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ABSTRACT

As a result of the interest in variables affecting language development, and because of concern with disadvantaged groups, this study, involving 134 first and second grade Mexican-American and Anglo students, investigated five questions: (1) Is language development affected by high structured instructional materials and procedures which teach specific skills? (2) Does training in the speed of perception and oculomotor control aid in language development? (3) Is the traditional language arts program adequate for language development? (4) Do attention and intelligence affect language development and are there interaction effects among these variables and differing instructional methods? and (5) Are there any differences in language development among Mexican-American students exposed to different instructional methods? Results indicated significantly higher reading means for both first grade experimental groups than for controls; visual perception did not affect reading performance; significant differences were found only at grade one among Mexican-American students; and no significant group differences on any variables existed among second grade groups. (HS)

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LINGUISTIC DEVELOPMENT AMONG MEXICAN-AMERICAN AND ANGLO PRIMARY STUDENTS IN THE PUBLIC SCHOOLS

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November 30, 1972

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U. S. DEPARTMENT OF
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Final Report

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ABSTRACT

The study investigated the effects of instructional programs in language and visual perception among 134 first and second grade Mexican-American and Anglo students. Two first and two second grade experimental groups received a highly structured reading program. One of these groups at each grade also received supplementary training in visual perception. A first and a second grade control group were instructed with traditional basal reader - language arts materials.

Results indicated significantly higher reading means than controls for both first grade experimental groups, entire sample, but experimental groups did not differ. In first grade group differences on intelligence scores also existed, with the reading instruction only group exceeding controls and the other experimental group.

Mexican-American students in first grade experimental groups excelled controls and the group receiving both types of training exceeded the language training only group. No differences for intelligence were evident.

No significant group differences on any variables existed among second grade groups, neither for the entire sample nor for Mexican-American students only.

There was a possible indication that pretest intelligence, attention, and reading scores related to and predicted posttest reading scores differentially for differing instructional methods and for the two grade levels.

CHAPTER I

INTRODUCTION

Problem

There is general consensus that proficiency in both vocal and written language is fundamental to an individual's social, academic, and economic success. Of great concern is the possibility of critical periods which may occur in the language development of a child, and that what is not acquired at the earlier stages may cause cumulative deficits in future learning (Bernstein, 1964; Raph, 1965; Strom, 1965). Research studies have indicated that deficiencies in the language arts, e.g., listening, speaking, reading, or writing contribute to a student becoming disenchanted with education (Cheyney, 1967; Newton, 1964). This is particularly applicable to the so-called disadvantaged learner.

Cheyney (1967) described the disadvantaged as follows: "The culturally disadvantaged are characterized by a lack of the verbal and abstract behavior patterns that are required for successful work in the public schools and normal (middle class) functioning in our society." Bereiter (1967) presumed that children of different socioeconomic strata may need special teaching in the area of language development, and stressed what children may need to learn is a more relevant issue than why they need special programs. As a result, the Distar system, (Science Research Associates, 1971), developed from the Bereiter-Engleman Curriculum for Project Headstart, was structured to meet specific behavioral objectives in a logical sequence; provide systematic evaluation, acceleration and review; motivate the students by individual physical and emotional involvement; and to provide tangible recognition in the form of praise and take-home sheets. Reidford and Berzonsky (1969) using the Bereiter-Engleman program found support for its use in language development for disadvantaged children of Headstart age. This program, nevertheless, was designed to be of benefit to non-disadvantaged as well as disadvantaged students. It was recognized that many children meet certain criteria of language mastery simply through informal language activities. However, disadvantaged children frequently are deprived this opportunity, and it becomes necessary to build into the educational program some special kinds of teaching in order to facilitate these students' achievement.

Rosen and Ortego (1969) pointed out that linguistic acculturation of immigrant groups from overseas countries takes possibly one or two generations, while the "Americanization" of Mexican immigrants, if it occurs at all, takes three, four or even five generations unless they move into high density and non-contiguous English speaking populations. The close proximity to Mexico and the tendency for the Mexican-American populations to cluster (Hughes, 1969) especially limit linguistic acculturation in the southwestern part of the United States.

Both Bernstein (1964) and Taylor (1962) emphasized the important relationship between perceptual skills and language facility, with language habits relevant to perceptual abilities. Acquired verbal responses to elements in the environment condition motor behaviors which facilitate adjustment of oneself to the environment. Bernstein (1964) argued for the need for a gradual modification of learned responses through language which stabilize and strengthen perceptions. He characterized languages, in terms of linguistic usage, typical of two social strata. Elaborated or formal language was considered the dominant and typical speech form of the middle classes. Formal language permits the speaker to make highly individual and flexibly structured verbal responses. A public language, the major speech form of the lower working class, is restricted in both structure and meaning.

Bernstein (1964) related the two types of language usage to perception by emphasizing that an individual's perceptual system is restricted and structured in like manner to his language. This affects conceptual development and problem solving proportionately. Some efforts to find relationships between visual perception training and various areas of school achievement have been fruitless and somewhat frustrating (Wiederholt and Hammill, 1970). However, there is growing evidence which supports the proposition that the transfer effect of visual perception training in learning to read is greatest when the training involves: (1) a verbal-visual component, and (2) when the visual stimuli possess letter-like features (Gibson, 1963; Reidford and Berzonsky, 1969; Jenkins, Bausell, Jenkins, 1972; and Samuels, 1972). The Michigan Tracking Program (Smith, 1967) was designed to focus attention to relevant stimulus dimensions and is used to increase perceptual speed in reading. These materials use letters and numbers and may provide the kinds of experiences for beginning readers and older poor readers which resulted in the improved performances found in studies which were reported in the manual accompanying the materials.

Furthermore, laymen and professionals alike have long associated attention with learning. However, the historical reviews of research and theory development in the area of attention have left a broad array of definitions of attention. Therefore, the concept has stimulated much interest but little agreement as to what is the accurate meaning or meanings which are to be understood by the term attention (Blum and Adcock, 1968; Mostofsky, 1968). The status of research in attention would suggest a multivariate interest in the perceptual, neurological, behavioral, and information processing abilities of the individual (Anderson, 1970; Diller and Weinberg, 1968).

Finally, language development and intellectual development have been thought to depend upon a mutual interaction. Newton (1964) stated that words are the tools of thought and that limited concepts lead to verbal destitution. Reidford and Berzonsky (1969) noted significant increases between pre- and posttest intelligence quotients in a field test of the Bereiter-Engleman program which was designed to instruct Headstart children in language, reading, and arithmetic.

As a result of the interest in variables affecting language development, and because of concern with so-called disadvantaged groups, a study investigating the effects of instructional methods, intelligence, and attention upon language development was deemed appropriate. Language or linguistic skills encompass the interrelationships of the four facets of the communicative cycle: listening, speaking, reading, and writing (Newton, 1964). Reading is one of the receptive language arts involving decoding, interpreting, responding, and receiving meaning and information in code (Durost, Bixler, Wrightstone, Prescott and Balow, 1970). Therefore, the reading scores obtained on a standardized test provided the scores used to measure language development in this study. Other measures of language development, e.g., the expressive language arts (speaking and writing), were not used in this investigation.

It was the purpose of this study to provide information concerning the following questions:

(1) Is language development affected by highly structured instructional materials and procedures which teach specific skills, e.g., attending, decoding, reading sounds, blending, rhyming, and sound-symbol relationships?

(2) In addition to the above instruction, does training in the speed of perception and oculomotor control aid in language development?

(3) Is the traditional language arts program (basal reader and phonics workbooks) adequate for language development in comparison to the instruction materials and methods described in (1) and (2)?

(4) Do attention and intelligence affect language development and are there interaction effects among these variables and differing instructional methods?

(5) Are there any differences in language development among Mexican-American students exposed to different instructional methods?

To study these problems, scores on tests of attention, intelligence, and achievement in reading were analyzed within a sample of first and second grade children who received different instructional methods.

The significance of this study lies in its attempt to determine the extent to which different instructional programs affect language development. The interaction of personological variables with instructional programs also would be an important outcome to consider in the area of instructional methodology. Perhaps classroom instruction could be adapted to accommodate for any differences or interactions found among these variables (Anderson, 1970; Bium and Adcock, 1968; Hanley, 1970; Rosenshine, 1970).

CHAPTER II

REVIEW OF RELATED RESEARCH

An adaptive mode of education assumes that the educational environment can provide a variety of instructional methods and opportunities for success (Glaser, 1972). Success in turn depends upon the match between a student's or sub-group of students' abilities and the treatment or instructional activities in which they engage (Berliner and Cahen, 1973; Glaser, 1972).

Although little empirical evidence is available to support the concept, Bracht (1970) discussed the need for research to find interactions between alternative treatments and personological variables, i.e., I.Q., scientific interest, anxiety or other measures of individual characteristics. These would aid in developing flexible instructional programs related to different ways of learning.

The results of a number of investigations have shown that relationships between variables such as attention, visual perception, intelligence, instruction and language development in early childhood appear to exist. These variables were considered in the investigation, and related research follows relative to each.

Culturally Disadvantaged and Language Development

Most of the research relating to language development indicates that inadequate communication due to ineptness in either receptive skills (listening and reading) or expressive ability (writing and speaking) represents one of the most fundamental handicaps among students in American schools (Newton, 1964; Raph, 1965; Rosen and Ortego, 1969).

Bernstein (1964) sought to find an answer to the question: through what means is the social process learned, and what are the implications of such learning? He examined the possibility that linguistic forms provided an answer to that question. Two forms of linguistic utterances were described and contrasted by Bernstein (1964). The general form of a public language is a restricted mode of communication, in the sense that individual selection of structure and permutation are grossly restricted. It is, therefore, highly predictable in meaning as well as structure. The public mode of language is the major form of the disadvantaged. A formal language, by contrast, is elaborated. It is less predictable in structure and syntax and is more individualistic. It is the dominant and typical speech form of the middle classes. The characteristics of the languages provide direction to the organization of thinking and feeling. Bernstein (1964) believed that an analysis of spoken language might provide a step in developing a theory of social learning. If so, then as the child learns his speech, so he will learn his social structure.

Rosen and Ortego (1969) stressed some distinctions that are frequently overlooked and thus distort much of the research with Mexican-Americans. They indicated that in a "quest for the quaint", investigators frequently confuse Mexican-Americans with Mexicans. It is true that Mexican-Americans have tenaciously resisted forfeiture of the Spanish language, but the people on either side of the border are different - just as different as English-speaking Canadians are from English-speaking Americans despite some basic linguistic similarities. Rosen and Ortego (1969) quoted Ralph Guzman who stated, "For many scholars the proximity of Mexico has obscured the fact that problems of the Mexican-Americans relate to American life." Several authors (Anderson and Johnson, 1971; Hughes, 1969; Rosen and Ortego, 1969) agreed that the majority of Mexican-Americans are not "immigrants", but the fact of contiguity between Mexico and the United States retards their linguistic acculturation. While linguistic acculturation of immigrant groups from overseas countries takes possibly one or two generations, the "Americanization" of Mexican immigrants, if it occurs at all, may take three, four, or five generations. These authors emphasized this fact as basic to the need for attention to curriculum considerations, methodologies, and innovations for effecting success in the crucial area of language arts development for these children.

Visual Perception and Language Development

The field of perceptual learning is, perhaps more than most, in need of redefinition and systematic integrative theoretical effort. Witkin (1969) in her paper stated that perception should be distinguished from sensation and cognition and quoted Gould's definition that perception is "sensory experience which has gained meaning or significance. When, as the result of learning experiences, one understands the relationship of objects which are previously raw, undifferentiated sensory experiences, he is said to perceive these objects."

Wohlwill (1966) stated that the major theories of perceptual learning have either been sidelined or are inspiring research on only a limited array of problems. The work of the Gibsons (1963) represents a partial exception in this respect, but it has thus far focused on the what rather than the how of perceptual learning. Their area of interest is reading, where the focus of attention has been on the differentiation of relevant stimulus features and on the problem of the significant perceptual units in the reading process (Gibson, 1963).

Recent research (Harris, 1965) has shown that a simple form of adaptation to prism-displacement of the visual field consists primarily of a proprioceptive change - a change in the felt position of the arm seen through prisms - rather than a visual, motor or visuomotor change. More complex sorts of adaptation (to inversion, reversal, and other optical transformations) can also be understood as resulting from changes in the felt locations of parts of the body relative to other parts. Harris (1965) suggested that proprioceptive perception of parts of the body (and therefore, of the location of touched objects) develops with the help of innate visual perception rather than visa versa. He cited several recent studies in support of this view and concluded that if

this is a valid assumption, many aspects of visual perception are not influenced by experience but are largely innate.

Wohlwill (1966) stressed the continuity between perceptual learning and the field of learning in general. He referred to Postman's paper (1963) in which he discussed such concepts as observing responses, identifying responses, and mediating mechanisms. All of this suggested that a convergence between the psychology of perception and that of learning may occur rather than a unilateral incorporation of the former into the latter. Wohlwill (1966) also considered perceptual changes to be attributable to learning and development.

One of the problems that has inhibited the formulation of an adequate theory of perceptual learning has been in the specification of the mechanisms that could account for the phenomena in this area (Wohlwill, 1966; Wood, 1970). Focusing and scanning mechanisms have been postulated as processes along with attentional constructs, designed to handle changes in discrimination based on selection for a complex stimulus input. Wood (1970) found that young children from minority groups need visual closure abilities (both horizontal and vertical scanning abilities) in order to successfully master language skills basic to academic achievement in learning to read and to write.

Some of the most significant work being done on the problem of eye movements appears to be emanating from Russian laboratories. Wohlwill (1966) reported research which demonstrated the influence of eye movements in reading. The results showed that as the sequential dependence on the material read approached the English text, the number of forward, and especially of regressive, eye movements decreased.

Wohlwill (1966) reported Gibson's findings with regard to the pronunciability variable, which demonstrated that in an experiment where pronounceable versus nonsense (unpronounceable) words were used, lower recognition thresholds were found for the nonsense words. In a replicated study Gibson found that unpronounceable sequences of letters and sequences of letters with no meaning had lower thresholds of recognition than did the pronounceable and meaningful sequences of letters e.g., (TVA versus TAV). Gibson felt that pronunciability facilitates the structuring of the letters into a coherent perceptual unit.

Wiederholt and Hammill (1970), using the Marianne Frostig Developmental Program of Visual Perception, randomly assigned pupils in kindergarten and first grade classes in three schools to experimental or control sub-groups. This sample was mostly Negro children in a Philadelphia school district from families who were generally below the city average on median family income and above the average on male unemployment, receipt of public assistance, and juvenile crime. Experimental groups received 16 weeks of training in the Frostig-Horne perceptual development program; control groups received no formal training in visual perception development. At the end of the 16 week period, there were no significant differences between the groups as measured by the readiness and achievement tests used in the study.

Fisher and Turner (1970) investigated the effect of an intensive program of perceptual-motor instruction upon the academic readiness of disadvantaged kindergarten children. They based their training program on the hypothesis that culturally disadvantaged children would improve their conceptual skills and readiness for school as a result of this training. Using four kindergarten classes randomly selected from public schools in an economically disadvantaged area with a population of almost 100 percent Negro, they used two experimental groups and one control group.

The only difference between the experimental groups was a time factor where one experimental group (E_1) received exercises recommended by Kephart (balance and posture, locomotion, contact, body image, laterality, perceptual-motor match, and cognition) for three hours per day throughout the entire school year. The second experimental group (E_2) began the program in the middle of the school year, and the control group (C) received no systematic perceptual-motor training program during the school year. The Slosson Intelligence Test, Metropolitan Readiness Test, Frostig's Developmental Test of Visual Perception, and Kephart's Purdue Perceptual-Motor Survey were administered to ascertain if the perceptual motor training program produced increases in general intelligence, reading readiness, and perceptual motor readiness.

The Slosson Intelligence Test was the only pre-post measure of those listed, and indicated approximately equal gains in I.Q. from October to May for Groups E_1, E_2 and C. There were significant differences for the two experimental groups over group C on the "Copying" subtest of the Metropolitan Readiness Test which, according to the authors, is a measure of perceptual-motor control. No significant differences among the groups were found on the Frostig test or the Purdue Perceptual Motor Survey.

Fisher and Turner (1970) speculated that the major effect of the training program resulted from intensive exposure to frequently used verbal concepts, (e.g., top, next, row, beginning, and below) paired with concrete examples and movements. The training program may have achieved this by providing immediate feedback as to whether subjects correctly understood and could perform in accordance with the perceptual-motor instructions.

Halliwell and Solan (1972) investigated the effectiveness of an extended, comprehensive, supplementary perceptual and perceptual-motor training program on the reading achievement of first grade boys and girls who were designated as potential reading problems. A preliminary study conducted the previous year had indicated that the Mentropolitan Readiness Test was the single best predictor of success in first grade reading of about 40 predictor variables studied. Each of the students selected was matched as closely as possible on the basis of regression score and sex with two other students. The results were that 35 matched trios were randomly assigned to one of three groups: experimental I, experimental II, and control.

The control group was composed of 35 students who were distributed throughout the school system and were to participate in the regular reading program conducted by the various first grade teachers. They received no additional small group assistance from the district reading personnel. The experimental I group also was composed of 35 students who were distributed throughout the school system and who took part in the regular reading program conducted by the first grade teachers. However, as a supplement to the reading instruction they received perceptual training in sessions of 45 minutes duration, scheduled two times weekly from November 1 to May 20. The training featured sensory processing, inter-sensory development, fine and gross motor development, and developmental concepts of directionality and laterality. The experimental II group also was composed of 35 students distributed in the same manner as the experimental I and control groups. In addition to their regular reading instruction they were given special reading assistance conducted by the same school district reading personnel who worked with the experimental I group. These special reading sessions were matched with the experimental I group with regard to time, size of small groups, and the number of sessions. However, the special assistance received was of a more conventional type of reading aid, such as word recognition training, phonetic training, including consonant and vowel sounds, and blending of sounds involving short vowels, simple reading comprehension exercises, listening exercises, and choral poetry. At the end of the experiment in May, all of the groups were administered the Metropolitan Achievement Test, Primary I Battery. The reading comprehension subtest provided the criterion of effectiveness of the program. The mean scores on the reading comprehension subtest of the Metropolitan indicated that the experimental I group (perceptual-training) obtained the highest mean score in reading for both boys and girls. The experimental II group (conventional remedial) obtained higher reading scores than did the control group. This study featured perceptual training as a supplement to the regular reading program rather than a part of the reading program. It should be noted that the study included more instruction time and a more comprehensive program than did other studies reviewed by Halliwell and Solan (1972).

On the basis of the Halliwell and Solan study it appeared that perceptual training for first grade students had been more effective with boys than with girls and with students whose readiness scores were low. However, while acknowledging the superior achievement of the perceptually trained boys, a few of the first grade teachers indicated that they felt the success of the venture with the boys was perhaps more a function of the small group instruction and individual attention that the boys needed and were being given by the district reading personnel, rather than the perceptual training itself.

Gibson (1963) indicated that from the point of view of the stimulus alone, symbols may be classified as more line drawings of a geometric rather than a representational type. However, since they function in any given culture to symbolize the sounds of its spoken language, then we are concerned with how graphic symbols are perceived,

because their correlation with already known speech units may affect the process of the spoken language. Gibson (1962) separated the process of perceiving symbols into three stages; (a) the differentiation of letters from one another, (b) the association of graphic symbols with speech units and (c) the perception of graphic units of various sizes when the correlation with speech has entered the picture. Gibson, Gibson, Pick and Osser (1962) studied the discrimination of letter-like forms. Their aim was not merely quantitative comparison of different age levels but a qualitative developmental study of types of errors with respect to the critical features of letters. Using twelve specified transformations for each of a group of twelve standard letter-like forms, they required the subject to match a standard with an identical form. The transformations which were considered involved, (a) discriminating printed letters, (b) rotations or reversals, and (c) transformations involving a break and a close within the letter-like form. The discrimination task required the subject to match a standard with an identical form. Two types of error were possible: omission and confusion. The subjects were children, ages four through eight. The analysis of errors by transformation type showed that although confusion errors decreased with age for all transformations, there were significant differences between types not only in number of errors at age four but in rate of error decrease thereafter. The confusion errors with topological transformations were few even at four years and disappeared by eight years. Rotations and reversals were much more frequent at four years, but they also declined to nearly zero at eight years. The confusion errors with perspective transformations were not only frequent at four years but still were frequent at eight years.

Gibson (1962) felt that the types of errors decrease at different rates because children learn to detect the distinctive features of objects, both real and pictures. This ability should carry over to letter-like forms insofar as features which have been critical for objects in the past are present. Certain questions arise, such as: does the amount of stimulus information which can be processed increase with age? Does perception increase in veridicality with maturity or does it on the other hand become more and more influenced by the private world of the individual as his experience increases? Gibson (1962) felt that perceptual development progresses by both maturation and learning and that at least three kinds of perceptual learning could be pointed out in developmental studies (Gibson, 1962): (1) increase in specificity, (2) detection of distinctive features, and (3) changes which take place developmentally in a constant error.

Smith (1967) developed a program for aiding both children and adults to overcome errors commonly made in reading, e.g., additions, substitutions, reversals, and omissions. He stated that the Michigan Tracking Program was developed for use in overcoming erratic eye movements which account for errors such as were discussed above. The program was developed as a by-product of a University of Michigan research program on perceptual skills in reading. The manual for the program presented results from three studies which validated the use of the materials. The underlying assumption was that development of speed in discriminating letters and words decreases the tendency for eye movement

errors to occur, and that specific instructional procedures could improve discrimination and possibly directional control. Smith (1967) also suggested the possibility that perceptual retardation was related to inadequate visual tracking. Sometimes words may be recognized singly, but difficulty arises when they are presented in sequence. The program concerned itself with both vertical and horizontal scanning, a function referred to by Wood (1970) as vertical and horizontal closure. It was this program that was used in this study.

Language and Attention

There is a long-standing awareness among laymen and professionals alike that attention must play a crucial role in learning and schooling. Those who develop curriculum materials speak of providing for proper attention, and those who evaluate behavior or achievement on the part of students in the classroom frequently refer to the variable of attention. The absence of an historical appreciation for specific definition has left a void in establishing the accurate meaning or meanings which are to be understood by the term attention. Exactly what are the mechanisms of attention and the neurophysiology involved are not known (Blum and Adcock, 1968; Mostofsky, 1968; and Witkin, 1969).

Blum and Adcock (1968) indicated that definitions of attention have, by and large, centered around the response of the organism. They quoted Berlyne's definition of attention as the "momentary effective reaction-potential of the perceptual response." Mostofsky (1968) referred also to the fact that an accident of history, alone, has led to attention research having been pursued almost exclusively along the visual and aural modalities. At any rate researchers, such as Blum and Adcock (1968) and Mostofsky (1968), agree that the increased frequency with which the word is used in the face of the diverse experimental tactics which have been suggested in the name of attention requires examination.

Wohlwill (1966) in his review of the research regarding perceptual learning included observing and scanning responses as attentional processes. He indicated that attentional constructs are designed to handle changes in discrimination based on selection from a complex stimulus input, and continued to discuss the individual's movements of the eyes and hands made in exploring a particular stimulus. This was discussed in the previous section of this review.

Blum and Adcock (1968) also referred to various studies to provide evidence that children attend differently, not only on the basis of age and sex, but also on the basis of what has become known as "cognitive style". When children, for example, are given the task of choosing the two pictures in each group of three that "are alike or go together in some way", the tendency of first through fourth graders is to respond either by analyzing into component parts and choosing two pictures with some part in common or by categorizing in terms of functional relationships or inferential concepts. Blum and Adcock (1968) referred to the Kagen, et al. (1964) studies which term such response styles as analytic and non-analytic and as would be expected, these researchers attempted

to differentiate between these two styles with indices of attention. Kagen, et al. stated that cardiac deceleration and respiration variability of analytic and non-analytic boys differed during periods of attention and rest. Blum and Adcock (1968) reviewed some of the research regarding attention and early learning. They stated that attention overlaps many areas of interest in learning --- readiness, need achievement, concentration, and motivation. Blum and Adcock (1968) also provided references to various researchers who have found that attention and socioeconomic or cultural status are related. They stated that it is undoubtedly the poor, the psychosocially deprived child who is the first victim of the school system where attention must be elicited and maintained.

The problems of attention in terms of the orienting reflex have been studied for many years in the Soviet Union. Both Maltzman (1967) and Mostofsky (1968) indicated that the orienting reflex and related principles and theory as researched by the Soviet investigators contributed importantly to the possible solution of problems of perception and attention. The findings of the Soviet investigators provided interpretations of striking similarities between the initial conditions and consequent physiological changes accompanying attention as described by Pillsbury (1908) and others who provided data related to physiological responses, such as constrictions of the peripheral blood vessels and dilation of the cephalic vessels when attention was being investigated. Maltzman (1967) discussed the work of Sokolov, leading Soviet authority on the orienting reflex. He reported that an initial condition for elicitation of an orienting reflex is stimulus change. Any increase, decrease, qualitative or quantitative change in stimulation may evoke an orienting reflex. Consequent response changes defining an orienting reflex include cephalic vessel dilation and peripheral constriction, the GSR, and pupillary dilation. These are considered to be the vegetative components of the orienting reflex. In addition to these components, there may be overt responses, such as turning of the head and eye movements, which also have the effect of facilitating stimulus reception.

Maltzman (1967) described recent Soviet experiments using the orienting reflex concept in semantic conditioning and generalization to identify subjects classified as either high or low orienters. The identification of high and low orienters was on the basis of the distribution of galvanic skin responses to radical changes in stimulation by introducing a list of prerecorded words via earphones. Four stages were described: (1) habituation, which occurs presumably due to generalization of habituation to words; (2) conditioning, accomplished by interspersing a particular word nine times among a list of different unrelated words, each presentation being followed by a 100 decibel burst of white noise; (3) semantic generalization; and (4) extinction, introduced by interspersing the conditioned stimulus (word) five times among filler words while omitting the unconditioned stimulus (100 decibel burst of white noise). It was evident from the research that high and low orienters differed in the magnitude of their response to the filler words as well as to the conditioned stimulus (word). The same trend held true when the unconditioned stimulus, a new stimulus, was introduced following a series of words. Maltzman (1967) stated that these

results are in accord with the hypothesis that the orienting response facilitates discrimination and are what one would expect in terms of the ordinary usage of "attention".

Zeaman and House (1963) have worked with discrimination learning tasks. An example is a task involving discrimination between two objects, relatively easy even for severely retarded children. Thus, most of the studies conducted used problems involving at least two dimensions, one stimulus dimension being relevant and the other irrelevant to solution. On each trial two stimuli would be presented, each representing one value on each dimension. The four stimuli would appear equally often. Using this technique, the most common method of following the course of learning had been to plot the proportion of correct responses per trial or per block of trials for a group of subjects over the course of training. Usually, learning curves of this kind start near chance (50 percent in this case) and rise quite regularly along a negatively accelerated course to a final level of near 100 percent correct performance. Zeaman and House (1963) found this to be true of the most rapid learners among their retarded subjects; however, among the more retarded subjects, they found that the curve remained virtually at chance for a considerable number of trial blocks and then rose relatively steeply to the final common level of nearly 100 percent correct responding.

As a consequence of this finding Zeaman and House (Estes, 1970; Zeaman and House, 1967) used backward learning curves to look more closely at the data. The resulting learning curves began with virtually horizontal segments, over which the proportions of correct responses were at chance followed by a relatively sharp rise to 100 percent correct over about the last forty trials preceding attainment of criterion. The fast and slow learners were found to differ primarily in the number of trials required before their learning functions began to depart from the chance level. Zeaman and House (1967) suggested that discrimination learning might represent a two-stage process for mentally retarded subjects. The two-stage process postulated a chain of two responses for problem solution: the first, an attention response to the relevant stimulus dimensions; the second, a correct instrumental response to the positive cue of the relative dimension. Thus they described two classes of parameters: (1) parameters controlling individual differences in rate of acquisition and extinction, and (2) parameters controlling individual differences in initial probabilities of paying attention to the various dimensions of stimuli.

According to this conception, the initial plateau of the backward learning curves, during which performance hovered around chance level, represented a phase during which the subject was predominantly attending to irrelevant dimensions and thus was making no progress whatever toward mastery of the discrimination. Then the subject finally happened to attend to the relevant dimension, the reward he received produced an increase in his probability of making the correct response

when attending to that dimension, and the accelerative phase of his learning process began (Estes, 1970). The tenative conclusion was reached that intelligence level was associated with differences in attention rather than learning, in the sense of rate of habit acquisition. Zeaman and House (1967) postulated that if they could engineer the subject's attention, that is, get him to focus on the relevant dimension, they could get fast learning and wash out the effects of intelligence. Wischner (1967) in discussing the Zeaman and House attention theory objected to the use of the term, observing response, as being synomous with attention. He felt that it was a valid question to ask why retardates are deficient in observing response behavior, since an observing response should be classified more as a habit acquisition factor than as a fundamental process such as attention.

Language and Intelligence

Bernstein (1964) was cited previously as having presented a language structure wherein a public language was described as possessing a relatively closed perceptual system along with a highly predictable structure and syntax of language development. Bernstein (1964) stated that the individual who is limited to a public language will be oriented toward a relatively low order of conceptualization which will set the limits to the matrix of relationships within which he operates. He referred to the Piagetian developmental sequence from concrete to formal operations and indicated that this may not be inevitable in case of a child restricted to a public language. The individual will have difficulty in structuring certain types of unstructured situations and will be insensitive to the means whereby generalization becomes possible. A distinct relationship will be found between verbal and non-verbal measures of intelligence; language scores are depressed in relation to scores obtained on the non-verbal tests.

Wechsler (1958) stated that we know intelligence by its effect or its properties, and it may manifest itself in a variety of ways. With regard to language, he stated, "the size of a man's vocabulary is not only an index of his schooling, but also an excellent measure of his general intelligence. Its excellence as a test of intelligence may stem from the fact the number of words a man knows is at once a measure of his learning ability, his fund of information and of the general range of his ideas."

Reidford and Berzonsky (1969) referred to Project Headstart in 1965 where many experiments were carried out to design a curriculum that could remedy the environmental deficiencies of disadvantaged preschool children. They reiterated well-publicized information that the most highly structured of these curriculumswas the Bereiter-Engleman program, from which the Distar materials were later developed. The program was used for instruction of language, reading, and arithmetic for disadvantaged four year olds. Bereiter and Engleman (1966) claimed dramatic changes in linguistic skills and I.Q. scores as measured by the Illinois Test of Psycholinguistic Abilities and the Stanford-Binet Intelligence Scale, Form L-M. Reidford and Berzonsky (1969) attempted to test the claims of Bereiter and Engleman (1966). Among other tests they

administered Form L-M of the Stanford-Binet Intelligence Scale as a pre- and posttest measure to compare I.Q. gains resulting from the instructional program. The results were that the children's mean intelligence quotients rose from 95.7 to 102.1, a mean gain of 6.4 points. This gain was significant at the .01 level. Exposure to the Bereiter-Engleman preschool curriculum not only raised intelligence quotients but also stimulated development in reasoning ability, in grammatical usage and in understanding as measured by the Illinois Test of Psycholinguistic Abilities. Reidford and Berzonsky (1969) concluded that long term exposure to the Bereiter-Engleman preschool curriculum reverses some of the intellectual deficits of the culturally disadvantaged.

The Distar Reading Program was developed from the Bereiter-Engleman Curriculum for Project Headstart, designed to remedy some of the language deficiencies of disadvantaged pre-school children. The Distar Reading Program provides an excellent balance between hearing, saying, and blending the sounds of language with the recognition of the sounds of language in printed and written form. This appears to coincide with the position of those who have recognized the need to intergrate sensory channel functions for more efficient decoding and encoding of stimuli (Deutsch, 1964; Friedman, 1971; Underwood, 1969). The program is based on mastery learning principles. It places special emphasis upon letter-sound training, which has been found to have greater positive effect on facilitating the reading acquisition process than does the more traditional letter-name training (Jenkins, Bausell, Jenkins, 1972; and Samuels, 1972).

The general weight of evidence would seem to support the contention that there is a positive relationship between intelligence and language development. Also it appears that ethnic group membership, visual perception, and attention are variables deserving of further study in their relation to the instruction of language or reading.

CHAPTER III

PROCEDURES

Subjects

The subjects in this study consisted of first grade and second grade children attending an elementary school in the Buena Elementary School District, Sierra Vista, Arizona. With the assistance of the principal, students were randomly assigned to classes at the beginning of the school year, and the experimental treatments were randomly assigned to classrooms. Two experimental groups at each grade level thus were obtained. The control group subjects for each grade were dispersed throughout the remaining first and second grade classes in the school and were randomly chosen from among those students.

The sample included 68 males and 66 females and was composed as follows:

	Anglo	Mexican-American	Total
Grade 1	39	25	64
Grade 2	46	24	70
	85	49	134

Mexican-American status was determined from knowledge of family background possessed by the principal, teachers and other school personnel. Decisions of classification were made on this basis to eliminate errors that arise when classification is made on the basis of only student surname. The Mexican-American students in Buena Elementary School District schools are frequently observed by teachers to be disadvantaged as described by Cheyney (1967) and Rosen and Ortego (1969). They appear to be lacking in the verbal skills which are required for successful work in the public schools.

The mean age of the children in the first grade groups was 6 years 4 months, with a standard deviation of 10.9 months. For the second grade groups, the mean age was 7 years 5 months, and the standard deviation was 8.4 months.

Methods

The two first grade experimental groups (E_1 and E_2) were instructed with the Distar Reading I program which concentrates on developing decoding skills that are needed to look at a word, sound it out, and say it at a normal speaking rate. A total of 159 lessons were organized according to a scope and sequence chart. The lessons were divided into four main categories: (1) sounds and reading sounds, (2) related skills, e.g., symbol-action games, blending, rhyming, and symbols, (3) take home materials, and (4) workbooks.

The two second grade experimental groups (E_3 and E_4) were instructed with the Distar Reading II program. This program was a systematic continuation of Distar Reading I, teaching more advanced reading and comprehension skills. A recycling book for review of the Reading I program was also included for second grade children since they entered the Distar Reading program with no previous experience in Distar I. A recycling placement test was provided to enable the teacher to determine the entry skills of students in the class. The Distar Reading II program provided 63 lessons in the recycling book and 180 lessons in the program covering sounds and reading sounds, take home stories and worksheets, and writing sheets. Each Distar Reading program provided for grouping according to learning rate.

Groups E_1 and E_3 received a supplementary visual perception training program which incorporated into a global task an increase in the speed of perception. The Michigan Tracking Program was selected because it encompassed many of the functions which have been found to be relevant to the development of visual perception skills. The control of eye movements aid in focusing attention to relevant stimulus dimensions (Hendrickson and Muehl, 1962; Kinchla & Allen, 1969; Langer, 1969; Wohlwill, 1966 Wood, 1970; Zeaman and House, 1967). Spring (1971) found a relationship between perceptual speed and reading ability. The transfer value of letter-like perceptual stimuli in a visual-perception training program to subsequent acquisition of reading skills has been documented by Gibson (1963) and Pryzwansky (1972), and the development of perceptual span with functional spelling units has been found by other researchers (Aderman and Smith, 1971; Freeburne, 1949). In addition to possessing the above characteristics, the Michigan Tracking Program provides levels of graduated difficulty and skill development so that children of differing ages and developmental levels may be benefited by their use.

Groups E_2 and E_4 received no formal visual perception training program. They used this time for free play on the playground.

The control groups (C_1 and C_2) received no formal visual perception training, and their instruction was the regular language arts program. This program provided three to four sets of basal readers designed to provide varied amounts and kinds of learning experiences for different learning rates of students. It generally included student-teacher discussion of words and related pictures, stories and a phonics program. Writing, punctuation and spelling were also taught.

The teacher variable was considered to be controlled among the experimental groups by the use of the highly structured materials, trainin workshops and continued supervision. Three teacher training workshops in the Distar system were conducted prior to the beginning of the school year. Three times during the investigation, the training representative of the publishing company for the Distar materials visited the classrooms for further instruction and consultation. The author and assistant supervised the teachers two to three times weekly and were available at other times for consultation at the teachers' request.

Figure 1 diagrams the organization of the groups utilized in the study.

Figure 1

	Treatment I (Language plus perception)	Treatment II (Language only)	Controls (Regular program)
Grade One	Experimental I (E_1)	Experimental II (E_2)	Control I (C_1)
Grade Two	Experimental III (E_3)	Experimental IV (E_4)	Control 2 (C_2)

To summarize the groups:

(1) Experimental Groups E_1 and E_3 received both the language training program (Distar Reading Program) and the visual perception training program (Michigan Tracking Program).

(2) Experimental Groups E_2 and E_4 received only the language training program (Distar Reading Program).

(3) Control Groups C_1 and C_2 received a basal reader and phonics workbook approach to language development as devised by the regular classroom teacher.

Measures

The following tests were administered to each subject in the sample.

(1) Lorge-Thorndike Intelligence Test, Level I (Grade 1) and Level II (Grade 2), 1957.

(2) Metropolitan Readiness Test, 1969, and Metropolitan Achievement tests: Primer, Form F; Primary I, Form F; Primary II, Form F, 1971.

(3) Digit Span Subtest of the Wechsler Intelligence Scale for Children.

The Lorge-Thorndike Intelligence Test, Level I, The Metropolitan Readiness Test, Form A, and the Digit Span subtest of the Wechsler Intelligence Scale for Children were administered to the first grade children in the beginning of the school year, 1971.

The Lorge-Thorndike Intelligence Test, Level II, The Metropolitan Achievement Test, Primary I, Form F, and the Digit Span subtest of the Wechsler Intelligence Scale for Children were administered to the second grade children also at the beginning of the school year, 1971.

These tests were administered again as posttests in January 1972, following one semester of the experimental treatment. The Primer and Primary II levels, both Form F of the Metropolitan Achievement Test, were selected as the post achievement measures of reading for the first and second grades respectively.

The Lorge-Thorndike Intelligence Test, Primary Battery, Levels I and II, consisted of three non-verbal tests which the authors claim are tests of abstract intelligence, defined as the ability to work with ideas and relationships among ideas. The alternate-forms reliability coefficient for the tests of Level I and II which use pictorial material is about .79. This value is regarded as satisfactory (Pidgeon in Buros, 1959).

The Metropolitan Readiness Test (MRT) constitutes a prognostic or predictive measure of later achievement in first grade work (Hildreth, Griffiths, and McGauvran, 1969). The authors reported correlations of the MRT with the Metropolitan Achievement Tests (Primary I and Primary II) in terms of raw scores. The Total Readiness Score correlated with Primary I and Primary II Reading Scores .643 and .577 respectively, and with Word-Knowledge scores .684 and .579 respectively. The Word-Knowledge Score and Reading Score combine to make up the Total Reading Score which served as a measure of language development in this research. Both split-half and alternate-forms reliability coefficients range from .89 to .94.

The Metropolitan Achievement Tests were standardized in 1969-70, and reliability coefficients are reported to range from .93 to .96 for the Total Reading scores on the Primary I and Primary II level tests.

The Digit Span subtest of the Wechsler Intelligence Scale for Children is a test of simple recall, basically a test of attention and freedom from distractibility (Cohen, 1959; Cronbach, 1960; Glasser and Zimmerman, 1967; Wechsler, 1958). The reliability coefficient for this test is reported to be .60, with a standard error of measurement of 1.90 for children in the early elementary grades.

Analysis of Data

To seek answers to the questions posed in this study, the following hypotheses were tested for significance at the .05 level:

1. There are no differences between posttest means of reading, intelligence, or attention scores between the control groups in either the first or second grades who are taught with traditional basal reader and language arts materials and

   (a) The experimental groups who are taught with highly structured materials, and

   (b) The experimental groups who are taught with materials described in (a) above and with additional materials designed to develop visual perception skills.

2. There are no differences between means of posttest reading scores between the experimental groups in either the first or second grades after instruction.

3. For Mexican-American students there are no differences between posttest means of reading, attention, or intelligence scores after differing methods of instruction in either the first or second grades.

4. There are no differences between means of posttest reading scores among high and low levels of intelligence and attention for the three methods of instruction at both grade levels, and none of the interactions are significant.

5. Posttest reading scores at either grade are not related to scores on tests of intelligence, reading or attention which were administered prior to the instruction.

6. Pretest measures of intelligence, attention, and reading make no contribution at either grade to the prediction of reading scores after instruction.

To test hypothesis one, a nonparametric single classification analysis of variance was computed for all groups at each grade level. The posttest reading score was the dependent variable. To locate specific differences, Mann-Whitney U Tests were computed at each grade level. This also provided a test for the second hypothesis.

To test hypothesis three, a nonparametric single classification analysis of variance also was computed for Mexican-American subjects only at each grade level. In order to locate sources of variance, follow-up Mann-Whitney U Tests again were computed at each grade level.

To test hypothesis four, a three-way classification analysis of variance was computed for all groups at each grade level. The reading score was the dependent variable. High and low levels of attention and intelligence were formed by dividing the groups above and below the median scores for each variable.

To test hypothesis five, product-moment correlation coefficients were computed between the pre- and posttest scores.

To test hypothesis six, multiple regression analyses were computed for each group at each grade level, using pretest attention, I.Q. and reading scores as predictors. The criterion was posttest reading scores in all cases.

Statistical calculations of means and standard deviations, analyses of variance, correlation coefficients, and multiple regression analyses were performed at the University Computer Center, The University of Arizona. Other statistical calculations were made by the author.

CHAPTER IV

RESULTS

The means and standard deviations for all variables for all groups on the pretests are presented in Table 1.

TABLE 1

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES FOR ALL GROUPS, ENTIRE SAMPLE (PRETEST SCORES)

Groups	Lorge-Thorndike M	Lorge-Thorndike SD	Attention M	Attention SD	Reading M	Reading SD
			GRADE I			
E_1, N=21	42.89	10.06	6.11	1.86	53.37	21.30
E_2, N=21	44.67	6.85	5.71	1.52	55.24	16.63
C_1, N=22	43.71	6.52	5.90	1.74	55.29	16.26
			GRADE II			
E_3, N=25	46.84	6.61	7.04	1.18	47.32	14.85
E_4, N=21	42.95	5.72	7.14	.99	44.71	14.63
C_2, N=24	43.54	5.70	7.21	1.47	35.29	8.12

Among the pretest scores, the means and standard deviations on all variables appeared to be similar in each grade with the possible exception of the reading mean and standard deviation in the control group (C_2) for grade two.

Table 2 presents the same information for the entire sample for the posttest scores.

TABLE 2

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES FOR ALL GROUPS, ENTIRE SAMPLE (POSTTEST SCORES)

Groups	Lorge-Thorndike M	Lorge-Thorndike SD	Attention M	Attention SD	Reading M	Reading SD
			GRADE I			
E_1, N=21	45.05	5.28	6.45	1.40	28.75	2.84
E_2, N=21	48.57	5.75	7.00	1.35	27.48	6.45
C_1, N=22	41.91	6.56	5.95	1.82	17.77	7.29
			GRADE II			
E_3, N=25	47.16	6.95	8.20	1.17	49.16	13.58
E_4, N=21	44.14	5.95	7.67	1.04	43.86	15.87
C_2, N=24	42.37	6.13	7.79	1.22	41.71	18.34

Among the posttest scores for the entire sample, general similarity again was evident. However, the reading means for first grade groups appeared to differ more widely than had the pretest means.

The means and standard deviations for all variables for all groups, Mexican-American students only, on the pretests are shown in Table 3.

TABLE 3

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES FOR ALL GROUPS, MEXICAN-AMERICAN STUDENTS ONLY (PRETEST SCORES)

Groups	Lorge-Thorndike M	Lorge-Thorndike SD	Attention M	Attention SD	Reading M	Reading SD
			GRADE I			
E_1, N=9	37.78	11.57	5.14	1.57	42.67	19.49
E_2, N=8	39.87	8.46	5.37	1.77	51.50	22.04
C_1, N=8	42.37	7.74	6.12	1.25	52.00	19.67
			GRADE II			
E_3, N=7	41.14	5.24	7.57	1.13	44.43	6.70
E_4, N=9	41.11	6.05	7.33	1.00	43.22	14.96
C_2, N=8	40.50	4.81	6.12	1.36	30.62	5.83

As may be seen, the Mexican-American students did not appear to differ markedly among groups within grades except for the pretest reading means for groups E_1 and C_2. At second grade level, pretest reading score variances were quite different. Compared to the entire sample, of which they were a part, the Mexican-American students performed similarly, again except for the C_2 group on reading.

On the posttest scores for the Mexican-American students only, Table 4 presents the means and standard deviations for both grades.

TABLE 4

MEANS AND STANDARD DEVIATIONS FOR ALL VARIABLES FOR ALL GROUPS, MEXICAN-AMERICAN STUDENTS ONLY (POSTTEST SCORES)

Groups	Lorge-Thorndike M	Lorge-Thorndike SD	Attention M	Attention SD	Reading M	Reading SD
			GRADE I			
E_1, N=9	44.67	5.87	5.67	1.41	27.87	3.44
E_2, N=8	46.62	5.75	6.62	1.68	24.87	9.09
C_1, N=8	41.87	9.61	6.12	1.36	14.37	4.47
			GRADE II			
E_3, N=7	42.43	7.34	8.00	1.41	43.00	8.12
E_4, N=9	44.00	5.43	7.78	1.09	42.78	15.95
C_2, N=8	39.50	5.13	7.37	1.19	32.87	12.98

As before, these students (on posttest scores) appeared to have performed quite similarly, except in the area of reading where control groups at both grades earned somewhat lower means.

The differences in sizes of pre- and posttest reading means in grade one must be viewed in light of the fact that the pretest was a readiness test with a total of 102 items while the posttest scores were based on a 33-item achievement test.

Because a test of the homogeneity of variances indicated that significant differences among variances did exist, and because of the uncertainty of meeting other assumptions in the use of a parametric test, the Kruskal-Wallis H test was used to test the first hypothesis.

Table 5 presents the results for the first grade groups, entire sample, for the three variables.

TABLE 5

KRUSKAL-WALLIS H TEST RESULTS FOR ENTIRE SAMPLE
GRADE 1, POSTTEST SCORES (N=64)

Lorge-Thorndike	H = 10.78*
Attention	H = 4.68
Reading	H = 19.65*

* Significant at .05 level

The H of 19.65 for reading and the H of 10.78 for intelligences were significant also at the .01 level. Thus the first hypothesis was rejected at grade one for the reading and intelligence variables. The non-significant H for attention scores was anticipated, in view of the fact that the attention score means were highly similar on both pre- and posttests.

In order to ascertain where the differences among groups existed on the intelligence and reading variables, follow-up Mann-Whitney U tests were calculated for each group versus every other group. Results were as follows for the intelligence test scores:

E_1 vs E_2	U = 136.50*
E_1 vs C_1	U = 161.00
E_2 vs C_1	U = 108.50*

* Significant at .05 level

It was apparent that differences in posttest intelligence scores existed between the two experimental instructional methods groups and between the group which did not have the supplementary perceptual training and the controls at the first grade level. The question may be raised as to why the intelligence posttest score means were slightly lower generally for the entire sample and also but not significantly lower for Mexican-American students in first grade groups receiving both language and perceptual training as against groups receiving language training only. A speculation might be made as to whether the perceptual training made for some type of interference effect with first grade intelligence test scores.

Differences among groups for the reading scores were:

E_1 vs E_2	U = 216.00
E_1 vs C_1	U = 71.50*
E_2 vs C_1	U = 77.50*

* Significant at .05 level

A different pattern of group differences was evident for posttest reading scores. Here the experimental groups did not differ, but each group exceeded the performance of the control group at grade one. Furthermore, the effects of the combination training (language plus perception) apparently did not affect posttest reading performance adversely, but neither did it make for a significant difference in the experimental instructional programs.

In Table 6 appear the results for the entire sample, grade two.

TABLE 6

KRUSKAL-WALLIS H TEST RESULTS FOR ENTIRE SAMPLE
GRADE 2, POSTTEST SCORES (N=70)

Lorge-Thorndike	H = 5.43
Attention	H = 2.73
Reading	H = 2.60

In grade two, there were no significant differences among the groups on any of the variables. Accordingly, the hypothesis was accepted for second grade students and rejected for first grade students.

Figure 2 diagrams the results for the reading scores for the two grades. Figure 3 shows the results for both grades on the intelligence test scores.

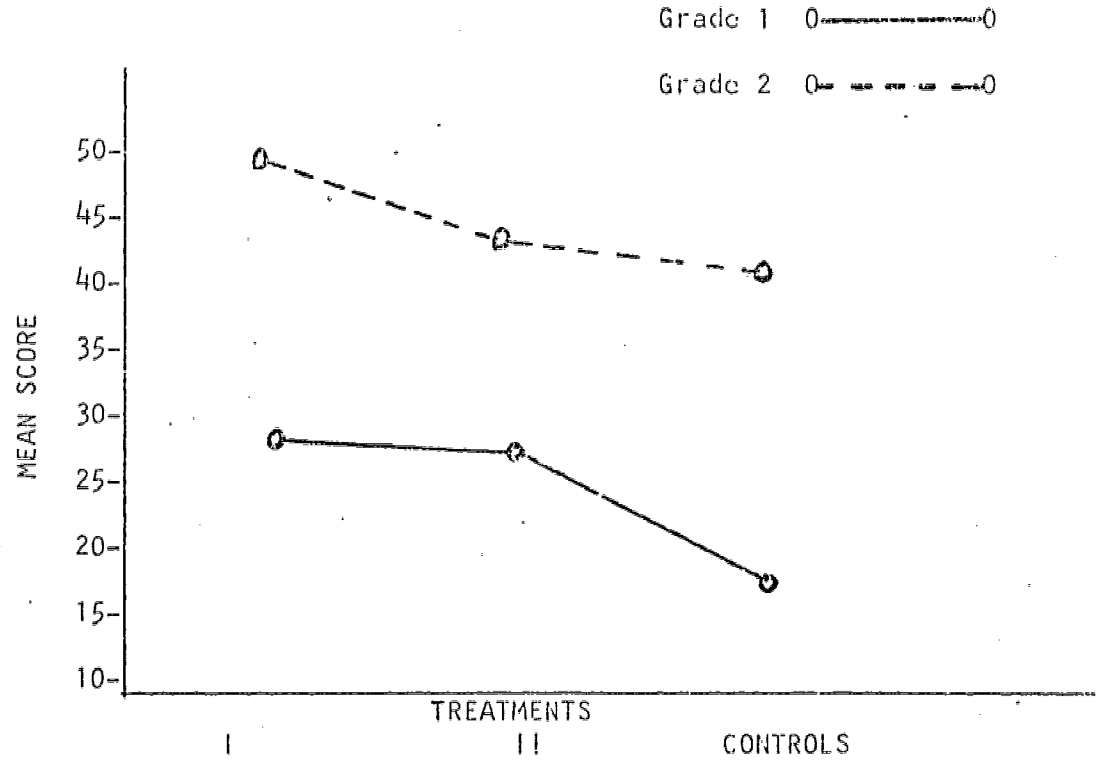

Figure 2. Mean Posttest Reading Scores for all Groups in Grades One and Two, Entire Sample.

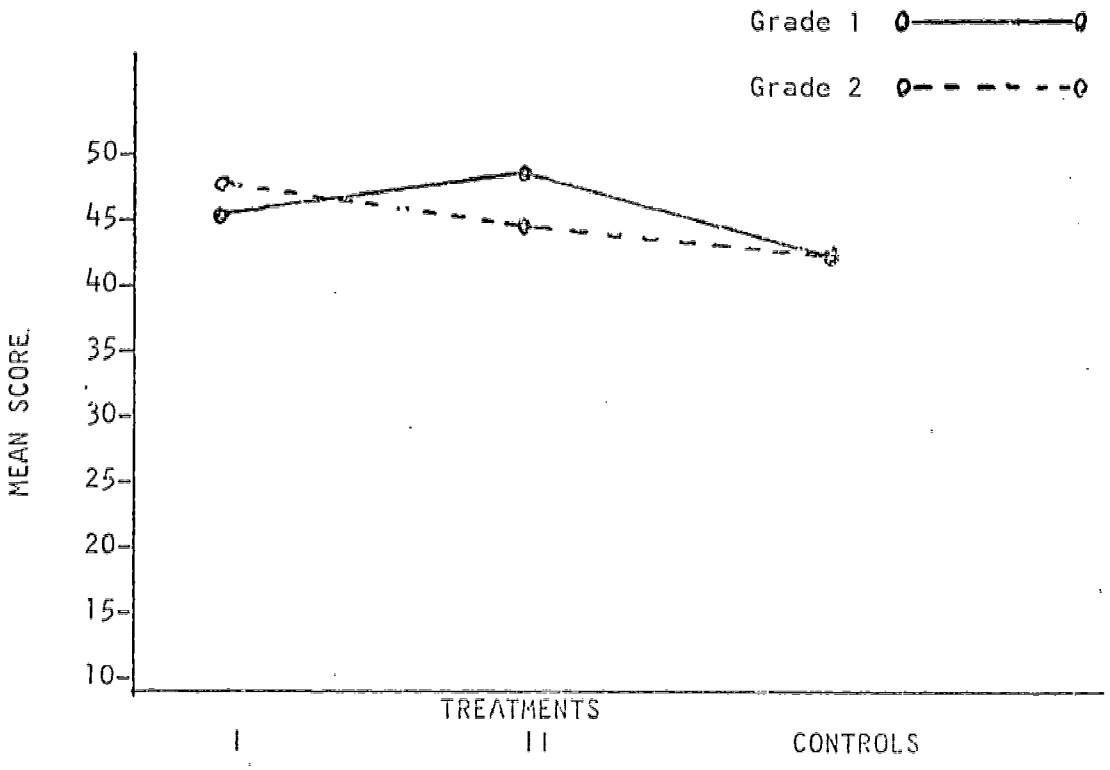

Figure 3. Mean Posttest Intelligence Scores for all Groups, Grades One and Two, Entire Sample

When the data for the Mexican-American students was analyzed separately, a Kruskal-Wallis H Test was used for each variable at each grade level to test the third hypothesis which stated that there were no differences between means on posttest scores of reading, intelligence and attention among the Mexican-American students in either grade. The outcomes of the analyses for the first grade groups are presented in Table 7.

TABLE 7

KRUSKAL-WALLIS H TEST RESULTS FOR
MEXICAN-AMERICAN STUDENTS ONLY
GRADE 1, POSTTEST SCORES (N=25)

Lorge-Thorndike	H = .94
Attention	H = 2.46
Reading	H = 10.36*

* Significant at .05 level

The H of 10.36 for the posttest reading scores was significant also at the .01 level, indicating that the third hypothesis was rejected for the first grade groups for the reading scores only.

The results of follow-up Mann-Whitney U Tests for the first grade groups of Mexican-American students, to determine between which groups differences might exist, were:

E_1 vs E_2	U = 14*
E_1 vs C_1	U = 1*
E_2 vs C_1	U = 11*

*Significant at .05 level

The follow-up tests revealed differences in reading scores among all groups. The means for both experimental groups differed significantly from the mean for the control group, and the difference between the means for the two experimental groups was also significant, with the combination of language and perceptual instruction being the most effective. It is of interest to note that group differences on posttest intelligence scores were not significant for first grade Mexican-American students, but that such group differences had been found for the entire sample at grade one.

Table 8 presents the results for the Mexican-American students only in the second grade groups.

TABLE 8

KRUSKAL-WALLIS H TEST RESULTS FOR
MEXICAN-AMERICAN STUDENTS ONLY
GRADE 2, POSTTEST SCORES (N=24)

Lorge-Thorndike	H = 2.58
Attention	H = 1.07
Reading	H = 3.91

There were no significant differences on any of the variables among the second grade Mexican-American groups. Therefore, the third hypothesis was accepted for grade two.

Figure 4 shows the results for the two grades.

No differences among groups were found for attention at either grade level. Differences between groups of Mexican-American students resided in posttest reading scores at grade one but existed for the entire sample at grade one in both intelligence and reading.

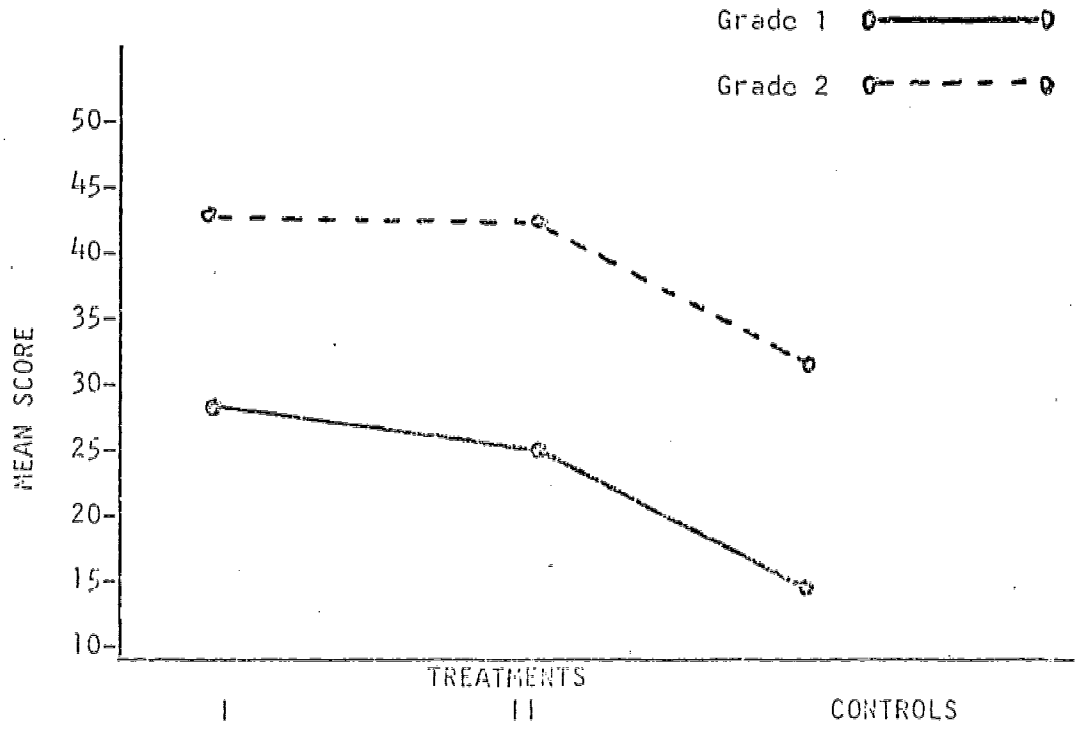

Figure 4. Mean Posttest Reading Scores for Mexican-American Students Only in Grades One and Two

The fourth hypothesis could not be tested by a nonparametric test. Therefore, even though requisite assumptions were violated knowingly, a multiple classification analysis of variance was calculated for the entire sample at each grade level, more or less out of curiosity. (This test could not be computed for Mexican-American students alone because of inadequate numbers in cells.)

Table 9 presents the results, and great caution must be used in interpreting the outcomes. The total degrees of freedom are one less than expected because of the loss of useable data for one subject.

TABLE 9

ANALYSIS OF VARIANCE OF POSTTEST READING SCORES FOR ATTENTION, IQ, AND METHODS FOR THREE FIRST GRADE CLASSES (ENTIRE SAMPLE)

Source of Variation	DF	Sums of Squares	Mean Square	F
Total	62	2069.35		
Attention	1	41.12	41.12	1.24
IQ	1	3.53	3.53	.1065
Methods	2	272.36	136.18	4.11
Attention x IQ	1	.015	.015	.00005
Attention x Method	2	38.93	19.46	.587
IQ x Method	2	7.89	3.95	.119
Attention x IQ x Method	2	15.85	7.92	.239
Error	51	1689.65	33.13	

Making the significance level more stringent because of violation of assumptions, it is evident that none of the main effects nor interactions were significant at the .01 level.

The same type of outcomes were observed for the second grade groups, as may be seen in Table 10.

TABLE 10

ANALYSIS OF VARIANCE OF POSTTEST READING SCORES FOR ATTENTION, IQ, AND METHODS FOR THREE SECOND GRADE CLASSES (ENTIRE SAMPLE)

Source of Variation	DF	Sums of Squares	Mean Square	F
Total	69	15434.90		
Attention	1	53.02	53.02	.222
IQ	1	790.57	790.57	3.307
Methods	2	129.29	64.65	.270
Attention x IQ	1	176.33	176.33	.738
Attention x Method	2	175.13	87.56	.369
IQ x Method	2	69.17	34.59	.144
Attention x IQ x Method	2	175.72	87.86	.378
Error	58	13865.67	239.06	

The fourth hypothesis as a result was accepted at both grade levels.

Further research of this type with sufficient numbers of subjects might be desirable because of the significant differences among groups found at grade one for the entire sample on the reading and intelligence variables.

The fifth hypothesis stated that reading scores achieved on posttest measures are not related to pretest scores on tests of intelligence, reading or attention. Table 11 presents the correlation coefficients between posttest reading scores and pretest scores of reading, intelligence, and attention for the three groups in grade one.

TABLE 11

CORRELATION COEFFICIENTS BETWEEN EACH OF THREE PRETEST SCORES AND POSTTEST READING SCORES GRADE 1, (ENTIRE SAMPLE)

	1	2	3	4
1. Posttest reading		.361**	.249*	.346**
2. Pre-reading			.737**	.538**
3. Pre-intelligence				.391**
4. Pre-attention				

**Significant at .01 level
* Significant at .05 level

In first grade, pretest scores of reading, intelligence and attention were significantly related to posttest reading performance; the hypothesis accordingly was rejected.

Correlations also were obtained for the second grade classes. Table 12 presents the coefficients for the three groups in grade two.

TABLE 12

CORRELATION COEFFICIENTS BETWEEN EACH OF THREE PRETEST SCORES AND POSTTEST READING SCORES GRADE 2, (ENTIRE SAMPLE)

	1	2	3	4
1. Posttest reading		.750**	.367**	.328**
2. Pre-reading			.252*	.083
3. Pre-intelligence				.300*
4. Pre-attention				

**Significant at .01 level
* Significant at .05 level

At second grade also, posttest reading scores related significantly to pretest scores of reading, intelligence and attention. Consequently, hypothesis five was rejected at both grade levels.

The pre-reading scores at first grade level, it will be recalled, were readiness test scores, which related to intelligence pretest scores in the amount of .737. In the second grade, the relationship was lower, .252. At both grade levels; posttest reading performance was significantly related to all three pretest variable scores. By second grade past performance in reading seemed to assume a larger role than either intelligence or attention, both of which appeared to be more importantly related to the beginning stages of learning to read.

There was evidence of intelligence and attention test scores being significantly related, but to a low degree. Also, the difference in correlation between pre-reading test scores and pre-attention test scores in the two grades should be noted. The relationship may be more important in beginning reading than it is in later learning in second grade, as was mentioned above.

To determine the role of these pretest scores in the prediction of posttest reading performance, hypothesis six stated that pretest measures of intelligence, attention, and reading make no significant contribution at either grade level to the prediction of posttest reading scores. To test this hypothesis, multiple regression analyses were performed for the groups in each grade.

Tables 13, 14 and 15 present the results of the multiple regression analyses for the groups in grade one.

The posttest reading score constituted the criterion in each case. The predictors were pretest IQ score, pretest attention score, and pre-reading score.

TABLE 13

MULTIPLE CORRELATION COEFFICIENTS AND BETA COEFFICIENTS FOR REGRESSION ANALYSIS, E_1 GRADE 1, (ENTIRE SAMPLE)

	Post Reading		
Multiple R	.373	.400	.405
Pre-reading	.373	.548	.482
Pre-IQ		-.226	-.248
Pre-attention			.106

TABLE 14

MULTIPLE CORRELATION COEFFICIENTS AND BETA COEFFICIENTS FOR REGRESSION ANALYSIS, E_2 GRADE 1, (ENTIRE SAMPLE)

		Post Reading	
Multiple R	.743**	.836**	.852**
Pre-IQ	.743**	.615**	.468**
Pre-attention		.405**	.354**
Pre-reading			.234

**Significant at .01 level
* Significant at .05 level

TABLE 15

MULTIPLE CORRELATION COEFFICIENTS AND BETA COEFFICIENTS FOR MULTIPLE REGRESSION ANALYSIS, C_1 GRADE 1, (ENTIRE SAMPLE)

		Post Reading	
Multiple R	.473*	.548**	.609**
Pre-reading	.473*	.768**	.624*
Pre-IQ		-.403	-.415
Pre-attention			.306

**Significant at .01 level
* Significant at .05 level

Hypothesis six was accepted for the E_1 group, and rejected for the E_2 and C_1 groups. In the groups, although differing multiple regression weights appeared significant for different treatment groups, the addition of the variables raised the multiple correlation coefficients by such small amounts as to be of no great use to a classroom teacher. Furthermore, no great significance should be placed upon these results because of the small samples. They certainly should be cross-validated to determine if the beta coefficients do represent valid multiple regression weights.

Given the above restrictions, it may be seen that none of the multiple correlation coefficients nor beta coefficients were significant in the E_1 group (both language and perceptual training). For what it is worth, in interpreting the beta coefficients, interference effects were observed by the negative correlations between pre-reading and pre-intelligence scores and between pre-intelligence and pre-attention scores.

Still being cautious, it was determined that of the 73% of the variability of posttest reading scores in group E_2, almost half (35%) could be attributed to the relationships between the posttest reading scores and pre-intelligence and pre-attention scores. More variability (22%) was attributable to pre-intelligence scores than to pre-attention scores (13%). Fifteen percent was attributable to the correlation with pre-intelligence and pre-reading scores.

A different (if unreliable due to small samples) pattern existed for the C_1 group. Here 41% of the variability in criterion scores was due to their correlation with pre-reading scores. However there was a large dampening or interference effect from the two negative correlations of criterion scores with pre-reading and intelligence scores and with pre-intelligence and attention scores.

If doubt is raised as to the legitimacy of such lengthy interpretation in the face of so much uncertainty regarding the practical utility of the regression analyses, it must be admitted that the possibility of having discovered differential predictors for differing instructional methods was too much to resist further exploration.

Tables 16, 17, and 18 present the information for second grade. The posttest reading score constituted the criterion in each case for grade two also. Likewise, the predictors were pretest IQ score, pretest attention score, and pre-reading score.

TABLE 16

MULTIPLE CORRELATION COEFFICIENTS AND BETA COEFFICIENTS FOR REGRESSION ANALYSIS, E_3 GRADE 2, (ENTIRE SAMPLE)

		Post Reading	
Multiple R	.757**	.762**	.763**
Pre-reading	.757**	.742**	.748**
Pre-IQ		.092	.088
Pre-attention			.046

**Significant at .01 level
* Significant at .05 level

TABLE 17

MULTIPLE CORRELATION COEFFICIENTS AND BETA COEFFICIENTS FOR REGRESSION ANALYSIS, E_4 GRADE 2, (ENTIRE SAMPLE)[a]

		Post Reading
Multiple R	.845**	.877**
Pre-reading	.845**	.831**
Pre-attention		.237*

**Significant at .01 level
* Significant at .05 level
a. Tolerance level of pre-intelligence scores insufficient for computer to add to prediction equation.

TABLE 18

MULTIPLE CORRELATION COEFFICIENTS AND BETA COEFFICIENTS FOR REGRESSION ANALYSIS, C_2 GRADE 2, (ENTIRE SAMPLE)

		Post Reading	
Multiple R	.842**	.860**	.867**
Pre-reading	.842**	.721**	.685**
Pre-attention		.215	.154
Pre-intelligence			.133

**Significant at .01 level

In grade two (with equal recklessness), a quite different interpretation for all three groups may be made in comparison to the E_1 and E_2 groups in first grade. At second grade level in each group, a large amount (from 50% to 70%) of the total variance of criterion scores was due to the direct contribution of the pre-reading scores. This situation also characterized the C_1 group (41% due to pre-reading), but the C_2 criterion score variance was not affected by interference effects from negative correlations between pretest variable scores.

In summary, it must be repeated that in this study even though multiple correlation and beta coefficients were significant, they were derived from quite small samples and thus probably have little practical use because of the uncertainty of regression equations based upon such small numbers.

The important conclusion seems to be the possibility that the predictors may behave in different ways with different instructional methods at different grade levels. Further research on adequate samples would be desirable to answer this question, and also to determine if intelligence and attention are more significant for some methods at grade one, and if past performance in reading, regardless of method of instruction, is the best predictor after grade one.

CHAPTER V

SUMMARY AND CONCLUSIONS

Results of this study may be summarized as follows:

1. At grade one for the students as a whole, both experimental groups exceeded the reading performance of the control group.

2. The addition of the visual perception training in one experimental group at grade one (all students) did not bring about a significant difference in reading performance between that group and the experimental group which had only the language training.

3. At first grade level also for the entire sample, the group which had language training only exceeded both the control group and the group which had both types of training on the posttest intelligence scores.

4. For total sample groups, there were no significant differences between experimental groups nor between experimental groups and controls at the second grade level on the variables of intelligence, attention, and reading.

5. Among Mexican-American students only, significant differences among instructional groups also were found only at grade one.

6. At grade one, both experimental groups differed significantly from the control group in reading performance (Mexican-American students only), and the experimental group supplemented with visual perception training exceeded the performance of the language training only group. Differences among groups on intelligence test scores were not evident, as had been the case in the entire sample at grade one.

7. Differing relationships between pretest scores of reading, intelligence, attention and posttest reading performance were observed in the two grades. Intelligence and attention scores appeared to be of possibly more consequence in first grade, while past achievement in reading seemed to be important in second grade.

8. Given the restrictions of rather small numbers, in the prediction of posttest reading scores from pretest scores of reading, intelligence, and attention, the pretest reading scores generally were the best predictors. However, at first grade level intelligence and attention scores made a contribution for the group receiving language instruction only, while none of the pretest scores weighted significantly in the post reading performance of the group receiving both language and perceptual training.

9. Though there appeared to be a suggestion of differential predictor variables for differing instructional methods, it must be realized that the beta coefficients should be cross-validated before such a conclusion is accepted as viable. Also it must be noted that even though varying predictors were significant, their additions raised the multiple correlation coefficients by such small amounts in this study that they would be of little practical use to a classroom teacher.

The results of this study which showed significant differences between methods of instruction in reading among first grade students as a whole are consistent with previous findings. Studies which have stressed the continuity between perceptual learning and language development (Bernstein, 1964; Taylor, 1962; Wohlwill, 1966) gained some support among Mexican-American students in the study. The findings that letter-like perceptual stimuli used in a visual-perception training program enhance subsequent acquisition of reading skills and the emphasis on developing perceptual speed (Gibson, 1963; Pryzwansky, 1972; Spring, 1971) are supported also for Mexican-American students at first grade level.

Since neither of the two second grade experimental groups manifested significant differences on mean posttest reading scores as compared to the controls, it may be that they had difficulty in making the transistion from the basal reader method of instruction to the Distar method. These students in first grade had learned by the regular or control method. The recycling materials may have consumed too much time to allow for significant progress, or the review may have been insufficient for students starting the new method in second grade.

Another reason for the differences in results obtained between the first and second grade groups may be with regard to maturational factors. It may be that the younger students represented an optimum period for learning the perceptual and language skills provided and were thus particularly responsive to training at this time. The first grade Mexican-American students in this study might then be said to have been optimally responsive to both at that level.

It would appear desirable for further research to be conducted to measure the long-term effects of Distar and of Distar plus visual perception training in comparison with a traditional basal reader language arts program, in samples large enough to answer questions such as the following:

1. Would a program such as was designed in the present study be more effective if begun in kindergarten?

2. Would visual perception training continue to contribute to the learning of some groups as it appeared to in this study?

3. What effects upon linguistic skills and learning in general might be observed in the middle and upper grades from a long-term program, particularly for so-called disadvantaged students?

4. What are the interrelationships and interactions with instructional treatments existing among perception, attention, and intelligence?

5. Would intellectual level, attention level and instructional methods interact given available samples of adequate size?

6. Do the variables of attention, intelligence and past achievement in reading differentially predict performance for varying methods of instruction and does prediction also vary by grade level?

In addition to statistical outcomes, it was deemed desirable to gather informal statements from teachers which might reflect their attitudes and those of the students regarding the instructional methods. These may be seen in Appendix A. They appear to be too good to be true but are actual comments reflecting the success of the instructional programs.

As a result of the outcomes of this study, the suggestion seems clear that the language and visual perceptual training were differentially effective for first grade Mexican-American students. The combination of the two proved to be the superior method for these students.

For first grade students as a whole, the addition of the visual perception training appeared to add nothing to the language training. Both the combination method and the language training alone, however, were shown to be superior to the regular program.

Since similar outcomes were not found for second grade Mexican-American pupils nor for second graders as a whole, it may be that maturational and program-switching factors were at least partially responsible for the lack of differences among groups at that level.

APPENDIX A

A consideration in this program was the expressed attitudes and evaluations of the teachers using the experimental instructional materials. Teacher comments included such as the following:

"The students respond so enthusiastically to the Distar program, I never want to go back to the basal reader approach."

"My children keep asking me, 'Can't we have more reading later in the day?'"

"I tried to skip reading so we could have the Christmas Party, but the students wouldn't let me."

"I find the Distar method of reinforcement and hand signals affecting the teaching of other subjects."

"I have a girl who used to be in special education who is doing fine in the Distar Program."

"Although the Reading Program is especially effective with the language handicapped students, the brighter students getalong very well with it."

"Children who had difficulty spelling by sounds at first, soon began to show progress."

"I sometimes use the Michigan Tracking materials as a reinforcer for good work."

"The students like to be timed with the stop watch in the Tracking Program to see if they can beat their previous time records."

"The encouragement enjoyed from success in the Distar and Michigan Tracking Materials is enough to commend this program for all teachers and students."

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