model.

The author only made suggestions about the way that the materials could be used and the Ss were encouraged to proceed with their own strategies

at their own rate. Kolberg (1968) states that the principle of optimal developmental match is found between the challenge of a task and the child's skills and interests. The materials and learning climate provided were an attempt to simulate that condition.

It is obvious that one teacher supervising 24 children would be unable to record or even observe the exact activity of 24 individual approaches in a five-minute period of time. The following descriptions were taken from the notes recorded after the kindergarten session concluded each day. The generalizations and lack of exact numbers would not satisfy the standards of an inferential study. Within the limitation of action research, the author would like to submit these general observations that appear to be relevant to the findings, but makes no pretense of inferring to groups other than the experimental group described in this study.

Interest and active participation did remain high during the sensorimotor reinforcement program. There were variations in the way that the Ss worked with the materials. One S was observed to systematically trace the outline of the letters on the two dimensional model card with his right hand while visually scanning the three dimensional letter that he held in his left hand. Three of the Ss, boys, were intrigued by the shapes of the letters. They spent expensive time throughout the study exploring the configurations through various contact activities. They stacked all of the circle letters in their own name on a finger and inspected the differences in this way. They compared stick letters by stacking them on the table as if they were

blocks. One S put the "o" on his tongue and another hung a "J" on his ear. It was interesting to note that this contact activity was individual strategy because each of these Ss was seated at a different table and could not view the activities of the others.

Every Ss spent some segment of the approximately 60 minute sensorimotor reinforcement period observing other Ss working with the letters in their names. No exact record was kept on the amount of time that was spent in this way, but it did range from an incidental glance to an intensive survey of the strategy used by another S seated at the same table. Intrinsic motivation appeared to be significant in determining the style employed by each S because the Ss rarely duplicated the methods employed by the Ss he was observing. It appears that since all of the Ss worked with their own names, the task was seen by the Ss as individual.

There was great variation in the methods of working on the sensorimotor reinforcement task throughout the study. The intra-group strategies were as varied as the intra-individual strategies recorded by the author.

One method employed by the Ss was to superimpose the letters on the visual model each day before attempting to independently position the letter components without the visual model. Another frequently observed method that the Ss employed was trying to position the letters independent of the model and to refer to the letter outlines as reinforcement when the Ss were unable to complete the name. More intense interest in the configuration of the letter was expressed when a S noted a difference in the word that he had built and the word printed on the visual model. Motor activity in moving

the letters around was employed in comparing the model and movable alphabet word and the visual input was reinforced as the perception of the proper orientation of the letters was formulated.

It is not surprising that the variations in the methods ranged from a disorganized, casual approach to a systematic, intense approach. Participation varied from the slow starter, who was not ready to conclude his activity at the end of the five minute period to the more motivated Ss who began the task immediately and was satisfied with his efforts before the end of the five minute period. This evidence of individual style points to the basic need of individualizing learning tasks and reorganizing the classroom to facilitate small groups and individuals instead of organizing for total group participation in learning tasks.

During a two-day period, on the seventh and eighth day of the sensorimotor reinforcement program, three Ss, girls, who sat at a common table, collaborated their efforts. The Ss challenged themselves to perform the task with the visual model turned face down. One S was able to perform perfectly but the other two Ss were unable to complete the task without the visual model. The seventh and eighth days were Thursday and Friday. On Monday, the three Ss resumed independent work. S_5 continued to work without the model, S_6 returned to the launching phase and superimposed the letters over the visual model. S_{20} alternated between putting her hand over a portion of the name while attempting to free lance in positioning and ordering the letters in her name and placing the letters directly on top of the intact printed name.

Even though the task was administered as a total group experience, the major thrust by the Ss was individual and independent. No attempt was made to use all the letters of the alphabet, but each child used only the letters in his first or first and last name. Gotkin (1967) found that children who were introduced to movable alphabet letters in a gradual method, starting with six letters on the first day and increasing the number daily, learned the letters in less time and required less assistance from adults than children who were introduced to all 26 letters on the first day.

This study, using a limited number of alphabet letters, permitted the children to be introduced to a learning task that was simple enough to provide success while providing a challenge. Name building involved the child in his own learning . . . to attend to the details of the configuration of the letters and the order of the letters in his own name.

In tabulating the data, the author became interested in the distribution of positioning errors made by the Ss in the use of the lower case letters. An analysis of the distribution of the positioning errors of capital letters appeared to be in proportion to the total number of capital letters included in the Ss names. The television show Sesame Street, which incorporates teaching the capital letters into the format, was not shown in the Chicago area until November. This study was concluded in early October so whatever influence the program has in teaching capital letters to young children is not reflected in this study. Table 7 was constructed to show the distribution of errors made in positioning lower case letters. Letters j, q, w, x, z were not included in the table because they were not contained in any S's names.

Table 7. Distribution of positioning errors of individual lower case letters relative to total number.

CONTROL			Alphabet letter	EXPERIMENTAL		
Total No.	Error Scores Pre-test	Post-test		Total No.	Error Scores Pre-test	Post-test
19	15	15	a	17	12	2
4	2		b	3		
3	1		c	1	1	
4	2	1	d	4	1	
14	5	4	e	17	1	
0			f	1		
2	2	0	g	0		
3		1	h	2		
12			i	7		
3	1	1	k	0		
4			l	10		
6			m	3		
9	2	1	n	12		
8			o	6		
1			p	0		
12	1	1	r	12		
2			s	1		
9			t	6	2	
4		1	u	3	1	
2	1		v	2	1	
9	3		y	9		

Table 7 indicates that the lower case a was the alphabet letter that was most often positioned incorrectly. The control group did not improve at all in the ability to position the a but continued to rotate it to face to the right instead of to the left. The experimental group improved from 12 errors on the pre-test to two errors on the post-test. It is interesting to note that the two positioning errors made by the experimental group after the completion of the sensori-motor reinforcement program were both with the lower case a. This coincides with the findings of Vernon (1959) that five year old children are often unable to see a difference between a shape and its mirror image even when it is pointed out to them. The experimental group did improve significantly in positioning the lower case a. The visual experience was not enough to increase the acuity of the perceptual analysis required for the task, but the visual tactual sensory input provided by the sensori-motor reinforcement program did improve the performance of the Ss in positioning the lower case a.

Due to the visual experiences program, the control group improved in the ability to position the letters in their first names but failed to show improvement in the ability to position the letters when the last name was added to the task. Gotkin's finding, that learning is more efficiently accomplished when the task is programmed to the ability of the individual and the tendency of the Ss in the study to regress when they were challenged to a task beyond their capacity would suggest a possibility of the occurrence of this finding. There is the further possibility that in the task of collecting their

own name card (the visual model), recognition of the first name was enough to accomplish the task. The S may not have had adequate time to inspect the model to increase the visual input required for perception of position to take place. It is possible that the S did not in fact have an adequate visual perceptual experience with the alphabet letters in his own last name in order to position the letters correctly.

The gains made by the experimental group in the ability to position the letters correctly would agree with Wheelock and Silvardoli (1967) that skill in visual discrimination is learned and can be improved by direct training.

The control group increased in their ability to order the alphabet letters in their own names due to the visual experience program. Vernon (1957) stressed the difficulty that children experience in perceiving the order of letters within a word. She states that many children see only those letters at the beginning or end or those letters that are taller or stand out in some significant way. The greater gains made by the experimental group in the ability to perceive the correct order support the hypothesis that the experimental group would make greater gains by the use of the movable alphabet letters and the visual model. The use of the sensori-motor reinforcement materials increased the perception of order by the visual and tactual sensory input that enabled the Ss to perceive that each of the letters was different in some significant way.

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary of Study

The purpose of this study was to determine if a sensori-motor reinforcement experience would improve the ability of kindergarten children to attend to the configurations of alphabet letters and the order of letters within a word.

Two hypotheses were formed:

1. There will be a measurable difference between the experimental population and the control population in the ability to order the letters correctly to spell the subjects own name after the completion of a systematic sensori-motor reinforcement program.

2. There will be a measurable difference between the experimental population and the control population in the ability to position the letters correctly to spell the subjects own name after the completion of a systematic sensori-motor reinforcement program.

Two separate kindergarten classes were selected as the experimental and control groups. Twenty-one Ss (twelve girls and nine boys) served as the experimental group. Twenty-seven Ss (sixteen girls and eleven boys) served as the control group.

Preceeding the main study, a pilot study was conducted on a small group of similar children to test the structure of the proposed research design.

Each group was given a pre-test and a post-test as an intact group. The subjects in the control and the experimental group were subjected to a visual perceptual experience with their own name for twelve consecutive school days. In addition, each school day during the study, the experimental group received approximately five minutes of sensori-motor experience with their names to reinforce the visual perceptual experience. The effect of the sensori-motor reinforcement program was the variable in this experimental study.

The visual perceptual experience was provided by the visual model of the child's own name that was shown by the teacher each day in the process of taking attendance. The sensori-motor experience was provided through the use of three dimensional movable alphabet letters used in conjunction with the visual model. The Ss used the movable alphabet letters to build their own names.

Both the visual perceptual experience and the sensori-motor experience involved the subjects as a total group. The task was individualized by the use of each subjects own name. Some subjects in each group performed at level I, using their first name only and other subjects in each group were performing at level II, which involved using the Ss own first and last name.

Summary of Findings

1. A systematic visual experience with their own names did improve the ability of the kindergarten children to attend to the configurations of alphabet letters and the order of letters in a word.

2. Even greater improvement in the ability of kindergarten children to attend to the configuration of alphabet letters and the order of letters in a word was shown by the Ss in the experimental group who had a systematic visual experience with their names reinforced by a sensori-motor program. The use of three dimensional movable alphabet letters to build their own names increased the subject's ability to perceive alphabet letters and their order in a word through the increased visual-tactual sensory input.

Conclusion

When children encounter a learning situation that provides sensory input through more than one sense modality, they learn a perceptual task more effectively than they do when the available sensory input is singular.

Recommendations for Future Studies

1. A further study increasing the groups of kindergarten pupils to three to test for the effect of the visual experience program. One group would receive no experience with their names or alphabet letters during the study. The other groups would receive the experiences designed for this study.

2. A similar study using one word instead of individual names would more accurately measure the gains made by the experimental group.

3. A further study designed to include a follow-up test employing alphabet letters not included in the subjects own name to determine if the experience with the three dimensional movable alphabet letters helped the subjects learn problem solving strategies for attending to the configurations of other alphabet letters.

4. A replication of this study using a sample of pre-kindergarten pupils would help to identify the influence of age in achieving perceptual gains through the visual and tactual sensory media.

5. A further study, based on the finding in this study, that a child becomes confused by a task which is too complex and actually regresses in his performance level, would help to identify the point at which a task is either challenging or defeating.

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APPENDIX

INDIVIDUAL DATA SHEET

Experimental group_____ Control Group_____ Number_____

Age_____

Sex_____

First Name - Level I

Name													
Pre-test													
Post-test													

First and Last Name - Level II

Name													
Pre-test													
Post-test													

Discrimination of Letters

Number of incorrectly ordered letters

Level I Pre-test_____ Post-test_____ Improvement_____

Level II Pre-test_____ Post-test_____ Improvement_____

Number of incorrectly positioned letters

Level I Pre-test_____ Post-test_____ Improvement_____

Level II Pre-test_____ Post-test_____ Improvement_____

Table 8. Positioning task raw score data for each level I subject in the control group

Boy or Girl	Age Yr	Age Mo.	Number of letters	Error Score Pre-test	Post-test	Gain	
1g	5	8	3	1	0	1	
2g	5	4	4	0	0	-	
3g	5	6	4	1	1	0	
4b	5	5	4	1	1	0	
5b	5	8	4	2	0	2	
6b	5	7	4	1	2	-1	
7b	5	5	4	2	1	1	
8g	5	8	5	1	1	0	
9g	5	5	5	3	1	2	
10g	5	4	5	1	1	0	
11g	5	0	5	1	1	0	
12g	5	7	5	3	3	0	
13g	5	4	5	2	1	1	
14b	5	7	5	1	0	1	
15b	5	6	5	3	0	3	
16b	5	5	5	2	1	1	
17g	4	10	6	2	0	2	
18g	5	1	7	1	2	-1	
19g	4	10	7	0	2	-2	
20b	5	4	7	4	2	2	
21b	5	9	7	1	0	1	
22b	5	4	7	3	2	1	
22			113	36	22	14	Total

Table 9. Positioning task raw score data for each level I subject in the experimental group

Boy or Girl	Age Yr.	Age Mo.	Number of letters	Error Score Pre-test	Error Score Post-test	Gain	
1b	4	11	4	1	0	1	
2g	5	7	5	2	0	2	
3g	5	5	5	0	0	-	
4g	5	2	5	1	0	1	
5g	5	9	5	2	0	2	
6g	5	7	5	3	0	3	
7g	5	6	5	1	0	1	
8g	4	10	5	1	0	1	
9b	5	2	5	1	0	1	
10b	5	2	5	0	1	-1	
11b	5	5	5	0	0	-	
12b	5	9	5	1	0	1	
13b	5	9	7	0	0	-	
14g	5	1	8	2	0	2	
14			74	15	1	14	Totals

Table 10. Positioning task raw score data for each level II subject in the control group

Boy or Girl	Age Yr.	Age Mo.	Number of letters	Error Score Pre-test	Error Score Post-test	Gain	
23g	5	0	9	0	2	-2	
24g	5	8	10	4	2	2	
25g	5	7	10	0	1	-1	
26b	4	10	11	2	2	0	
27g	5	3	12	1	1	0	
5			52	7	8	-1	Total

Table 11. Positioning task raw score data for each level II subject in the experimental group

Boy or Girl	Age Yr.	Age Mo.	Number of letters	Error Score Pre-test	Error Score Post-test	Gain	
15g	5	7	8	0	0	-	
16g	5	4	9	1	0	1	
17b	5	5	9	2	0	2	
18b	5	5	10	2	0	2	
19b	4	11	11	1	0	1	
20g	5	9	12	0	1	-1	
21g	5	6	15	0	0	-	
7			74	6	1	5	Totals

Table 12. Ordering task raw score data for each level I subject in the control group

Boy or Girl	Age Yr.	Age Mo.	Number of letters	Error Score Pre-test	Error Score Post-test	Gain
1g	5	8	3	0	0	-
2g	5	4	4	2	3	-1
3g	5	6	4	2	0	2
4b	5	5	4	4	3	1
5b	5	8	4	4	0	4
6b	5	7	4	2	3	-1
7b	5	5	4	4	4	0
8b	5	8	5	5	2	3
9g	5	5	5	2	4	-2
10g	5	4	5	4	0	4
11g	5	0	5	3	4	-1
12g	5	7	5	4	4	0
13g	5	4	5	2	0	2
14b	5	7	5	5	0	5
15b	5	6	5	2	3	-1
16b	5	5	5	0	5	-5
17g	4	10	6	4	0	4
18g	5	1	7	6	7	-1
19g	4	10	7	4	5	-1
20b	5	4	7	7	6	1
21b	5	9	7	6	4	2
22b	5	4	7	6	6	0
22			113	78	63	15 Totals

Table 13. Ordering rask raw score data for each level I subject in the experimental group

Boy or Girl	Age Yr.	Age Mo.	Number of letters	Error Score Pre-test	Error Score Post-test	Gain
1b	4	11	4	4	0	4
2g	5	7	5	5	2	3
3g	5	5	5	2	0	2
4g	5	2	5	2	2	0
5g	5	9	5	0	0	-
6g	5	7	5	2	0	2
7g	5	6	5	0	0	-
8g	4	10	5	2	0	2
9b	5	2	5	2	0	2
10b	5	2	5	4	4	-
11b	5	5	5	2	0	2
12b	5	9	5	4	0	4
13b	5	9	7	6	2	4
14g	5	1	8	8	7	1
14			74	43	17	26 Totals

Table 14. Ordering task raw score data for each level II subject in the control group

Boy or Girl	Age Yr.	Age Mo.	Number of letters	Error Score Pre-test	Error Score Post-test	Gain
23g	5	0	9	3	2	1
24g	5	8	10	4	4	0
25g	5	7	10	3	0	3
26b	4	10	11	9	5	4
27g	5	3	12	0	0	-
5			52	19	11	8 Totals

Table 15. Ordering task raw score data for each level II subject in the experimental group

Boy or Girl	Age Yr.	Age Mo.	Number of letters	Error Score Pre-test	Error Score Post-test	Gain
15g	5	7	8	3	0	3
16g	5	4	9	9	0	9
17b	5	4	9	4	0	4
18b	5	5	10	7	0	7
19b	4	11	11	5	0	5
20g	5	9	12	2	0	2
21g	5	6	15	7	3	4
7			74	37	3	34 Totals

VITA

Leona Magnus Peters

Candidate for the Degree of

Master of Science

Thesis: Effects of Sensori-Motor Reinforcement on Alphabet Letter Discrimination Tasks

Major Field: Child Development

Biographical Information:

Personal Data: Born at Brookings, South Dakota, October 7, 1936; married John Stuart Peters, June 28, 1958; two children.

Education: Graduated from Brookings High School, Brookings, South Dakota in 1954; received the Bachelor of Science degree from South Dakota State University, Brookings, South Dakota, with a double major in Child Development and Home Economics Education in 1958 (one quarter was spent at the Merrill Palmer Institute, Detroit, Michigan); completed the requirements for the Master of Science degree, in Child Development, at Utah State University in 1970.

Professional Experience: 1968 to present, Kindergarten Teacher, Lincoln School, Roselle, Illinois; 1965-1967, Director and teacher, Roselle Methodist Nursery School, Roselle, Illinois; 1962, Instructor in the Nursery School Laboratory, South Dakota State University, Brookings, South Dakota; 1960, Head Teacher, Jack and Jill Nursery School, Aurora, Illinois; 1959-1960, Home Economics and Science Teacher, Cement High School, Cement, Oklahoma; 1958-1959, Science and Physical Education Teacher, Ramsey Junior High School, Fort Smith, Arkansas.