

# An Investigation of Visual Discrimination Training for Beginning Readers

Warren H. Wheelock and Nicholas J. Silvaroli

The act of learning to read is an associative-conceptual process. The formation of correct associations between the spoken symbol and the written symbol depends on the child's ability to make auditory and visual discriminations. This study concerned itself solely with the one factor of visual discrimination. It attempted to determine if those kindergarten students who are trained to make instant responses of recognition to the capital letters of the alphabet show a significant difference in their visual discrimination ability from those kindergarten students who did not receive this training. In analyzing the data, analysis of co-variance was used. Results showed there was significant difference (.01 level of confidence) in visual discrimination ability between students taught to make instant responses of recognition to the capital letters of the alphabet and those who did not receive this training. It might be assumed that learning to make these responses enhances visual discrimination ability.

The act of learning to read is an associative-conceptual process. The formation of correct associations between the spoken symbol and the written symbol depends on the child's ability to make auditory and visual discriminations as well as upon the general wealth of his experience with the word in its various meanings. From among the many factors that contribute to readiness for beginning reading, this study concerned itself solely with the one factor of visual discrimination.

All of the word forms printed in English are but combinations of only 26 different letters. Learning to see visual differences and similarities among word forms appears to be a formidable task for any child. The word forms "EAT" and "FAT" may be confusing to the beginning reader because these words may look alike, and it may also be due to his inability to distinguish upper case "E" and upper case "F." The implication of this for teaching may be that it is essential to beginning reading that pupils have already developed an ability to distinguish the

graphic shapes of the letters, as can be shown by instant responses of recognition.

It is believed that the development of the habits of instant responses to the significant contrastive features of the capital letters of the alphabet will relieve some of the burden placed upon the beginning reader by the associative practice that introduces word forms and word meanings or letter forms and letter sounds during initial reading instruction, and thereby might better prepare the child for initial reading instruction.

In most American elementary schools today the current reading readiness programs seem to be aware of the importance of perception, and to emphasize the need for the child to make visual discriminations and auditory discriminations, and to learn letter and word orientations. An examination of several representative basic readiness programs reveals that these programs devote some of the readiness time in training the child to make visual discriminations.

However, the preponderance of this perceptual training has to do with learning to discriminate pictorial forms and geometric shapes from one another. Gates found only low correlations between discrimination of geometrical figures and reading ability.<sup>1</sup> Vernon is of the opinion that learning to discriminate meaningless shapes from one another does not have much effect on learning to recognize letters and words.<sup>2</sup>

According to some workers, individual letters constitute the most important cues in word perception.<sup>3</sup> Durrell's study of success in first grade reading leads him to summarize that "without perception of letter forms, there is little hope for reading success."<sup>4</sup> Capital letters, according to Fries, have the simplest forms and thus furnish the most efficient materials for learning the process of reading at the very beginning.<sup>5</sup>

<sup>1</sup> Gates, A. I., "A Study of the Role of Visual Perception, Intelligence and Certain Associative Processes in Reading and Spelling," *Journal of Educational Psychology*, 17:430-439, 1926.

<sup>2</sup> Vernon, M. D., "The Perceptual Process in Reading," *The Reading Teacher*, 13:2-8, October, 1959.

<sup>3</sup> Anderson, Irving H., and Walter F. Dearborn. *The Psychology of Teaching Reading*. New York: The Ronald Press Company, 1952.

<sup>4</sup> Durrell, Donald D., and others, "Success in First Grade Reading," *Journal of Education*, 140:1-48, February, 1958.

<sup>5</sup> Fries, Charles C., *Linguistics and Reading*. New York: Holt, Rinehart and Winston, Inc., 1962.

Gibson seems to be in agreement with Fries on this point, for she indicated that the simplest form of the letter would eliminate "noise" from the stimulus, thereby facilitating the perceptual task in children.<sup>6</sup>

Anderson and Dearborn also feel that capital letters have "cue value" because they attract notice on account of their size.<sup>7</sup> The high (ascending) and low (descending) letters, together with the capitals, were called "dominant letters" by Zeitler.<sup>8</sup> In experiments with a tachistoscope, he obtained many instances of misreading in which the capital letters were reported correctly. Hence he concluded that these letters must have dominated or controlled the student's perception of the word.

The repudiation of the old "alphabet method" of teaching reading has given rise to a variety of unfavorable attitudes toward the alphabet itself. These attitudes have tended to persist and thereby rule out the introduction of those activities related to the training of letter forms. The Letter-Form-Training Program suggested in this study did not endeavor to teach the names or sounds of the letters or the association of these sounds and letters; instead, this study did endeavor to train the child to make instant responses of recognition to the capital letters of our English alphabet.

#### *Purpose of the Investigation*

The major aspects of the problem of this study were: (1) Will those kindergarten students who are trained to make instant responses of recognition to the capital letters of the alphabet show a significant difference in their visual discrimination ability from those kindergarten students who did not receive this training? (2) To what extent can instant responses of recognition to the capital letters of the alphabet be trained during the "readiness stage" of, and prior to, formal instruction in reading?

#### *Methods and Procedures*

Prior to the opening of school in September, 1964, three schools in the

<sup>6</sup> Gibson, Eleanor J., "Perceptual Development," *Child Psychology: The Sixty-Second Yearbook of the National Society for the Study of Education*. Chicago: The University of Chicago Press, 1963, pp. 144-195.

<sup>7</sup> Op. cit.

<sup>8</sup> Zeitler, Julius. "Tachistoskopische Untersuchungen uber das Lesen," *Philosophische Studien*, 26:380-463, 1900.

Phoenix Elementary School District Number One, Phoenix, Arizona, were selected to participate in this study. The three schools selected represented extremes in a socio-economic continuum within the district. An attempt was made to establish the fact, based on the available census data, that the children in this study were representative of two different environments within this school district. It was realized that the term "high socio-economic group," as used in this study, would not hold once it was removed from the context of the Phoenix Elementary School District Number One. The same would apply to the term "low socio-economic group," as we used it.

All of the children attending the morning kindergartens in these schools were administered visual discrimination sub-tests one, two, and four of the Lee-Clark Reading Readiness Test, and a Letter-Form-Training Criterion Test.

The three visual discrimination sub-tests of the Lee-Clark Reading Readiness Test were administered to the children in small groups of not more than ten in each group.

The Letter-Form-Training Criterion Test (L-F-T Test) was designed by the writers to measure the child's ability to make instant responses of recognition to the capital letters of our English alphabet. The test material is presented on a film strip (Figure 1). The film strip consists of two practice frames and 26 frames of actual test items. Each test item represents one letter of the alphabet flashed by means of a tachistoscopic device for approximately  $1/40$  of a second. The child is required to recognize instantly the stimulus letter and then pick out that letter from four letters displayed on a card.

For example, the letter "H" is flashed and the respondent must pick that same letter out of the letters "F, H, E, A." The practice frames show the child where to look and how he is to respond, and allows time to become acquainted with a tachistoscopic presentation.

All of the children were given the Letter-Form-Training Criterion Test on an individual basis. It was administered as a control on prior ability to perform the task of instant responses of recognition.

A random selection was made from an alphabetical list of these 98 kindergarten children to determine the experimental and control groups. Transfers and illness resulted in a final sample population of 90 children. Forty-five were placed in the experimental group, and 45 in the control group.

# LETTER FORM TRAINING

Developed and Written by  
Nicolas J. Silverthorn, Ed. D.  
College of Education  
University of Minnesota  
Twin City, Minnesota

## PURPOSE

The purpose of this program is to enable the student to make automatic VISUAL RECOGNITION RESPONSES to the capital letters of our alphabet.

(Cont.)

The student is expected to visualize the significant features of the items presented in each exposure.

Each student is required to indicate if the items are the "same" or "different".

## PROCEDURE

Provide each student with three paper  and three paper .

The student must learn that a  is used to indicate when the items are the same. He must also learn that the  is used to indicate when the items are different.

(Cont.)

Be sure the student understands that by using  and  he can indicate that the pairs of items are the same or different.

## RESPONSE

After each exposure ask: "Are the two letters (or drawings) the same or different?" The child should make his response by selecting a  (same) or a  (different).

(Cont.)

There should be no attempt to connect the letters themselves with sounds. Any attempts at this time to relate letters to sounds and sequences of letters to words, i.e., IF or IT may cause confusion and retard the student's progress.

I T

I T

T T

T T

I I

I I

T I

T I

F T

F T

F F

F F

E F

E F

I F

I F

T F

T F

E E

E E

E I

E I

T E

T E

E E

F I

E E  
 F I

T F

E I

T F  
 E I

EASTMAN 6 14F

SAFETY FILM

EASTMAN 6 14F

Figure 1.  
The film strip  
"Letter Form  
Training."

The children in the experimental group were given training to establish instant responses of recognition to the capital letters of our English alphabet, in addition to their regular kindergarten activities.

The training of instant responses of recognition to the capital letters of our English alphabet was attempted by means of a series of five film strips which introduced 16 upper-case, sans-serif capital letters. The eight stick letters introduced were: "I, T, F, E, H, A, M, N." The four stick and circle letters introduced were: "D, B, P, R." The four circle letters introduced were: "U, O, C, S."

The experimental group received 15 minutes of training a day, five days a week, for a period of one month. These training procedures are described below.

The purpose of this series of training film strips was to enable the student to make visual recognition responses to the capital letters of the alphabet. The child was expected to visualize the significant features of the contrasting letters presented in each exposure. Each student was required to indicate if the contrasting letters were the "same" or "different." To do this each student was provided with three cardboard squares and three cardboard circles. The child was then taught that a square represents contrasting letters which are the same, and that the circle represents contrasting letters which are different.

The first film strip used introduced the stick letters, "I, T, F, E," in 30 combinations of contrasting letter pairs. The contrasting letter pair "E, F" was flashed. Since the children were taught that a response to "different" calls for a circle, they were expected to display one circle on the table before them. The second frame was then exposed and held on the screen, showing the "E, F" preceded by a circle. The children could then compare their response to the standard shown on the screen. Those that had correctly displayed a circle were reinforced by the standard on the screen, and those that had displayed a square were helped to see that the "E, F" were "different" and that a circle was used to respond when two things were "different." The same procedure was followed when a contrasting letter pair that was the "same" was flashed, e.g., "E, E."

All of the film strips were shown using a standard film strip projector with a tachistoscopic attachment for use when flashing was called for. For each frame of contrasting letter pairs shown, the instructor called the children's attention to the significant contrastive features of the

letters. This was done after the children had first responded to them by use of their squares and circles.

At the conclusion of this training all of the children in both groups were again administered sub-tests one, two, and four of the Lee-Clark Reading Readiness Test, and the Letter-Form-Training Criterion Test. Exactly the same procedures were followed as those described in the pre-testing.

In analyzing the data, it was decided to employ the statistical technique of analysis of covariance to provide the investigator with a measure of attaining control of individual differences when testing for significance.

### Results

To control on individual differences in aptitude and ability which might have had an unbalanced influence on the mean criterion of the groups of students trained by the different methods, sub-tests one, two, and four of the Lee-Clark Reading Readiness Test were administered during the first month of the 1964–1965 school year. As was noted earlier, the sample population for this study was comprised of kindergarten children representing extremes of the socio-economic continuum within the Phoenix Elementary School District Number One. Since these children were tested at the outset of their first school experience, it was assumed that the Lee-Clark would be a valid measure of the child's ability to make visual discriminations prior to any formal training in school.

TABLE 1: *Analysis of Variance of the Visual Discrimination Sub-tests 1, 2, and 4 of the Lee-Clark Reading Readiness Test for Children, Representing Extremes of the Socio-economic Continuum within the Phoenix Elementary School District #1*

<i>Source of Variation</i>	<i>Degrees of Freedom</i>	<i>Sum of Squares</i>	<i>Mean Square</i>	<i>F Value</i>
Socio-economic Status	1	1,449	1,449	12.5
Within Subgroups	96	11,148	116	
Total	97	12,597		

$F_{1, 96} = \frac{1,449}{116} = 12.5$ . It should be noted that while only 90 children

remained in the groups at the termination of this study, 98 children were available at the time of the pre-testing.

The additional fact that there was significant difference in visual discrimination ability between students taught to make instant responses of recognition to the capital letters of the alphabet and those who did not receive this training, might lead to the assumption that learning to make these responses enhances visual discrimination ability.

There are, however, certain limitations to be considered. While learning to make instant responses of recognition to the capital letters of the alphabet, the children were learning to attend to these stimuli and to concentrate on them. The attention-concentration factor is one that merits consideration. In order to make visual discriminations, one must attend to things being discriminated.

While the pre-test results very definitely favored those children who came from environments characterizing the upper extreme of the socio-economic continuum within the district, the children from the lower extreme of the same continuum seemed to profit most from the training. Perhaps further investigation will find that children who do well on tests of visual discrimination ability upon entry to school will progress satisfactorily within the scope of the usual readiness programs, and that those children who do not already possess the ability to a satisfactory degree will profit most from this kind of additional training. The results of this study tend to point in that direction.