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AUTHOR	Teager, Joyce
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ABSTRACT

Isolation of optimal instructional processes to provide information feedback and to motivate disadvantaged children was the goal of this comparative study of reinforcement contigencies. The subjects were 21 black children from 45 to 65 months of age. Children were ranked on the PPVT and a learning program pretest, then randomly assigned to three treatment groups. The contingency treatments compared during a 3-day social studies learning program were: Treatment 1: token reinforcement (raisins), chemical feedback (green or red dot shows on booklet when correct or incorrect response is marked), and verbal information; Treatment 2: verbal reinforcement (praise), chemical feedback, and verbal information; and Treatment 3: chemical feedback and verbal information only. Also, paired associate tasks were run with half of the subjects in Treatment 1 receiving token reinforcement and half of the subjects in Treatment 2 receiving verbal reinforcement. All groups performed significantly better on the post-test than on the pretest. The subgroup continuing to receive token reinforcement was significantly superior to its matched subgroup: this was not true of verbal reinforcement. Neither reinforcer appears to be necessary as children can learn to receive feedback stimuli as information signals. (MH)

CONDITIONS FOSTERING THE USE OF INFORMATION FEEDBACK BY YOUNG CHILDREN[1]

Joyce Teager

University of California, Los Angeles

June 1969

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CHAPTER 1

INTRODUCTION

The level of language ability of the preschool disadvantaged child has become a major concern among research workers and educators. The question no longer is whether or not impoverishment is present; the research evidence is quite conclusive on this point. The focus now is on how to develop and implement educational programs which will lessen the established deficities.

There are currently in progress a number of research studies testing the comparative effectiveness of different intervention procedures. The impact of such programs is appreciably affected by variables which are only too often neglected in the evaluation. One of the most important of these is the area of motivation, that is, getting learners to want to do well on school tasks. This is the major emphasis of many intervention curricula.

In developing instructional materials, there is generally a close adherence to principles of reinforcement theory. Glaser, (1966), in an excellent discussion of the role of response contingencies in learning, called attention to the difference between reinforcing events, either positive or negative, and corrective feedback. Although it is a very elementary concept in the reinforcement framework, hence probably one taken for granted, it may be useful to reiterate that stimuli are not intrinsically reinforcing; that is, certain events become reinforcing only as a product of a specific history of

conditioning. Thus, while ice cream and candy may be effective reinforcers for most children, they are not equally potent for children from diverse backgrounds. Even more discrepancy is found in the effectiveness of secondary reinforcers such as verbal approval.

A previous study (Stern and Teager, 1968) notes that a substantial body of research questions the value of traditional types of reinforcement for school achievement. Evidently, with learners from certain types of repressive and punitive environments, aversive stimuli may be more potent controllers of behavior than various techniques of social approval. This same study demonstrated that while young children given feedback on both correct and incorrect responses were better able to transfer to new classification tasks than those given no feedback or those given feedback about only the correct response, no differences for treatment were found on the immediate posttest over the program content. It was felt that perhaps these young children had not yet learned to work for the secondary reinforcement of "being right."

The present study has focused upon the importance, in work with preschool disadvantaged children, of not only being able to use feedback as information, but of finding the information of sufficient reinforcement value to want to perpetuate correct responses.

CHAPTER 2

REVIEW OF RELATED LITERATURE

The language facility or lack of language facility of the preschool disadvantaged child has become a major concern among research workers and educators. The issue does not appear to be whether or not impoverishment is present in the child's verbal skills but rather how to develop and sequence educational programs which will lessen this deficit. There are currently in progress a number of research programs designed to explore this very problem. The success or lack of success of such programs is influenced by numerous variables, some of which have been identified and some which have not.

The emphasis on variables to be studied by the laboratory researcher and by the researcher interested in developing and maintaining an on-going program of instruction for various public and private institutions may differ greatly. For example, the laboratory worker may attempt to find the most optimal type of feedback for a specific learner, engaged in a specific program, under highly controlled conditions.

The research in program development will be influenced by the goals of the particular instructional program. This program may be designed and tested with a view toward long range implementation in such locations as day care centers or Head Start Centers. Some of the requirements of such a program might be

(1) that it can be administered by adults available in the community who have had little or no training in instruction.

(2) that the expense of the program is reasonable, i.e., although it may be educationally desirable to have computer assisted instruction in all Head Start Centers, the cost would be prohibitive.

(3) that the programs could be given to a number of children at the same time.

(4) that there is a method, inherent within the instructional program, of presenting each child with information regarding his performance on the program while at the same time keeping a record of his responses which may be examined and evaluated at a later date.

These program requirements would negate the use of somewhat "ideal" instructional conditions, i.e., one to one instruction, highly specific feedback and/or immediate individual remedial procedures. The requirements would also indicate some specific variables which may need to be examined.

One of these variables would be the feedback or knowledge of results. Within the framework of the instructional program previously outlined and in light of the information available about the population, the culturally disadvantaged preschool child, what would be the optimal type of feedback to employ? It is true that it might be highly desirable for a teacher to give individual feedback to each child as he completes a frame along with an explanation of why his

response is right or wrong, but then we no longer have a program which must teach, we have an adult who must teach and one of the basic requirements of the instructional program (that it can be administered by untrained adults) is no longer met. The researcher must then find a type of feedback which

(1) can be used in language acquisition tasks such as concept development.

(2) can be provided with minimal adult interaction.

(3) will provide usable information to the child regarding the correctness of his response.

(4) will be effective in group instruction.

(5) will provide a record of the child's performance which can be referred to at a later date.

It is with these questions in mind that the following literature search has been conducted.

1. The Disadvantaged Preschool Child and His Language:

The NCTE Task Force in the publication Language Programs For The Disadvantaged has stated that

"The greatest deficit, and threat to academic achievement, of the disadvantaged child is his retardation in the development of language and conceptual skills."

In examining the verbal dimensions of the disadvantaged child's language, Osborn (1967) found many things which pointed to this very retardation. As a language teacher at the Bereiter - Engleman Preschool at the University of Illinois she has noted some common language deficiences on the disadvantaged child. In general they

(1) omit articles, prepositions and conjunctions and short verbs from statements.

(2) do not understand the function of "not" in a sentence.

(3) cannot use simple tenses to describe past, present, and future action.

(4) are able to use he and she for male and female figures but cannot use the pronoun "it" to refer to inanimate objects.

(5) do not understand many of the common prepositions and conjunctions.

(6) can often perform a direction but are not able to describe what they have done.

(7) do not realize that two or more words can describe one object.

(8) cannot produce plural statements correctly and cannot perform the actions implied by plural statements.

The classic studies of McCarthy (1930) have shown that low SES children typically use shorter sentences and ask fewer questions than their middle-class peers.

Others have noted that these children also have poorer articulation and a limited vocabulary. More important, however, is the failure of the low income child to use language as a cognitive tool. Bernstein (1960) has described the low class child's language as "restricted" and states that this restricted language is combined with the inability to develop logical and coherent thought sequences.

Carl Bereiter (1966) has stated that in almost every aspect of language development that has been evaluated quantitatively, young disadvantaged children have been found to function at the level of average children who are a year or more younger. The other area in which he found these children to be retarded is in reasoning ability or logical development. Here, too, the amount of retardation is typically a year or more.

The home environment of the lower class child is typically noisy and communication with adults is sparse. Deutsch (1963) has stated that although the environment is noisy, the noise is not meaningful but actually fosters inattention in the child. He has also noted a lack of feedback from adults to correct the child's pronunciation and grammar.

Kohlberg (1967) points out that some of the most striking and obvious deficits in culturally deprived children are attentional. Observations have suggested that these children are seldom alone with any engrossing task or toy due to sibling interference and such interference may have a marked effect upon learning programs. Kohlberg also suggests that the culturally deprived child typically sees the adult as someone who will set limits on behavior and supply non-cognitive needs, but not as a source of guidance or information.

All of the variables listed above play a part in what Kleinberg (1963) has termed the cumulative deficit phenomenon. Thus far, regardless of the instructional program, lower class children with poor verbal abilities do not seem to "catch up" to their middle class contemporaries but fall farther and farther behind. The research

of Krugman (1960) serves to substantiate Kleinberg's findings. When the effects of cultural deprivation were studied by noting the deficit in IQ and reading-test scores for children in a large low socio-economic district in New York City, and third graders were compared with sixth and eighth graders, the deficit was found to be cumulative.

Concept Development

Since our concern here is with the disadvantaged child, it would seem appropriate to examine the literature regarding concept development as it applies to the disadvantaged child. Unfortunately, the research does not allow such specificity. Although there is a plethora of information available regarding numerous variables operating in concept development relatively little emphasis has been placed on specific characteristics of the subjects such as sex, age, general intellectual ability and/or cultural background. It is assumed apparently that there is a generalizability of results regardless of the individual characteristics of the subjects. While it may be appropriate not to ascertain characteristics of the subjects in some studies, it seems essential to do so in terms of the disadvantaged child and concept development since organismic factors might be operating and confounding the results regarding the problem under consideration (Glaser, 1967).

Concepts have been explored by educators and psychologists for decades and by philosophers for centuries. To define a concept then one might preface the definition by stating whether it is Hullian, Piagetian, Skinnerian or perhaps cognitive or behaviorist. A glance at Webster's Dictionary tells us:

> concept 1. A thought, an opinion. 2. Philos. A mental image of a thing formed by a generalization from particulars; also an idea of what a thing in general is to be.

This duality of meaning is apparent as we hear a range of phrases such as the "concept of children," to the "concept of massive retaliation." Other definitions tend to be somewhat circular, typically explaining what a concept allows one to do (i.e., order the environment, provide stability in communication). Such definitions are usually complete with an example of concept learning.

Tracy Kendler (1961) has defined "concept formation" as the acquisition or utilization, or both, of a common response to dissimilar stimuli.

Bruner, Goodnow, and Austin (1956) have distinguished between concept acquisition and concept formation. According to them, the former process is what some have defined as concept learning (hunt, 1962)

Piaget (1957) has attempted to develop a logical system suited description of human mental processes. For him, a concept is an explanatory rule, or law, by which a relation between two or more events may be described.

D. H. Russell states that a concept is "a symbolic response to the members of one group or class of stimulus patterns...The pattern is always symbolized, sometimes verbalized, but the existence of the pattern is revealed by the individual's behavior toward the class of objects."

To become somewhat more specific about the experimental nature of corcept learning, it appears that the majority of studies

consider the learning to involve making a common response to a set of stimuli. The individual learns to respond in one way to one set of stimuli and in another way to another set of stimuli. He learns to categorize instances and generalizes his behavior so that a new instance with relevant properties can be included in the concept class. Almost without exception, the way in which the subjects involved in the research are expected to acquire this behavior is through inductive learning, (i.e., the instances are presented and the rule is induced).

Although concept studies have traditionally employed the inductive method the variables studied have been highly divergent. Klausmeier (1967) has recently identified five variables which he feels are significant in concept attainment. They are (1) stimulus (2) instruction (3) motivation (4) organismic and (5) response modes. Much along this same line Glaser has listed the following variables:

(1) positive and negative concept instances and relevant and irrelevant dimensions

(2) ordering and sequencing

(3) salience, dominance and preceptibility

(4) feedback and response contingencies

(5) task conditions and types of concepts

(6) individual differences

(7) theories

A brief outline of some of the literature will be offered following the Glaser outline.

1. Positive and Negative Concept Instances and Relevant and Irrelevant

Dimensions:

Hovland and Weiss (1953) demonstrated that human learners acquire information with greater facility from positive instances than from negative instances although a more recent study by Huttenlocher (1962) has shown that the most effective teaching technique is to arrange sequences of instances that include both positive and negative instances.

2. Ordering and Sequencing

Hovland and Weiss (1953) studied sequencing in the sense of the presentation of mixed order of positive and negative instances, but reported no effect of special importance. Gagne (1964) has offered the opinion that efficient concept learning will take place when the concepts of an area of knowledge are learned in a particular order while Heidbreder (1947) demonstrated a dominance hierarchy in concept learning in adults, i.e., object, form and number. Russell (1956) indicated that the sequence of concept development seems to move along a continuum from simple to complex, from concrete to abstract, from discrete to organized, and from egocentric to social. Welch (1940) hypothesizes that since higher-order concepts are further removed from the direct "stimulus trace" of its instance, and since the instances of higher'order concepts on the average have less common elements, they should be more difficult to learn. This was confirmed in a series of experiments on children's concept learning.

3. Salience, Dominance, and Perceptibility

Suchman, et al., (1961) has shown that young children prefer color and older children prefer form and that such preferences influence the salience in concept formation. Tracy Kendler (1965) has stated that dissimilar verbal labels serve to facilitate within class generalization. Concept learning with verbal dimensions occurs more effectively when the concept instances have a strong common descriptive response, a high dominance association, than with a weaker common association (Underwood and Richardson, 1956). Heidbreder and her associates (Heidbreder, 1945, Heidbreder, Bensley and Ivy, 1948) performed a series of experiments designed to show that concept learning was influenced by a tendency to perceive stimuli as unified wholes. Most of these experiments used Heidbreder's "modified memory technique," a variant of paired associates learning. In general, Heidbreder's hypothesis was confirmed.

4. Feedback and Response Contingencies

Buss (1950) investigated the effects of feedback following correct and incorrect responses and found that feedback signals provided only after the correct response are not as effective as feedback given only after incorrect responses or feedback given after both. Suppes (1965) demonstrated that learning in young children is more effective if the child who makes an error is required to make an overt correction response in the presence of the correct stimulus instance. Kurtz and Hovland (1953) presented familiar objects to elementary school children and asked one group to locate and circle a particular object on a sheet of pictures, and a second group to

circle the object on a sheet of names, and to pronounce the name aloud. In a one-week retention test, the group which verbalized the name was significantly superior in recall and in number of correct responses.

5. Task Conditions and Types of Concepts

The most detailed offering regarding the task conditions that affect concept learning are available in the book by Bruner, Goodnow, and Austin (1956). In general, the empirical findings state that the more complex concepts are more difficult to learn and that logical complexity is a factor in this difficulty.

6. Individual Differences

As mentioned previously, little has been done in the area of concept learning and individual differences, however, an exception is found in the work of Bruner, Goodnow, and Austin (1956) in which there is a rather intensive look at differences in strategy as a function of individual differences and task requirements. One of their claims put forth is that a preference for conjunctive concepts and strategies that discover them is largely the result of the intellectual heritage of Western culture. Whitfield (1948) showed that individual subjects differ in their tendency to remember first-presented or recently presented information. This is particularly important to the use of memory in inductive reasoning. Sarason (1961) has pointed out that in an individual's life history certain types of approaches to problems may be encouraged.

7. Theories

Most of the research in the area of computer simulation studies stems from the work of Newell, Simon, and Shaw on deductive logic (1957). Bruner, (1960) although his analysis antedates that of Newell et al., has agreed that the programming approach is a powerful tool in the analysis of strategies and their implication. Kendler (1961), in discussing the deductive model of Newell et al., pointed out that the argument for simulation rested on similarities between human behavior in previously investigated situations and certain aspects of a program's performance. However, he stated that "They add nothing to our further understanding of the living mechanism, but they do provide a better understanding of the computer."

Feedback and Knowledge of Results

One of the sacred pillars upon which programmed instruction is built is the assumption that continuous or periodic active responding on the part of the student to the information presented increases both the amount learned and the retention of that information. Supplementary to this assumption is another, that, having responded the student should be immediately or with only slight delay exposed to knowledge of the correct response so that he may either confirm or revise his own response. Illustrative of this is Pipe's booklet Practical Programming, in which he has listed four characteristics of programmed instruction. They are (1) small step, (2) active participation, (3) immediate knowledge of results and (4) self pacing. Markle, in Good Frames and Bad, has also mentioned these same two

requirements in her list of three principles of linear programming, (1) active responding, (2) minimal errors and (3) immediate knowledge of results. A review of the literature, however, do not consistently bear out the need for either active responding or immediate knowledge of results.

Angell (1949) in testing the effects of immediate knowledge of quiz results on final examination scores for 162 college freshmen in chemistry concluded that the final examination scores were significantly higher for the group receiving immediate knowledge of quiz results.

Kanner and Sulzer (1961) presented film teaching of the military phonetic alphabet to 2600 Air Force trainees. They found that in the covert response groups "thinking the response plus feedback" resulted in significantly greater learning than "thinking the response without feedback."

Krumboltz and Bonawitz (1962) sampled 32 college undergraduates in educational psychology on a linear 153 frame test writing program and determined that although there was no significant difference between groups with respect to knowledge of terms taught by the program, the group receiving confirmatory feedback in the context of complete sentences was significantly better able to apply the concepts and principles learned in the program than was the group receiving feedback in the form of single words or phrases.

Moore and Smith (1961) used a linear 846 frame program on spelling with two groups of sixth graders. They concluded that there was no significant difference between learning of the groups receiving knowledge of results and the groups receiving no feedback.

A linear program was administered to 270 college students using eight different treatments by Feldhusen and Birt (1963). Among other conclusions, it was determined that no significant differences in learning resulted between groups receiving (a) immediate knowledge of results, (b) delayed knowledge of results, (c) no knowledge of results.

The effects of learner's test anxiety and the presence or absence of feedback in programmed instruction was investigated by Peggy Campeau (1965) with fifth grade girls and boys. The feedback version of the program yielded significantly better performance than the no-feedback version for the high test anxiety girls; however, no other differences were great enough to achieve statistical significance.

Boersma attempted to determine the independent effects of delay of information feedback, post-information feedback delay and sex in a complex learning task. No significant differences were obtained. This study supports an earlier one by Bourne and Bunderson (1963) in concluding that delay of information feedback is not a critical variable in complex human learning.

An electronic educational laboratory was employed by Haynes to determine the effectiveness of immediate reinforcement in learning a complex mental-motor skill. The results indicated that immediate standardized learning reinforcement involving instructional films connected electronically with individual learning stations improved significantly the acquisition of complex mental-motor skills in learning to drive.

Melching (1962) attempted to determine the amount of feedback students would request when feedback was available to them on a demand basis. The low ability group required about three times as much feedback as the high ability group, however, the sample was too small to allow generalization.

In connection with the exploration of feedback in programmed instruction is a very basic question: is knowledge of results information or reinforcement? In going from the research laboratory to the classroom many writers seem to have equated reinforcement and response confirmation. It is not unusual to find them cross-indexed in a book, i.e., Learning and Programmed Instruction, Taber, Glaser and Schafer. Lumsdaine (1962) has indicated that the idea that confirmation of a correct response is reinforcing is a long standing tenet. He, however, questions the adequacy and value of reinforcement concepts in programming methodology. Lumsdaine argues that when programmers are writing frames they are actually more concerned with the manipulation of prompting cues rather than the manipulation of reward schedules.

In this area also, the research raises numerous questions about the reinforcing effect of response confirmation. Gagne (1958) and Carr (1959) have taken the position that confirmation serves as reinforcement when the task to be learned is intrinsically motivating. Ugelow (1962), on the other hand, contends that knowledge of results should have a reinforcing effect unless the learner has "no apparent desire to learn."

Glaser and Taber (1961) reported on a master's thesis problem completed by Scharf in which the symbolic logic program was rewritten and administered to 84 high school students in four alternative treatments: (a) 100% continuous reinforcement, (b) 50% fixed reinforcement, (c) 50% variable reinforcement (d) 25% variable ratio reinforcement. On a multiple choice criterion test no effect could be found which was attributable to any schedule of reinforcement. It was suggested that reinforcement by confirmation is a crucial event only when the probability of a correct response is low.

Reinforcement and Individual Differences

In a previous study (Stern and Teager, 1968) it was noted that a substantial body of research questions the value of traditional types of reinforcement for school achievement. Evidently, with learners of certain types of repressive and punitive environments, aversive stimuli may be more potent controllers of behavior than various techniques of social approval such as classroom awards.

For a long time it was accepted as almost axiomatic that any type of positive reinforcement would be more effective in changing behavior than negative reinforcement. (Bandura, 1962) However recent experiments which take into account the previous history of the learner (e.g. Church, 1963; Solomon, 1964; Baxter, Lerner, and Miller, 1965) demonstrate that there are individual differences in the reinforcement value of various types of stimuli. Children who have been accustomed to positively reinforced experiences do learn best when they receive approval or tangible rewards, but it is said (Lee, 1967) that those who have known a preponderance of punishment

seem to respond best to aversive stimuli. That is, they put out more effort to avoid punishment, perhaps because they have learned the best they can expect is the avoidance of pain.

The fact that the reinforcing effects of response confirmation interact with the reinforcement history of the learner has been reported in a paper by Husek (1966). She states that there is evidence that children of lower-class parents are more often subjected to punishment during the socialization process and it is possible that punishment for incorrect responses is more congruent with the learning styles of some lower-class children than is reward. Feshbach (1965) has suggested that some children may learn to cope effectively with aversive stimuli, such as punishment and therefore these children may learn more easily under conditions of punishment rather than reward.

Travers (1967) has stated that as feedback or knowledge of results produces improvement, it functions as a reinforcer for whatever behavior resulted in the improvement. He also points out that there are probably wide individual differences in the reinforcers that are effective with different children and that little has been done to provide an inventory of the reinforcers that may be used to shape the behavior of specific populations of children.

CHAPTER 3

EXPERIMENTAL DESIGN AND PROCEDURE

One of the acknowledged difficulties encountered prior to and during this research study has been that of supplying accurate and descriptive labels to the various treatment conditions. The following table is intended to summarize the treatment conditions and it is suggested that the reader use it as a reference throughout the study.

Learning Program

	Treatment 1	Treatment 2	Treatment 3
token reinforcement	all Ss		
verbal reinforcement		all Ss	
chemical feedback	all Ss	all Ss	all Ss
verbal feedback	all Ss	all Ss	all Ss

Paired Associate Tasks

	Treatment 1	Treatment 2	Treatment 3
token reinforcement	half of Ss		
verbal reinforcement		half of Ss	
chemical feedback	all Ss	all Ss	all Ss
verbal feedback			

Hypotheses

1. Children who are given a token reinforcer (raisins) accompanied by verbal and chemical feedback during a learning program will be superior in learning a new task when compared to the "new task" scores of children who were given verbal reinforcement (praise) along with verbal and chemical feedback in the same learning program.

2. Children who are given verbal reinforcement (praise) accompanied by verbal and chemical feedback in a learning program will be superior on a new task when compared to the "new task" scores of those given verbal and chemical feedback only in the same learning program.

3. Children who are given token (raisin) reinforcement or verbal (praise) reinforcement along with verbal and chemical feedback in a learning program will be superior to children given only verbal and chemical feedback in the learning program when compared on a new task.

4. Children who have had token reinforcement (raisins) and chemical feedback continued from the learning program to the new task but have had verbal feedback eliminated will perform better than children who have token reinforcement and verbal feedback discontinued, but chemical feedback continued, on the new task.

5. The two groups who have been trained on a learning program with token (raisin) or verbal (praise) reinforcement along with verbal and chemical feedback and have had the reinforcement and verbal feedback discontinued, but not the chemical feedback, during a new task will be superior to the group who was trained with verbal and chemical feedback only when "new task" scores are compared.

6. The two groups who have been trained on a learning program with token (raisin) or verbal (praise) reinforcement along with verbal and chemical feedback and have had the reinforcement and chemical feedback continued on a new task will be superior to the same two reinforcement groups who have had the differential reinforcement discontinued, but the chemical feedback continued, on the new task.

7. For all groups, the posttest performance on the learning program will be superior to the pretest performance.

Subjects

A group of 21 black children consisting of 6 boys and 15 girls, 45 to 65 months of age, in two urban Children's Centers made up the study population. The effect of the two different schools on the performance of the subjects was not considered an important variable as the two schools were in the same general area and the children could be considered to be from the same population. In addition, a certain amount of control over the school variable was established by ranking from high to low the subjects according to their scores on the Peabody Picture Vocabulary Test and the learning program pretest in each school before assigning them randomly to the three treatment groups. The Peabody Picture Vocabulary Test scores and the program pretest scores are reported in Table 3.

Treatments

There were three major treatment groups; Treatment 1 was the administration of token reinforcement (raisins) and verbal information along with chemical feedback, Treatment 2 was the supplying of

verbal reinforcement (praise), verbal information and chemical feedback, Treatment 3 was the giving of verbal information and chemical feedback only. The main effects regarding these three treatments have been stated in Hypotheses 1, 2, and 3.

A further treatment differentiation has been made by randomly selecting one half of the subjects in Treatment 1 and Treatment 2 to continue their differential reinforcement during a new task. These effects are considered in Hypotheses 4, 5, and 6.

The amount of learning which occurred on the program is considered in Hypothesis 7.

As stated above, all the children in all of the treatment groups received chemical feedback on both the learning program and on the new task. The chemical feedback was a special mimeograph ink developed by the A. B. Dick Company. This ink contains a water-soluble non-toxic pigment, such that when the material is printed on a page there is no way of distinguishing the embedded color of the feedback dot. However, when one of these dots (about one-half inch in diameter) under a picture is touched with a water-filled pen, the color is released and the dot turns either green or red, depending on whether it is the correct or incorrect response.

In addition to the chemical feedback, each child was given verbal feedback during the learning program. Whenever the child made a marking response under a picture with his water pen and uncovered a red or green dot, he was told by the experimenter "Green means it is the right picture. Red means it is the wrong picture." This verbal feedback was discontinued for all treatment groups during the new task.

Materials

The materials employed by each child during the learning program consisted of 1.) a water-filled marking pen, 2.) a twelve page booklet, 8 1/2 X 5 1/2 containing three pictures on each page which was used to familiarize the children with the use of water pens and the marking procedure prior to the presentation of the learning program, (see Appendix A) 3.) three 8 1/2 X 5 1/2 booklets one each of which was employed during each of the three days required for administration of the learning program.

In addition, the examiners presented the stimuli for the learning program with 8 1/2 X 11 pictures which were displayed to the child prior to his marking response in the booklet.

Learning Program

The content of the learning program was concerned with social studies concepts relating to the life of the Eskimo. There were a total of fifteen vocabulary words which described the clothing, food, housing and animals the Eskimo child might encounter in his daily living. Seven vocabulary words were presented on Day 1 of the program, eight words were given on Day 2 and all fifteen were reviewed on Day 3. Table 1 presents a list of the fifteen vocabulary words covered during the three day learning program.

Procedure

The three day learning program was administered to the sample of twenty-one children in groups of three children at a time. Dividers were used between the children so they could not see the

Table 1. List of Vocabulary Words for Days 1 and 2.

Program Vocabulary - Day 1

Eskimo

island

igloo

parka

mukluks

salmon

hole in ice

Program Vocabulary - Day 2

tent

ice fields

walrus

tusks

net

puffin

rocky cliffs

snare

The program vocabulary for Day 3 was a review of the words presented on Day 1 and Day 2.

marking response made by the child next to them. The lessons, which were presented verbally by the experimenter and her assistant, took between 12 - 15 minutes each day. The experimenter and her assistant went to alternate Centers each day to attempt to avoid any bias a child might develop toward one of the participants.

During the learning program the child was presented with the stimulus (vocabulary word) by means of an 8 1/2 X 11 picture which portrayed an Eskimo child engaged in some activity related to the word. For example, an 8 1/2 X 11 picture of an Eskimo boy putting on a pair of mukluks was shown to the group of children. The experimenter pointed to the mukluks and said, "Here is Sayac putting on his mukluks." The picture was then placed face down on the table and the children were told to turn the page in their booklet. On each booklet page were three pictures with a chemical feedback dot under them. Two of the pictures portrayed a graphic representation of other vocabulary words used elsewhere in the learning program. The third picture was a graphic representation of the correct response. In the above situation the child was told after he turned the page, "Mark the mukluks." Following the marking response the children in Treatment 1 were given a raisin if the chemical feedback dot turned green. If it turned red, no raisin was given which might be considered a mild form of punishment. The children were then given the verbal feedback, "Green means it is the right picture. Red means it is the wrong picture."

When the children in Treatment 2 made a correct marking response (green dot) they were given verbal reinforcement in the form

of praise, e. g., "You're doing a good job. That's a good boy (girl)." and mild verbal criticism, e. g., "That's too bad. You're wrong." or "oh, you marked the wrong picture." when an incorrect marking response (red dot) was made. These children were then given the verbal feedback "Green means it is the right picture. Red means it is the wrong picture.

Those children in Treatment 3 were given only the verbal feedback after a marking response was made.

Appendix B presents a selection of some of the 8 1/2 X 11 pictures, reduced in size, which were used to present the vocabulary words. The verbal commentary presented by the experimenter accompanies the picture. Appendix C represents the entire three day program without graphic illustrations.

Criterion for Evaluation

To evaluate learning on the program a pre and posttest was individually administered, the posttest being identical to the pretest. Appendix D lists each item in the pre-post test.

The "new task" in which the subjects engaged following the learning posttest was a paired-associate task which functioned as a posttest to determine the comparative effectiveness that the differential reinforcement and feedback techniques would display in a new learning situation.

For the new task, the paired-associate task, each child was presented with four stimulus words, contained in ten page booklets, depending on the correctness of the child's marking responses. The stimuli which were to be marked were new vocabulary words which were

related to the same content area of Eskimo life as was the learning program, they were as follows: 1) shamen 2) kyak 3) cache and 4) caribou. It was assumed that the population would not have had previous exposure to these words.

In the first booklet the child was told to mark the same stimulus, in this case a shaman, each time he turned a page. The shaman was one of three possible responses placed in a random position on each page. The other two responses were somewhat similar in that they were also men but the costuming was distinctly different among the three. Each time the child made a marking response on a page he saw either a green dot (correct response) or a red dot (incorrect response). Criterion was considered to be four successive correct responses. The subject's score on each PA task represented the number of errors he made before reaching criterion. If he selected either or both of the wrong (red dot) pictures only once before finding the correct (green dot) picture this was not considered an error. If the child knew that a red dot indicated an incorrect picture, and tried another picture, he was correctly using that feedback as information to select the appropriate picture. If the child did not reach criterion on the first booklet, another identical 10 page booklet was given to him. This procedure was followed for each of the remaining vocabulary terms.

It had been hypothesized that children in Treatment 1 (token reinforcement) and Treatment 2 (verbal reinforcement) would perform better if their differential reinforcement (raisins or praise) were continued in the new task as compared to those children who had

had their differential reinforcement withdrawn on the paired-associate task. For this reason, approximately half of the token reinforcement group (Treatment 1) and half of the verbal reinforcement group (Treatment 2) were randomly selected to continue to receive reinforcement during the new paired-associate task. None of the children in Treatments 1, 2, or 3 received verbal feedback during the paired-associate task; all received chemical feedback.

A note should be made regarding the distractors employed with the remaining three stimuli. As with the shaman stimulus an attempt had been made to portray similar representations but not graphically identical to the stimulus. The two distractors employed with the Kyak were an umiack and a sailboat. A mud-hut and another general structural shape were the distractors for the cache. The distractors for the fourth stimuli, the caribou, were also four legged animals with the main differentiation in the presence, size, or shape of the horns. It appeared that the caribou series was the most difficult to distinguish graphically. This will be discussed in the results and discussion.

CHAPTER 4

RESULTS

A total of six scores were subjected to analyses of variance. In each case, pretest scores on the learning program were used as the covariate. The major scores of interest were the scores on the new task. Each of the four stimuli in this paired-associate task were analyzed as well as the total score of all the paired-associate tasks. Only the comparisons using paired-associate four (caribou) showed significant difference between groups. In most cases the other three paired-associates were in the same direction as paired-associate four, however, they were not significant. For each measure there were large standard deviations.

The 3 X 1 analysis of covariance showed a significant difference between the three treatments on paired-associate task four ($F = 4.50$, df 2/17, $p < .05$) See Table 2. By a Newman Keuls comparison the significance was between Treatment 2 and Treatment 3. Subjects in Treatment 3 obtained significantly fewer errors than in Treatment 2.

Hypothesis 1, token reinforcement superior to verbal reinforcement, was not supported. Although Treatment 1 had fewer errors than Treatment 2, the difference was not significant.

Hypothesis 2, verbal reinforcement better than no reinforcement, was also not supported. There was, however, a significant difference between Treatment 2 and Treatment 3 but in the opposite

Table 2. Analysis of Covariance on Paired-Associate Task Four Using the Program Pretest Scores as the Covariate.

Source	df	MS	F
Treatment	2	169.1	4.50*
Error	17	37.6	

direction hypothesized, verbal reinforcement not superior to no reinforcement. The adjusted mean score for Treatment 3 on paired-associate 4 was 6.8 and for Treatment 2, 16.6. By the Newman Keuls comparison this was significant at the .15 level.

Hypothesis 3 involved a comparison between the two groups trained with reinforcement and the group trained without reinforcement. An analysis of the scores on paired-associate four showed a significant difference ($t = 2.18$, $p < .05$) between the reinforcement and nonreinforcement training, however it was in the opposite direction than was hypothesized. Table 3 shows unadjusted means and standard deviations for the three treatment groups.

Hypotheses 4, 5, and 6 were tested by analyses of covariance between treatments 1 and 2 only. Half of the subjects in each treatment had the reinforcement discontinued during the paired-associate tasks.

Hypothesis 4 regards a comparison between subjects trained with token reinforcement who continued to receive the same token reinforcement on a new task with those in the same treatment who had token reinforcement terminated on the new task. The greatest difference was found on the first paired-associate. The group with continued reinforcement had a mean error of 1.0 and the group with discontinued reinforcement had a mean error of 9.7. Even with very few subjects the variance was large and the scores were not significantly different. The continued reinforcement group had a total error mean of 18.25, the error mean for the discontinued reinforcement group was 37.7. This did not reach significance. (See Table 4)

TABLE 3

Means and Standard Deviations on Peabody Picture Vocabulary Test, Pretest, and Posttest, and Scores on Paired-Associate Tasks[a], by Treatments

	TREATMENT GROUPS					
	Information Only		Token Reinforcement		Verbal Reinforcement	
N	8		7		6	
Tests	M	SD	M	SD	M	SD
Peabody Picture Vocabulary	52.6	11.0	47.3	10.0	46.2	9.4
Pretest	6.3	1.2	7.0	1.5	6.0	1.4
Posttest	12.5	1.9	12.7	2.6	12.3	1.1
Paired-Associate						
Task #1	4.9	6.1	4.7	6.0	6.3	7.3
Task #2	2.7	6.9	.2	.4	3.3	7.5
Task #3	6.8	6.4	10.7	10.8	12.5	10.3
Task #4	7.3	7.8	11.0	7.2	17.7	3.2
Paired-Associate Total Score	21.3	22.9	26.6	18.6	39.8	21.1

[a]All Paired-Associate scores are reported in terms of mean errors.

TABLE 4

Means and Standard Deviations for Two Treatments Receiving Reinforcement, Grouped According to Whether Reinforcement was Continued or Terminated for the Paired-Associate Task

	TREATMENT GROUPS							
	Token Reinforcement				Verbal Reinforcement			
	Continued		Terminated		Continued		Terminated	
N	4		3		3		3	
Tests	M	SD	M	SD	M	SD	M	SD
Peabody Picture Vocabulary	47.3	9.8	47.3	10.2	47.0	9.3	45.3	9.5
Pretest	6.8	1.2	7.3	1.8	6.3	1.6	5.7	1.2
Posttest	12.8	2.1	12.7	3.2	12.7	1.2	12.0	1.0
Paired-Associate								
Task #1	1.0	2.0	9.7	10.0	3.0	5.0	9.7	9.5
Task #2	0.3	.5	0.0	0.0	6.3	10.9	0.3	.5
Task #3	9.5	10.9	12.3	10.7	12.7	10.1	12.3	10.7
Task #4	7.5	8.7	15.7	5.9	19.0	0.0	16.3	5.5
Paired-Associate Total Score	18.3	17.3	37.7	20.5	41.0	13.7	38.7	25.3

Hypothesis 5 involved all of the subjects who took the paired-associate tasks without reinforcement. A comparison is made between the combined two groups who were trained with reinforcement and verbal feedback and the one group which was trained with verbal feedback only. There was a significant difference between these two groups on paired-associate task four only ($f = 4.2$, df 2/10, p .05). The adjusted mean for Treatment 1 (token reinforcement discontinued) was 18.25. The mean for verbal reinforcement discontinued was 14.5. The mean for verbal feedback only was 7.0. By a Newman Keuls analysis, Treatment 3 was significantly different than Treatment 1 or Treatment 2. As with Hypothesis 3 the significance was in the reverse direction than hypothesized.

Hypothesis 6 was tested by a 2 X 2 design, two levels of reinforcement, token and verbal, and two levels of presence of reinforcement during the new task. On paired-associate 4 there was a significant interaction between the two factors ($F = 8.5$, df 1/8, $p < .05$). The token reinforcement groups followed the direction predicted. The reverse, however, was found with the verbal reinforcement groups. The performance of the verbal reinforcement group who continued to receive reinforcement was exceptionally poor, contrasted to the good performance of the token reinforcement group who continued to receive reinforcement.

For purposes of reference, Table 5 presents means and standard deviations for the two treatments receiving reinforcement, grouped according to whether reinforcement was continued or terminated for the paired-associate task.

TABLE 5

Analyses of Covariance on Paired-Associate Four Using the Program Pretest Scores as the Covariate Between 2 Groups Trained With Reinforcement and Tested without Reinforcement and a Group Trained and Tested Without Reinforcement.

Source	df	MS	F
Treatment	2	157.2	4.16*
Error	10	37.8	

Hypothesis 7, an indication of the occurrance of learning between the pre and posttest over the learning program, may be said to be supported. It was not deemed necessary to run a statistical analysis as the means of the groups were approximately six points higher in the posttest from the pretest with standard deviations less than two.

CHAPTER 5

CONCLUSION AND DISCUSSION

The purpose of this study was to get a closer look at how preschool children from disadvantaged environments view the reinforcement or lack of reinforcement they receive from the environment whenever they produce responses in learning situations. It is customary to assume with children from the middle class home that being "right" has a motivational effect. More and more evidence seems to indicate that this is not universally true. The question raised here is whether a primary reinforcer will serve as a bridge to establish and strengthen the effect of the secondary, verbal reinforcer. In the study reported here the data seem to indicate that the token reinforcer is certainly more potent. However, the most interesting finding is that neither of these effective types of reinforcers appear necessary. Children can learn to receive feedback stimuli as information signals and continue to use them in quite different learning situations.

It is possible that the lower mean score evidenced by Treatment 3 may have been influenced by the fact that the children in this group were more directed to the task at hand by the information - only feedback. The receiving of raisins and verbal praise may have acted not only as a distractor but may also have produced emotional side effects which interfered with learning.

It also appears that the mean scores on the PA task were influenced much more by treatment differences than subject differences since the various test scores (Peabody, pre and post) indicated very little difference among groups.

The paired-associate task may have been a rather difficult task since the stimulus labels actually approximated nonsense words to the unsophisticated learners involved in the study. The cognitive task of pairing a single word and stimulus, however, may approach quite closely the type of learning situation which the disadvantaged child faces in his environment. As has been stated in the literature, there is a great deal of verbal sparcity in the communication between the disadvantaged child and the adults with whom he typically comes in contact. Deutsch (1963) has also noted a lack of corrective feedback from adults to correct the disadvantaged child's pronunciation and grammar.

In the paired-associate task it was also noted that some children appeared to select a "favorite" picture and they continued to mark this picture throughout both booklets, ignoring the feedback information which indicated that this was the incorrect choice. It was also noted that other subjects seemed to have developed a strong avoidance reaction to some of the pictures and consistently chose not to mark that picture, regardless of its order on any of the eighteen pages. This may indicate that although the child has "learned" the meaning of chemical feedback, there are stronger influences such as visual or emotional preferences which can override the effect of the information feedback.

This study indicates a need for further research along the same line. Certainly a larger population sample would be desirable. Varying the initial program training period to more or less than the three day sequence employed in this study is also suggested. Another important variable not considered in this study was the possible potency of having the child respond verbally to the chemical feedback, i. e., "Green means it is the right picture. Red means it is the wrong picture."

It is critical in the planning of intervention programs for the disadvantaged child that we no longer rely on axiomized educational procedures but consider all of the variables involved in why or how a child may be educationally different and how his experiences may be maximized to benefit him in the educational process.

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APPENDIX A

BOOKLET EXAMPLE

Program: Introduction to Page Turning and Marking

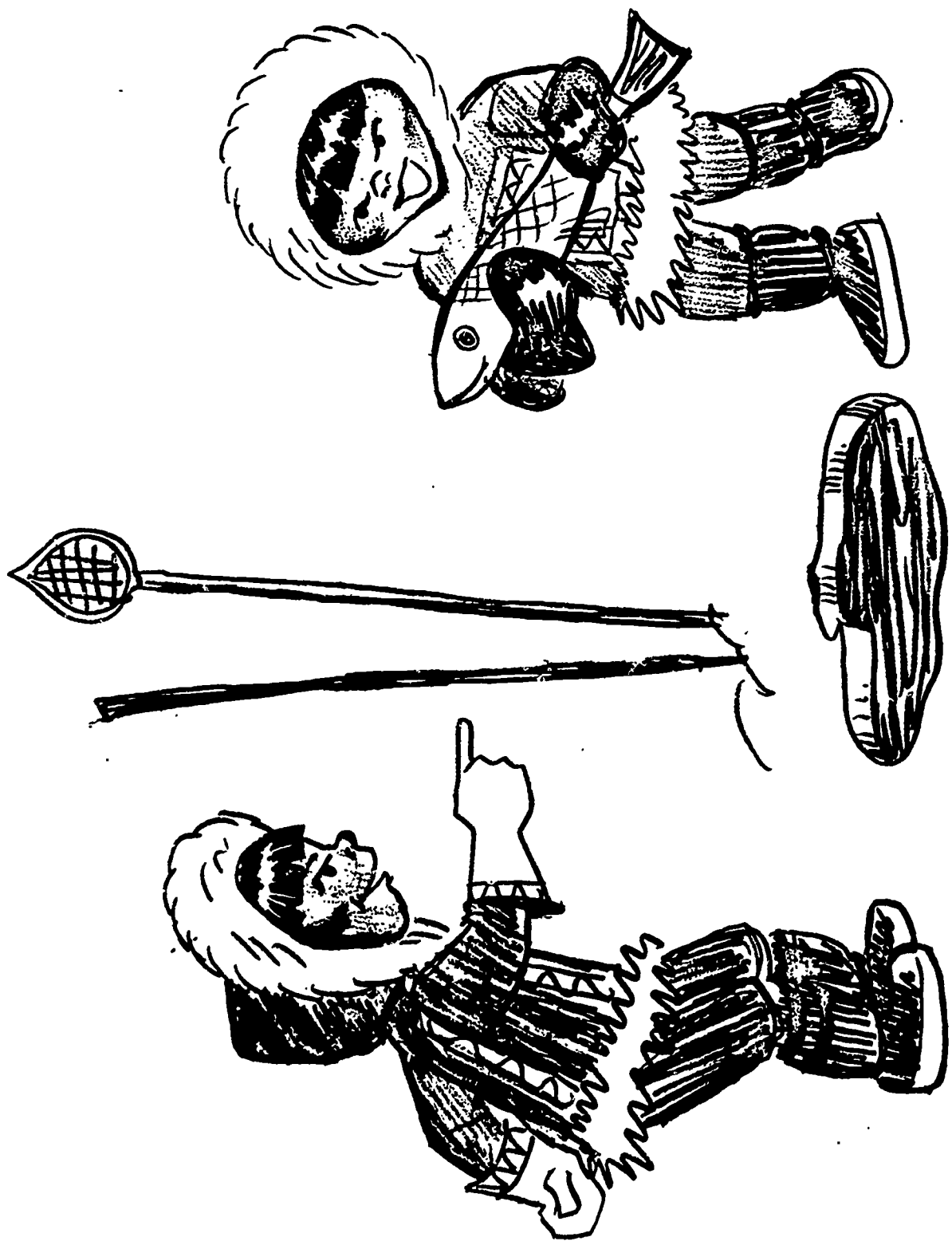
Materials: Booklets and water pens

VISUAL	AUDITORY (TEACHER COMMENTARY)
T. gives out booklets	I am going to give you a booklet. Let's practice turning the pages in the booklet. When I tell you, I want you to turn just one page at a time. Turn the page. Turn the page. Turn the page. Turn the page. Close the booklet.
T. gives out pens.	Now we are going to mark some dots in the booklets. The dots will be a color. Here is a magic pen for you. Turn the page.
tree- book mouse	Mark the dot under the mouse. Turn the page.
spoon dress flag	Mark the dot under the spoon. Turn the page.
balloon cup boat	Mark the dot under the boat. Turn the page.

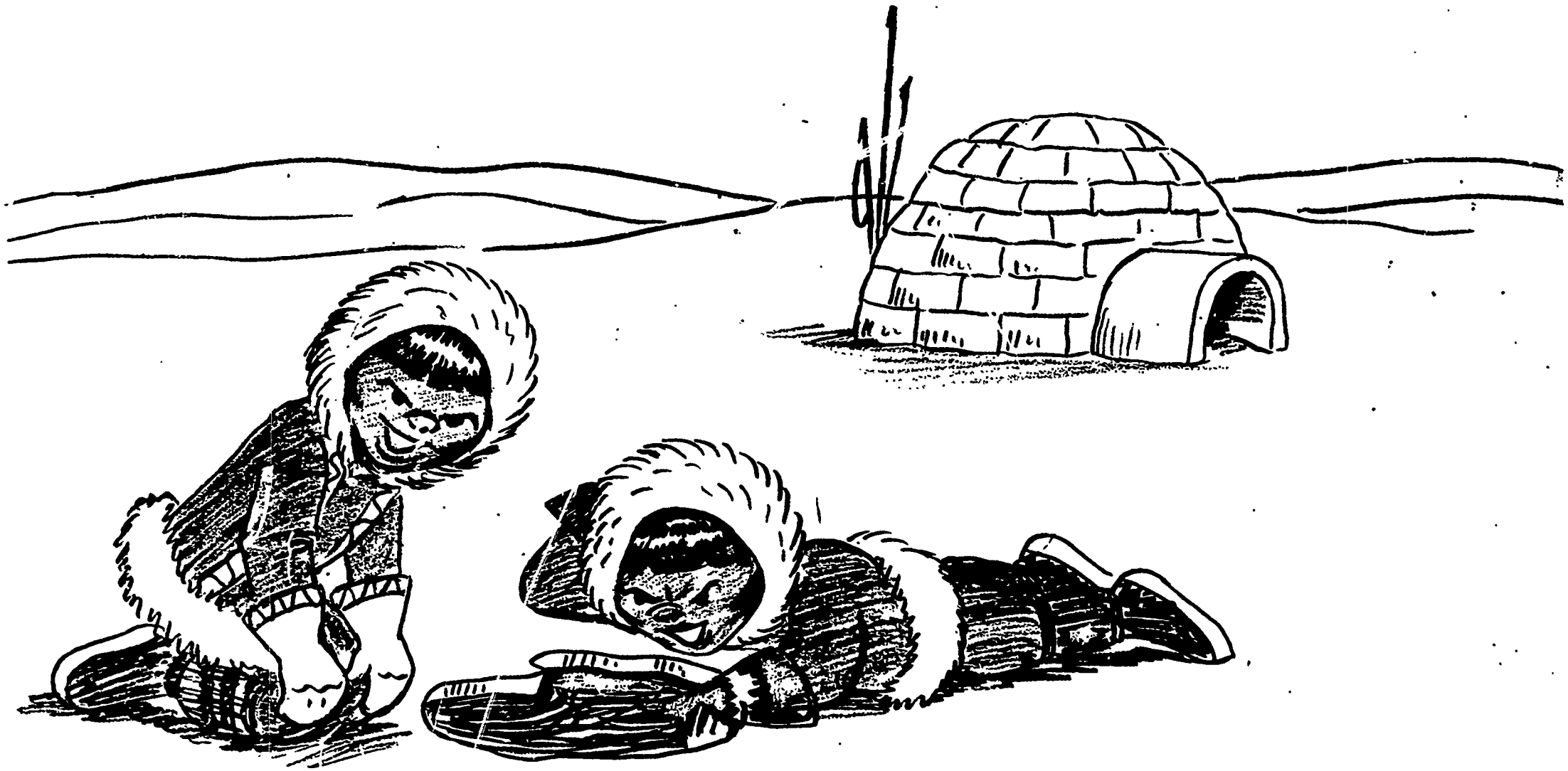
VISUAL	AUDITORY (TEACHER COMMENTARY)
baby house ball	Mark the dot under the house. Turn the page.
scissors pie chair	Mark the dot under the pie. Turn the page.
	(PRETEST BEGINS)
	Note: The following fifteen pages in this same booklet constituted the pretest. See Appendix D for a listing of the pretest items.

APPENDIX D

SAMPLES OF PICTURES



(Day 3) 6. "In the winter, Sayac and Muluc went fishing through a hole in the ice." (Teacher puts card down.) "Turn the page. Mark the hole in the ice." (Reinforcement) "Red means you marked the wrong picture. Green means you marked the right picture."



(Day 3) 7. "Sayac and Muluc caught a salmon when they were fishing." (Teacher puts card down.) "Turn the page. Mark the salmon." (Reinforcement) "The green dot means you marked the right picture. The red dot means you marked the wrong picture."

APPENDIX C

ENTIRE THREE DAY PROGRAM

Program: Eskimo, Day 1

Materials: flip cards for teachers
booklets and marking pens for students

VISUAL	AUDITORY (TEACHER COMMENTARY)
Magic carpet with boys and girls on it.	Let's take a trip around the world and visit some boys and girls. We're going to go on a magic carpet!
Japanese pagoda with children about.	First we will fly to Japan. In Japan the boys and girls live in this kind of house. (T. points to house.)
Japanese children eating food with chopsticks	Sometimes the children eat their food with little sticks called chopsticks. (T. points.)
Boys and girls in typical Dutch clothing.	Now our magic carpet takes us to Holland. Here the boys and girls may wear wooden shoes on their feet. (T. points.)
Dutch boy and girl eating breakfast.	And very often they have chees for breadfast!
Eskimo village with children about.	But now let's take a longer trip to Alaska and visit the Eskimos. We'll see how they dress, where they live and what they eat.
Note: Teacher's card information will be listed first followed by the three choices on the booklet page which child marked.	

VISUAL	AUDITORY (TEACHER COMMENTARY)
Eskimo boy	Mayac is an Eskimo boy. Mayac has long black hair and black eyes.
Eskimo boy Caucasion boy Caucasion girl	Mark the Eskimo.
Island partially covered with snow.	Mayac lives on an island where it is very cold much of the time.
forest farm island	Mark the island
Mayac near igloo	The island is very cold in the winter. Mayac lives in a special house. His winter house is called an igloo.
house igloo trailer	Mark the igloo.
Mayac in parka	In the winter Mayac wears a big coat with fur on it. The coat is called a parka.
parka sweater boots.	Mark the parka.
Mayac with mukluks on his feet.	Mayac also wears mukluks on his feet during the winter.
mukluks shoes socks	Mark the mukluks.
Mayac and Suluc	Mayac has a friend named Suluc. Suluc is an Eskimo boy too.
Eskimo boy Negro boy Negro girl	Mark the Eskimo.

VISUAL	AUDITORY (TEACHERS COMMENTARY)
Suluc putting on parka shirt skirt parka	One day Suluc put on his parka and went to see Mayac. Mark the parka.
Suluc watching Mayac put on his mukluks. mukluks sandals socks	Suluc said, "Let's go fishing Mayac. But it is cold outside. Put on your mukluks." Mark the mukluks.
Eskimo man holding up salmon. turtle salmon crab	Suluc said, "Let's go where father caught a fish yesterday. He caught a big salmon." Mark the salmon.
Eskimo man fishing through hole in ice. hole in ice swimming pool bridge over water	Suluc and Mayac found the hole in the ice where Suluc's father caught the salmon. Mark the hole in the ice.
Mayac and Suluc fishing with igloo in background. apartment house barn igloo	After a little while Mayac caught a fish. He said, "Come back to my igloo with me, Suluc. Mother will cook the salmon for dinner. Mark the igloo.
Suluc walking across island. igloo island ice field	Suluc said "Thank you, but I have to go home." Suluc walked across the island to his igloo. Mark the island

VISUAL	AUDITORY (TEACHER COMMENTARY)
Suluc on edge of island looking out at boys who are fishing through hole in the ice. salmon hole in ice walrus	As Suluc walked back across the island he saw another hole in the ice where some boys were fishing. Suluc was sad when he thought how good Mayac's salmon would have tasted at dinner. Mark the salmon.
Eskimo woman holding up salmon in front of Suluc. mukluks salmon Eskimo	When Suluc got home his mother had a surprise for him. "Look." she said. "Your father has been fishing. We are all going to have fresh salmon for dinner." Mark the salmon.

Program: Eskimo, Day 2

Materials: flip cards for teachers
booklets and marking pens for students

VISUAL	AUDITORY(TEACHER COMMENTARY)
Mayac and Suluc	Introduction: Here are our two Eskimo friends, Mayac and Suluc. They are waiting for Suluc's father. He has told the boys that they may come with him when he hunts the big walrus.
Suluc's father walking with Mayac and Suluc.	Soon Suluc's father comes with his gun and they all set off to hunt the walrus. (Begin booklet)
Suluc's father pointing to ice fields. grass ice field rock	"Look boys," said Suluc's father. "The walrus lives near those ice fields. Soon we will see one. Mark the ice fields.
Suluc pointing to walrus: father with gun raised. walrus bear deer	Soon Suluc whispered, "Look father. There is a big walrus. Shoot him!" Mark the walrus.
Suluc's father with hand on walrus tusks feet hands tusks	Suluc's father shot the walrus and then began to pull the walrus by his tusks back to the igloo. Mark the tusks.
Suluc and Mayac looking at ice fields. bridge ice fields hill	Suluc and Mayac stood for a little while and looked at the ice fields. One day they would come back and shoot their own walrus. Mark the ice fields.

VISUAL	AUDITORY (TEACHER COMMENTARY)
Suluc's mother looking at walrus. lion walrus seal	Suluc's mother was very happy when she saw the walrus. She could use the walrus meat for food and the walrus skin for warm clothes. Mark the walrus.
Suluc's father holding walrus tusks in front of Mayac and Suluc paws tusks ears	Suluc and Mayac were given the Walrus tusks and they made them into fish hooks to catch salmon. Mark the tusks.
Eskimo men putting up tents. apartment house igloo tent	Soon it was spring and the weather was warm. It was time for the Eskimo men to put up the tents for their summer homes. Mark the tent.
Mayac and Suluc approaching water and carrying nets. pail box net	In the spring the ice melted and Mayac and Suluc used nets to catch the fish. Mark the net.
Mayac and Suluc looking at puffin. puffin pelican chicken	When the weather was warm Mayac and Suluc also went hunting for birds and eggs. One of the birds they hunted was called a puffin. Mark the puffin.
Puffins on top of cliffs. lake trees rocky cliffs	The puffins lived on big rocky cliffs near Mayac's home. Mark the rocky cliffs.

VISUAL	AUDITORY (TEACHER COMMENTARY)
Mayac holding up snare for Suluc to see. cage snare box	Mayac said to Suluc "I have made a snare out of some rope. We can use the snare to catch a puffin." Mark the snare.
Puffins on rocks. puffin duck robin	Mayac and Suluc climbed up to the cliffs and put the snare on a rock. There were many puffin all around. Mark the puffin.
Mayac and Suluc on cliffs looking down on boys carrying nets. nets sack box	While Mayac and Suluc waited they looked down on the village. They could see the boys carrying nets to go salmon fishing. Mark the net.
Tents in village below. house trailer tent	Mayac and Suluc could also see the tents that were their summer homes. Mark the tent.
Puffin sitting on rock near snare. snare mouse trap box	Soon a puffin came to the rock. Mayac and Suluc watched very quietly and the puffin walked into the snare. Mark the snare.
Mayac and Suluc coming down rocky cliffs with puffin. cliffs hole beach	"We are very good hunters." said Suluc. "Everyone will be proud when they see what we caught on the rocky cliffs." Mark the rocky cliffs.

Program: Eskimo, Day 3

Materials: flip cards for teachers
booklets and marking pens for students

VISUAL	AUDITORY (TEACHER COMMENTARY)
Group of children on magic carpet.	We have taken a trip on our magic carpet and visited the Eskimos.
Small figures on island. hill island tree	1. We found the Eskimos living on an island. Mark the island
Mayac and Suluc Negro boy Eskimo boy Caucasion boy	2. We went to an Eskimo village where two Eskimo boys, Mayac and Suluc, lived. Mark the Eskimo.
Mayac and Suluc by igloo. house igloo apartment	3. We saw the igloo which is Mayac and Suluc's winter home. Mark the igloo.
Mayac in his parka shirt socks parka	4. We saw the big parka that Mayac wears to keep him warm. Mark the parka
Mayac putting on his mukluks. shoes mukluks boots	5. The mukluks on Mayac's feet kept them warm when it was cold. Mark the mukluks.

VISUAL	AUDITORY (TEACHER COMMENTARY)
Mayac and Suluc fishing. hole in ice lake field	6. In the winter, Mayac and Suluc went fishing through a hole in the ice. Mark the hole in the ice.
Mayac and Suluc holding up salmon. salmon trout eel	7. Mayac and Suluc caught a salmon when they were fishing. Mark the salmon.
Walrus in ice fields field ice field street	8. Later we saw the ice fields where the walrus lived. Mark the ice field
Suluc, his father, and Mayac by walrus. seal walrus bear	9. Suluc and Mayac watched Suluc's father as he shot a walrus in the ice fields Mark the walrus.
Suluc's father giving walrus tusks to boys hands feet tusks	10. Mayac and Suluc were given the walrus tusks to make into fish hooks to catch the salmon. Mark the tusks.
Eskimo men putting up tents for summer homes. trailer house tent	11. When the weather became warm we saw the Eskimo men put up tents for their summer homes. Mark the tent.

VISUAL	AUDITORY (TEACHER COMMENTARY)
Mayac and Suluc about to put net in water. pail net box	12. All of the ice had melted so Mayac and Suluc used nets to catch fish. Mark the net.
Mayac and Suluc standing on rocky cliffs. rocky cliffs lake road	13. When it was warm Mayac and Suluc went hunting for birds on the rocky cliffs. Mark the rocky cliffs.
Mayac and Suluc pointing to puffin. penguin puffin eagle	14. One of the birds Mayac and Suluc hunted was called a puffin. Mark the puffin.
Mayac and Suluc holding snare. snare box sack	15. We saw Mayac and Suluc catch a puffin with a snare. Mark the snare.
Boys and girls flying away on magic carpet as they wave good-by to Mayac and Suluc.	Now it is time to get on our magic carpet and fly back home. Good-by Mayac. Good-by Suluc. Come and visit us some day.

APPENDIX D

PRE AND POSTTEST

VISUAL	AUDITORY (TEACHER COMMENTARY)
snare igloo Eskimo	Mark the dot under the igloo. Turn the page.
salmon mukluk hole in ice	Mark the dot under the hole in the ice. Turn the page.
puffin tusks tent	Mark the dot under the tusks. Turn the page.
parka rocky cliffs net	Mark the dot under the parka. Turn the page.
Eskimo ice fields snare	Mark the dot under the ice fields. Turn the page
mukluk salmon island	Mark the dot under the mukluk. Turn the page.
rocky cliffs hole in ice walrus	Mark the dot under the rocky cliffs. Turn the page.
rocky cliffs walrus salmon	Mark the dot under the salmon. Turn the page.
net island tusks	Mark the dot under the island Turn the page.

VISUAL	AUDITORY (TEACHER COMMENTARY)
tent tusks puffin	Mark the dot under the puffin. Turn the page.
igloo ice fields tent	Mark the dot under the tent. Turn the page.
parka Eskimo hole in ice.	Mark the dot under the Eskimo. Turn the page.
island net mukluk	Mark the dot under the net. Turn the page.
snare walrus puffin	Mark the dot under the walrus. Turn the page.
	Give the booklet and the magic pen to me.