THE EFFECTS OF TWO TYPES OF LEARNING EXPERIENCES ON THE CLASSIFICATION STRATEGIES OF FOUR-YEAR-OLD CHILDREN

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CHAPTER I

INTRODUCTION

Early childhood is considered to be a very important period in the development of an individual's cognitive abilities. In the past decade interest in and investigation of the cognitive processes--the means by which organisms achieve, retain, and transform information--have increased notably (Bruner, Goodnow, and Austin, 1956). A key component in the development of these cognitive processes is skill at classification.

Classification is the process by which people, objects, and events are placed into categories and are responded to in terms of their class membership rather than on an individual basis (Snell, 1968). Classification behavior is viewed by Piaget and Inhelder as being comprised of successive stages with each stage being built upon the previous stages. Classification begins when two objects are grouped because they look alike in some manner (resemblance sorting). As the child matures, both the number of objects grouped and the number of characteristics used increases. The child begins to sort more than two objects (consistent sorting) and then includes all the objects which could be considered equivalent in some respect (exhaustive sorting). The child moves from sorting on observable attributes to grouping on the basis of unseen or inferred characteristics. In time the child recognizes that objects do not belong exclusively in different categories but can be members of many categories (multiple class membership). He actively tries out

different groupings choosing first one then another single attribute as the focus for grouping (horizontal classification). As his logical abilities develop, his method of choosing criteria becomes more complex. He then chooses combinations of attributes to construct successive classes (Olmsted, Parks, and Rickel, 1970; Kofsky, 1966).

The ability to classify serves five purposes for the individual:

1. Classification reduces the complexity of the environment.
2. Classification serves as a means by which the objects of the world are identified.
3. The establishment of a class based on a set of defining attributes reduces the necessity for constant learning.
4. Classification provides a direction for instrumental activity.
5. There is the opportunity for ordering and relating classes of events through classification. (Bruner, et al., 1956)

Due to the complex nature of the environment, an individual must learn to organize stimuli into classes to provide himself with a basis of response to his environment.

Since the ability to classify is considered a necessary condition for logical thinking, attention must be given to determining how children classify and how they can be helped to develop classification skills through educational programs. Some children may be limited in their ability to group because they lack labels or sufficient knowledge of the attributes of objects. Others may be able to group on the basis of one or more attributes but unable to communicate the rationales for their groupings. Kofsky and Osler (1967) report that children under school age tend to classify according to the first stimulus cue they recognize. As the number of the dimensions of an item increase, the probability decreases that the first cue selected is correct. The child is hampered by his inability to change criterion for classification. If appropriate training is provided so the child can learn to see objects

in their complexity with multiple functions, he should be able to make more precise and concrete classifications.

Purpose of Study

The purpose of this study is to investigate the classification strategies of four-year-old children from middle-class backgrounds and to determine the effects of two types of learning programs on these classification strategies. To achieve this purpose, an instrument developed by Sigel and Olmsted (1969) for measuring classification modes will be administered. Two types of training programs consisting of ten lesson units will then be given to two groups of children. A third group of children will serve as a control group. Post-testing will be done to determine the effects of the two educational programs on classification skills. The children's responses will be examined in relation to the variables of sex, style of classification, verbal level of response, and type of learning program.

The following hypotheses will be examined:

I. On the initial Object Categorization Test (OCT) there will be no significant difference among Experimental Group I, Experimental Group II, and Control Group III on:
   A. Verbal level of response
   B. Style of categorization

II. On the post OCT, there will be no significant difference among the three groups on:
   A. Verbal level of response
   B. Style of categorization

III. On the initial OCT, there will be no significant difference according to sex on:

A. Verbal level of response

B. Style of categorization

IV. On the post OCT, there will be no significant difference between boys and girls in Group I on:

A. Verbal level of response

B. Style of categorization

V. On the post OCT, there will be no significant difference between boys and girls in Group II on:

A. Verbal level of response

B. Style of categorization

VI. On the post OCT, there will be no significant difference among girls in all groups on:

A. Verbal level of response

B. Style of categorization

VII. On the post OCT, there will be no significant difference among boys in all groups on:

A. Verbal level of response

B. Style of categorization

VIII. There will be no significant difference between initial and post OCT scores for:

A. Group I on:

1. Verbal level of response

2. Style of categorization

B. Group II on:

1. Verbal level of response

2. Style of categorization

C. Group III on:

1. Verbal level of response

2. Style of categorization

IX. On the initial OCT, the responses of the subjects of this study will not vary greatly from the responses of similar subjects reported by Sigel and Olmsted (1969) on:

A. Verbal level of response

B. Style of categorization

CHAPTER II

RELATED LITERATURE

Styles of Classification

Classification behaviors have been studied in terms of styles of categorization. Sigel and McBane (1967) define the "style" or "strategy" of classification as the individual's preference for particular bases for classification when he has been presented with items offering numerous criteria for grouping. Since all objects are multidimensional, an individual has a choice of the criteria he chooses as a basis for classification. Annett (1959) states that an individual's method of classification is probably determined by a large number of factors including the subject's familiarity with the items, the range of items, and, in particular, the subject's purpose in making the classification.

Three styles of classification have been identified and used in previous studies. These are the descriptive, relational-contextual, and categorical-inferential classes (Sigel, Anderson, and Shapiro, 1966; Kagan, Moss, and Sigel, 1963; Sigel and McBane, 1967; Sigel and Olmsted, 1969; Sigel, 1971; Sigel and Olmsted, 1970; and Hurt, 1969).

The descriptive category contains those objects grouped on the basis of objective physical attributes. Included in this classification are groupings made on the basis of color, form, structure, texture, et cetera--those attributes which can be perceived through the senses.

Descriptive labeling dealing with form or structural qualities has been interpreted as reflecting a "process of differentiation" in which the child can deal with parts of the item as a criterion for grouping without destroying the identity of the item (Sigel and McBane, 1967). The child is required to abstract a part from the whole and then scan an array to determine commonalities. Kagan, Moss, and Sigel (1963) interpret the use of the descriptive response as being an indicator of reflection and response control.

The use of color as a criterion for grouping is considered to be a more primitive descriptive response. Utilization of color suggests the selection of a more blatant and less intrinsic characteristic which Sigel and McBane (1967) interpret as being easier to use.

Color-form studies have demonstrated that when children are asked to classify objects or geometric shapes that are comparable in color and form, children under six use color more often than older children (Corah and Gospodinoff, 1966; Corah, 1966; Mitler and Harris, 1969; and Modriski, 1969). Sachman and Trabasso (1966) found in a study of 145 children ranging in age from three to six, the median age for shifts from color to form preference was four years two months of age. Two explanations have been reported by Harris, Schaller, and Mitler (1970) for this shift from color to form preference. This shift can be seen as reflecting growing sensitivity to the meaning or function of an object and diminishing concern for its primitive stimulus characteristics. It can also be viewed as reflecting the growing operation of verbal skills. Thus, older children categorize more on the basis of implicitly applied labels such as square or circle than on physical qualities such as color.

Relational-contextual groupings are made on the basis of interdependence of items as if the objects do not have an objective identity except in relationship to each other. Items may be related by virtue of function or by a thematic story. Relational-contextual responses decrease with age, are negatively related to analytic intelligence, and positively related to dependency and impulsivity (Sigel, et al., 1966; Kagan, et al., 1963; Sigel, Jarmen, and Hanesian, 1965). These responses are interpreted as being indicative of cognitive immaturity. Sigel, et al (1966) found that middle-class children use more descriptive classifications with the emphasis on objective features of the objects. Middle-class girls consistently produced more descriptive responses than middle-class boys. Such behaviors reflect an increasing emancipation from a subjective approach to reality and an ability to treat items as distinct from self. This may further reflect an increasing differentiation among objects as well as an ability to identify commonalities. Lower-class children, on the other hand, use more relational-contextual categories. This is assumed to be a reflection of the child's application of active experience with the objects to his mode of classifying. Their classifications reflect their experiences with the items. Items are related to in terms of action and function rather than objective qualities. Lower-class children may be showing less differentiation of the object world and thus less competence in conceptualization.

Formanek and Morine (1968) indicate that it is the child's egocentricity which leads him to form the large, undifferentiated, all-inclusive categories which characterize relational-contextual groupings. The child proceeds from these to smaller, more concerete categories

using more specific criteria for classifying.

Sigel and Olmsted (1969) compiled test results from many prior studies using the Object Categorization Test into one unit. They found that for four-year-old children, color and relational responses are most frequent while form responses are not prominent. They also found that middle-class children tend to provide consistent response patterns.

A third basis for grouping or classification is categorical-inferential classification. A functional reason for classifying is stressed with all the items in the group having the same function (for example, toys, tools, eating utensils). Each item in the group represents the category label. Categorical-inferential responses are indicative of an ability to use class labels and to ignore apparent discrepancies and/or diversities among arrays of material. This is considered to be the highest level of classification. Sigel and McBane (1967) found that very few kindergarten children from either social class used categorical-inferential categories when classifying objects. Edwards (1969), in a test of first-grade boys, found that those subjects with high intelligence made more classifications of the categorical-inferential variety than the other subjects.

Allen (1971), in a study of 50 kindergarten children, found that boys scored significantly higher on the classification skills test given. Boys used a significantly greater percentage of categorical responses than did the girls who used more relational-contextual responses. Descriptive responses were used infrequently (by 22% of the sample). Of those giving descriptive responses, 73% were boys.

Verbal Levels of Response

Classification behaviors have also been studied in terms of verbal level of response. The verbal level of response has been defined as the degree to which children can produce groupings and verbalize the basis of the grouping.

Three levels of verbal response have been identified. Grouping responses are those which contain a meaningful relationship between all the items selected. All the items in the group must meet the criteria set forth in the response. Non-grouping responses are those in which an answer is given and the meaning is clear, but not all the items meet the criteria. The response may refer to only one or a part of the items grouped or may apply a common label to differing items. Non-scorable responses are those in which the subject gives no response, merely names the objects, or repeats or paraphrases the question (Sigel et al., 1966; Sigel and Olmsted, 1969; Sigel and Olmsted, 1970).

Sigel et al (1966) found a difference in response according to sex. Middle-class girls produced significantly more scorable (grouping and non-grouping) responses than middle-class boys. Lower-class children gave fewer scorable responses than middle-class children. When tested with actual objects, 55% of the middle-class children gave 25% or more scorable responses, while 46% of the lower-class children gave 25% or more scorable responses. The scores of lower-class children dropped considerably when tested with colored pictures. Only one-third of these children produced at least 25% scorable responses. Of the middle-class children, one-half gave 25% or more scorable responses when tested with colored pictures. Sigel and Olmsted (1970) also found children produce

more grouping responses with objects than with pictures.

Sigel and Olmsted (1969) compiled data from several previous studies into one unit. They report lower-class four-year-old children give a higher percentage of non-scorable responses than scorable (grouping and non-grouping) responses.

Sigel and Olmsted (1970) did a study to examine the long-term (one year) effects of a one-month classification training program and to assess the effects of re-introducing classification training. They found that children receiving booster classification training showed a significant increase in grouping responses as did children receiving classification training for the first time. The control groups showed no significant change in grouping responses.

Level of Representation

Sigel (1954) states that variations in level of representation (that is, actual objects or photographs) does not affect classification behavior. He found that the meaning of an object is independent of the stimulus characteristics. Once a child has established an object's meaning it is responded to consistently whether a three-dimensional item or pictorial representation is presented. These findings do not hold true for lower-class children. For lower-class children, the ability to group is significantly influenced by the level of representation.

Lower-class children can create groupings for actual objects, but when presented with photographs of the objects equal in size to the original object their ability to classify correctly is hampered. These children were presented three sorting tasks made up of twelve familiar items. The tasks varied in their mode of presentation: that is, actual

objects, colored pictures comparable in size to the actual items, and black and white pictures also comparable in size to the actual. Lower-class children differed significantly from their middle-class peers in their ability to group on both sets of pictures. There was no difference between the groups in their ability to identify and label the pictures. Thus, differences in grouping behavior cannot be attributed to the inability of the children to recognize the item on each level of symbolization. Simple recognition of the pictured items is not the problem. The difficulty seems to arise because the lower-class children have not acquired a mental representation of the object and thus are unable to deal comparably with the reduced cues a pictorial representation provides. Middle-class children, on the other hand, can transcend the mode of representation. They have a mental representation of the object and can deal with it regardless of the level of representation (Sigel et al., 1966; Sigel and McBane, 1967).

Modifiability of Classification Behavior

Instruction can be presented to promote the development of classification strategies in children. In classification training, the children are asked to identify objects and their manifold attributes, focusing on the multi-dimensionality of objects, and the awareness that any one or more of these attributes may be used as a criterion for grouping. The child is encouraged to shift from one attribute to another. Children with such training have been shown to employ a wider array of criteria for grouping as compared to children not having had experience (Sigel and Olmsted, 1970; Sigel, 1971).

Edwards (1969) reports that children's categorizing skills can be modified on a group basis through training. In this study of 102 first-grade boys, the children were instructed in classifying objects. Post-test results showed that the children participating in the training program scored significantly higher in number of categorizations when compared with the control group. Results indicated that the children who were allowed to categorize objects on their own did as well or better than those given extensive prompts from the examiner.

Nowak (1969) applied two types of training programs in his research study. One group of 70 children received training in both simple and hierarchial classification tasks; a second group received training in only hierarchial classification tasks; and a control group received no training. The data indicated that the children benefited from both instructional programs. Higher proficiencies in forming complete categories of materials were demonstrated by the children receiving training in both simple and hierarchial tasks. Before training began, boys and girls performed similarly on classification tasks. After training, girls were shown to have achieved more skill pertinent to hierarchial classifications.

Edwards (1968) used 154 first-grade boys assigned to three groups in an instructional program. The subjects in Group I received overt presentation instruction: that is, they were given a verbal cue describing the concept dimension to be used as the basis for matching two objects. A second group received an inferential type instruction in which they were provided a label for the stimulus object and had to infer the basis for matching from the feedback provided by the experimenter. The subjects in both instructional methods made significantly

more categorizations than controls. These findings indicate that children's categorizing skills can be shaped and modified on a group instructional basis.

Since the lag in the conceptual abilities of disadvantaged children has been identified, there have been several studies done to determine the value of classification training for these children. Asch (1970) found that disadvantaged children four and five years of age gained more in abstract classification from training with meaningful materials (representational pictures) than with non-meaningful materials (geometric forms). The training was most effective when done by the teacher or a stranger rather than the child's mother.

In a similar study with culturally deprived preschool children, Ward (1969) employed two treatment programs. One program used pictures of familiar objects as sorting elements and the other used pictures of geometric designs. Five instructional sessions, each averaging 25 minutes in duration, were given to both training groups. When compared with a control group, both training groups scored significantly higher on classification post-tests. Classification instruction using pictures of familiar objects resulted in more effective learning than the same instruction employing pictures of geometric designs.

Bowers (1969) studied the responses of both middle- and lower-class children. Before being asked to do any classificatory tasks, the children had the opportunity to engage in symbolic or dramatic play with the materials to be used in the classification tasks. She found that when the children were allowed to play with the objects prior to being tested with them, their performance on the test was aided. Lower-class children were particularly helped by this sequence of instruction.

Another study of the responses of middle- and lower-class children was conducted by Sigel (1971). The children attended training sessions in small groups for approximately 20 minutes for a total of 20 days. Those children in the classification training program showed significant changes as follows: 1) increases in groupings; 2) more articulate verbal labels for their groupings; and 3) more variety in bases used for grouping, such as form, color, structure, and more categorical responses. After eight months the children were retested. The experimental groups did not differ significantly from the control group in frequency of grouping on single dimensions. The control group had increased in the ability to group whereas the experimental group stayed at the same relatively high level previously induced by the training. One significant difference had persisted between the two groups. The training group used more multiple criteria as bases for grouping than did the control group.

Summary

Three styles of classification have been identified in the literature. Descriptive classification includes grouping by color, form, or structure. Relational-contextual responses are made on the basis of use or thematic story. Grouping on the basis of function or class label is a categorical-inferential response. Descriptive responses are interpreted as being indicators of reflection and response control. Relational-contextual responses are interpreted as being an index of cognitive immaturity. Lower-class children use more relational-contextual responses than middle-class children who more frequently group on the basis of descriptive criteria. Middle-class girls produce

more descriptive responses than middle-class boys. Lower-class four-year-old children give more color and relational responses while form responses are not prominent.

Preschool children tend to produce a higher percentage of non-scorable responses rather than grouping or non-grouping responses when verbal level of response is considered. Middle-class girls give more scorable responses than middle-class boys.

The level of representation must be considered when dealing with lower-class children. They respond differentially to actual objects and pictures. Middle-class children do not vary in their responses as the level of representation changes.

Classification skills can be modified through training. More gains are made when training is done using meaningful materials rather than geometric figures. Children who have received training use more multiple criteria as bases for grouping than children who have not received training.

CHAPTER III

METHOD AND PROCEDURE

Description of Subjects

The subjects who participated in this research were in attendance at the Oklahoma State University Child Development Laboratories and the Kollins Kiddie Kollege in Stillwater, Oklahoma. The children in Group I were selected from the Child Development Laboratories and received an instructional program. In Group II were children from the Child Development Laboratories who participated in a program which provided opportunities to use the instructional materials in a self-selected activities period without formal instruction. Group III was the control group selected from the children at the Kollins Kiddie Kollege. Table I shows the distribution of boys and girls and the age range of each group.

TABLE I

DISTRIBUTION OF CHILDREN BY GROUP

Group	Boys	Girls	Total	Age Range*
I	7	8	15	4:1-4:8
II	6	7	13	4:1-4:11
III	6	7	13	4:1-4:10
Total	19	22	41	4:1-4:11

*Age expressed in years:months

Description of Instrument

Test of Classification Skills

Measurement of the classification behaviors of each child was done through the use of Sigel and Olmsted (1969) Object Categorization Test (OCT). Included in this test were twelve items which were familiar to all the children. The items employed in the OCT as specified were: Pencil (yellow, sharpened), Ball (solid blue), Cigarette (all white including filter), Crayon box (common crayola box--yellow and green), Bottle opener (straight metal opener with sharp triangular bent head), Top (red, white, and blue metal with spring head), Pipe (briar straight stem, moderate size bowl), Cup (bright solid yellow plastic), Notebook (white covered spiral, 3" x 5"), Blocks (3 common alphabet type, with letters in yellow, blue, and red pasted on a piece of cardboard), Spoon (white plastic teaspoon), and Matchbook (paper colored solid blue except for striking surface). Sigel and Olmsted (1969) state "test-retest reliability was moderately high" for the OCT (p. 65). No further attempt was made by the investigator to determine validity or reliability of the OCT.

Administration. The OCT was given to each child individually in a small room with a table and two chairs used as the testing center. After the child was seated the examiner talked with the child in order to establish rapport. Then the examiner proceeded with the test. The task was introduced as follows: "We are going to play a game. I have some things in this Surprise Box. I want you to tell me the name of each as I take it out of the box." If the child was unable to provide

a name for the object he was asked to describe what it did or how it was used and the term he used was accepted as the label. For example, the top was frequently identified as a "spinner" or "thing that goes around."

The objects were all laid out in a predetermined order, so that items were not juxtaposed relative to class or color. See Appendix A for order of presentation of items. When all the items were placed in an array, the experimenter selected the stimulus object and said to the child, "Look over all the objects that are here (pointing to total array of objects) and put the ones that are the same or alike in any way with this one" (pointing to the stimulus object). If no response was given, the instructions were repeated with the phrase "belong together with this one" substituted for "alike or the same in any way." If that failed, a third substitute was used, "go together with this one." After the child selected the objects to group with the stimulus object, the responses were recorded on a score sheet. A sample score sheet may be found in Appendix B.

The child was then asked to explain the grouping. The child was asked "Why" followed by the phrase to which he responded when grouping. If the child responded to "belong together," the inquiry phrase was "Why do these things belong together?" The child's answer was recorded on the score sheet verbatim.

The experimenter replaced the first stimulus object and then selected another object from the array and repeated the procedure. This was done for each of the 12 items in the test. See Appendix C for the order of presentation of stimulus objects.

Scoring. Scoring was done for two types of responses--verbal level of response and style of categorization as specified by Sigel and Olmsted (1969) in their scoring manual. Three levels of verbal responses were used:

1. Grouping--A meaningful relationship between all the items grouped is given.
2. Non-Grouping--An answer is given and its meaning is clear but it does not meet the task requirements. The response is true for only one or a part of the items grouped.
3. Non-Scorable--Those responses in which an answer is not given or is not clear enough to score.

All scorable (grouping and non-grouping) responses were then scored in terms of style of categorization as follows:

1. Descriptive

   Form--Organized using properties such as round, flat, and straight.

   Color--Organized using color dimensions.

   Structure--Based in descriptions designating specific intrinsic or inherent parts.

2. Relational-Contextual

   Functional--When objects are placed together on the basis of interaction in context, e.g. you can light the cigarette with the matches.

   Thematic--When objects are related to one another in story sequence, e.g. smoke a cigarette while you drink coffee from a cup.

3. Categorical

Functional--When objects are placed in a relationship which is the basis for adult groupings but where a functional reason is stressed with all items subsumed under one function, e.g. you play with them or you write with them.

Class Label--When one term is used to define all objects, e.g. toys, eating things.

Scorer Reliability. Scoring of all tests was done by the investigator. The scoring manual provided by Sigel and Olmsted (1969) was followed carefully. This manual gave sample responses for all types of verbal and style responses in conjunction with each other. For approximately 90% of the responses, there could be no doubt as to its classification. The scoring manual gave explicit instructions as to the classification of those responses which were not clearly defined. The investigator made every effort to score consistently and reexamined each test repeatedly.

Description of Classification Training Procedures

Description and Collection of Lesson Unit Materials

Each of ten lesson units contained small arrays of familiar objects of various classes, e.g. tools, musical instruments, vehicles. Materials were collected for each of the ten units in both two- and three-dimensional forms. Pictures were selected from magazines and catalogues and mounted on poster board. Magnets were attached to the back of each

picture to facilitate use. Actual objects were used for the units on Men's Clothing, Women's Clothing, and Eating Utensils. Toys were used to represent the items in the remaining seven units. The objects varied in size, texture, color, shape, and function to provide a variety of stimuli for classification purposes. This was done in an attempt to enhance the children's ability to use many bases for grouping. For a complete listing of units and materials, see Appendix D.

Administration of Lesson Units for Group I

Group I received a tutoring program consisting of the ten different units each presented twice. The children were divided into two groups of seven and eight children and presented one 15-20 minute lesson daily for 20 days. The items were presented to the children by the experimenter and talked about using general principles of discussion developed by Sigel (1971) as a guide.

Each unit was presented to the children in a similar manner. One item would be presented at a time and the children asked to identify what it was. Open-ended probe questions were asked to obtain information about attributes of the object and picture. If appropriate, a search task to compare likenesses and differences was done with other objects in the room. For example, when discussing the clothing units, comparisons were made with the children's clothing searching for similarities and differences in style, color, material, et cetera. This procedure was followed for all items presented in the unit. After two items had been presented, comparisons among the unit items would be conducted to determine likenesses and differences. A description of materials and probe questions for each unit may be found in Appendix D.

Emphasis was placed on verbalization of attributes of an item in response to probe questions and comparisons of the items within the unit. After all the items and pictures had been presented, spontaneous grouping games were used. The children were asked to form groups and then verbalize their reason for grouping. Groupings were made until the children could think of no more attributes to use as the basis for grouping.

Administration of Lesson Units for Group II

Group II had the same items available as those presented to Group I. However, in this group the materials were placed on a table during self-selected activity periods and the children were allowed to manipulate them at will. A magnetic board was placed on the table with the pictures of that unit on it. The objects were placed in front of the board on the table. The materials were left out for the children to use for approximately one hour per day. Each of the ten units was presented twice. There was no teacher or experimenter direction.

Compilation of Initial and Post OCT Scores

The OCT was given to each child twice at eight week intervals. For Groups I and II, learning experiences occurred during the interim. Test scores for the initial test (Test A) and post test (Test B) were compiled onto a single score sheet for each child to facilitate analysis of the data. A sample of the condensed score sheet may be found in Appendix E.

Analysis of Data

The Kruskal-Wallis one-way analysis of variance was used to examine Null Hypotheses I, II, VI, and VII. Null Hypotheses III, IV, and V were tested by means of the Mann-Whitney U Test. The Wilcoxon Matched-Pairs Signed-Ranks Test was used to examine Null Hypothesis VIII. A percentage count was done to determine styles of classification and verbal level of response used by each child according to the model developed by Sigel and Olmsted (1969). The percentage counts were used in relation to Hypothesis IX.

The following Null Hypotheses were examined:

I. On the initial Object Categorization Test (OCT) there will be no significant difference among Experimental Group I, Experimental Group II, and Control Group III on:
   - A. Grouping responses
   - B. Non-grouping responses
   - C. Non-scorable responses
   - D. Color responses
   - E. Form responses
   - F. Structure responses
   - G. Relational responses
   - H. Categorical responses

II. On the post OCT, there will be no significant difference among the three groups on:
   - A. Grouping responses
   - B. Non-grouping responses
   - C. Non-scorable responses

D. Color responses

E. Form responses

F. Structure responses

G. Relational responses

H. Categorical responses

III. On the initial OCT, there will be no significant difference according to sex on:

A. Grouping responses

B. Non-grouping responses

C. Non-scorable responses

D. Color responses

E. Form responses

F. Structure responses

G. Relational responses

H. Categorical responses

IV. On the post OCT, there will be no significant difference between boys and girls in Group I on:

A. Grouping responses

B. Non-grouping responses

C. Non-scorable responses

D. Color responses

E. Form responses

F. Structure responses

G. Relational responses

H. Categorical responses

V. On the post OCT, there will be no significant difference between boys and girls in Group II on:

A. Grouping responses

B. Non-grouping responses

C. Non-scorable responses

D. Color responses

E. Form responses

F. Structure responses

G. Relational responses

H. Categorical responses

VI. On the post OCT, there will be no significant difference among girls in all groups on:

A. Grouping responses

B. Non-grouping responses

C. Non-scorable responses

D. Color responses

E. Form responses

F. Structure responses

G. Relational responses

H. Categorical responses

VII. On the post OCT, there will be no significant difference among boys in all groups on:

A. Grouping responses

B. Non-grouping responses

C. Non-scorable responses

D. Color responses

E. Form responses

F. Structure responses

G. Relational responses

H. Categorical responses

VIII. There will be no significant difference between initial and post OCT scores for:

A. Group I on:

1. Grouping responses

2. Non-grouping responses

3. Non-scorable responses

4. Color responses

5. Form responses

6. Structure responses

7. Relational responses

8. Categorical responses

B. Group II on:

1. Grouping responses

2. Non-grouping responses

3. Non-scorable responses

4. Color responses

5. Form responses

6. Structure responses

7. Relational responses

8. Categorical responses

C. Group III on:

1. Grouping responses

2. Non-grouping responses

3. Non-scorable responses

4. Color responses

5. Form responses

6. Structure responses

7. Relational responses

8. Categorical responses

IX. On the initial OCT, the responses of the subjects of this study will not vary greatly from the responses of similar subjects reported by Sigel and Olmsted (1969) on:

A. Verbal level of response

B. Style of categorization

CHAPTER IV

RESULTS AND DISCUSSION

Hypothesis I: On the initial Object Categorization Test (OCT) there will be no significant difference among Experimental Group I, Experimental Group II, and Control Group III on verbal level of response or style of categorization. No significant difference was found among the three groups on verbal level of response or style of categorization when examined by the Kruskal-Wallis one-way analysis of variance. The results are presented in Table II. Since the three groups showed no significant difference on verbal level or style of response on the initial OCT, the total response pattern can be used in comparisons with other studies. Subsequent differences between the groups cannot be attributed to any initial difference between the groups.

Hypothesis II (A): On the post OCT, there will be no significant difference among the three groups on verbal level of response. Analysis of this hypothesis was done by means of the Kruskal-Wallis one-way analysis of variance and results are shown in Table III. Post OCT scores showed no significant difference on verbal level of response among the three groups. One possible reason for the lack of difference after instruction had been presented might be because the initial scores of all the groups on verbal level of response were high. In all groups, over one-half of the responses on the initial OCT were grouping

TABLE II

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE OF GROUPS I, II, AND III INITIAL OCT SCORES

Response	H Score	Level of Significance
Verbal Level		
Grouping	1.97	n.s.
Non-grouping	1.08	n.s.
Non-scorable	0.67	n.s.
Style		
Color	3.18	n.s.
Form	3.61	n.s.
Structure	0.95	n.s.
Relational	3.18	n.s.
Categorical	0.28	n.s.

TABLE III

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE OF GROUPS I, II, AND III POST OCT SCORES

Response	H Score	Level of Significance
Verbal Level		
Grouping	2.90	n.s.
Non-grouping	1.63	n.s.
Non-scorable	2.74	n.s.
Style		
Color	13.77	.01
Form	1.38	n.s.
Structure	2.10	n.s.
Relational	0.08	n.s.
Categorical	0.30	n.s.

responses. See Appendix F, Table XIV for the percentage counts of Groups I, II, and III responses on the pre- and post-tests. This limited the possibilities for significant differences to occur among the groups on the post-test.

Hypothesis II (B): On the post OCT, there will be no significant difference among the three groups on style of categorization. No significant difference was found among the three groups on the post OCT on form, structure, relational, or categorical style responses. See Table III for Kruskal-Wallis one-way analysis of variance scores. A significant difference at the .01 level was found for color responses among the three groups. In order to determine exactly where the difference occurred, a Mann-Whitney U Test was done. A U score of 78 was obtained when Groups II and III were compared showing no significant difference between these groups. When Group I was compared with Group III, the U score was 45.5. This was significant at the .05 level. Comparison of Group I and Group II produced a U score of 51 which was also significant at the .05 level.

During training for Group I, efforts were made to call attention to as many attributes of the objects as possible. Probe questions referring to color of the objects were included in all units and groupings were made on the basis of color during grouping games. These discussions of color attributes may have made the children in Group I more aware of color as a basis for grouping and thus they used more color responses than the other groups on the post-test.

Hypothesis III (A): On the initial OCT, there will be no significant difference according to sex on verbal level of response. In order to determine the relationship between sex of the child and verbal level

of response on the initial OCT, Mann-Whitney U Tests were done. Results can be found in Table IV. A significant difference at the .05 level was found between the boys and girls for grouping and non-grouping responses. Inspection of percentages found in Appendix F, Table XV, show that girls gave more grouping responses than boys while boys produced more non-grouping responses than girls.

Sigel et al (1966) found that girls produce more scorable (grouping and non-grouping) responses than boys. In this study, when grouping and non-grouping responses were combined, the boys and girls did equally well. Approximately three-quarters of the responses for both boys and girls fall into the scorable class. However, the results showed the girls were still more likely to use more mature verbal responses than boys.

Hypothesis III (B): On the initial OCT, there will be no significant difference according to sex on style of categorization. The Mann-Whitney U Test was used to examine this hypothesis. No significant differences were found between the boys and girls on style of response. Results can be found in Table IV.

Hypothesis IV: On the post OCT, there will be no significant difference between boys and girls in Group I on verbal level of response or style of categorization. No significant differences were found between the boys and girls in Group I on the post-test for verbal level of response or style of categorization. Analysis was done by using the Mann-Whitney U Test and results may be found in Table V.

Although no significant difference was found between the boys and girls responses in Group I, there were some variations in the response patterns as can be seen in Table XV of Appendix F. The girls used a

TABLE IV

MANN-WHITNEY U TEST COMPARISON OF BOYS AND GIRLS RESPONSES ON INITIAL OCT ($n_1 = 19$; $n_2 = 22$)

Response	Z Score	Level of Significance
Verbal Level		
Grouping	-2.05	.05
Non-grouping	-2.28	.05
Non-scorable	-0.35	n.s.
Style		
Color	-1.48	n.s.
Form	-1.42	n.s.
Structure	-0.07	n.s.
Relational	-0.44	n.s.
Categorical	-1.21	n.s.

TABLE V

MANN-WHITNEY U TEST COMPARISON OF BOYS AND GIRLS RESPONSES IN GROUP I ON POST OCT ($n_1 = 7$; $n_2 = 8$)

Response	U Score	Level of Significance
Verbal Level		
Grouping	17.0	n.s.
Non-grouping	21.0	n.s.
Non-scorable	22.5	n.s.
Style		
Color	21.5	n.s.
Form	13.5	n.s.
Structure	24.0	n.s.
Relational	14.5	n.s.
Categorical	17.0	n.s.

greater proportion of relational responses than the boys while the boys gave a greater percentage of form and categorical responses on the post-test. Relational responses are considered to be a more immature response than form or categorical responses. This agrees with the findings of Allen (1971) who reported boys used a greater percentage of categorical responses than the girls who used more relational responses. It appears that boys give more mature style responses than girls.

Hypothesis V: On the post OCT, there will be no significant difference between boys and girls in Group II on verbal level of response or style of categorization. The Mann-Whitney U Test was done to determine the effect of self-selected use of the materials on response according to sex. The resulting U scores showed no significant differences between the boys and girls in Group II on verbal level of response and style of categorization. Results can be found in Table VI.

Hypothesis VI: On the post OCT, there will be no significant difference among girls in all groups on verbal level of response or style of categorization. The Kruskal-Wallis one-way analysis of variance was used to compare the post-test scores of the girls in Groups I, II, and III. Results of this test are found in Table VII. No significant difference was found among the three groups of girls on level of verbal response or style of categorization. The provided learning experiences produced no significant effect on the performance of the girls when the three groups were compared.

Hypothesis VII (A): On the post OCT, there will be no significant difference among boys in all groups on verbal level of response. Analysis of the boys post-test scores was done by using the Kruskal-Wallis one-way analysis of variance and results are provided in Table VIII.

TABLE VI

MANN-WHITNEY U TEST COMPARISON OF BOYS AND GIRLS RESPONSES IN GROUP II ON POST OCT ($n_1 = 6$; $n_2 = 7$)

Response	U Score	Level of Significance
Verbal Level		
Grouping	20.5	n.s.
Non-grouping	14.0	n.s.
Non-scorable	13.5	n.s.
Style		
Color	17.5	n.s.
Form	16.0	n.s.
Structure	14.0	n.s.
Relational	15.0	n.s.
Categorical	20.0	n.s.

TABLE VII

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE OF POST OCT SCORES FOR GIRLS IN GROUPS I, II, AND III

Response	H Score	Level of Significance
Verbal Level		
Grouping	0.53	n.s.
Non-grouping	3.07	n.s.
Non-scorable	1.91	n.s.
Style		
Color	5.76	n.s.
Form	1.54	n.s.
Structure	0.00	n.s.
Relational	1.50	n.s.
Categorical	0.89	n.s.

TABLE VIII

KRUSKAL-WALLIS ONE-WAY ANALYSIS OF VARIANCE
OF POST OCT SCORES FOR BOYS IN
GROUPS I, II, AND III

Response	H Score	Level of Significance
Verbal Level		
Grouping	6.64	.05
Non-grouping	1.31	n.s.
Non-scorable	2.21	n.s.
Style		
Color	8.33	.05
Form	7.35	.05
Structure	2.11	n.s.
Relational	2.41	n.s.
Categorical	0.12	n.s.

A significant difference at the .05 level was found for grouping responses. A Mann-Whitney U Test was utilized to determine the significance of differences between independent groups.

U scores showed no significant difference between Groups I and II and Groups II and III. A difference at the .01 level was shown when Groups I and III were compared. The U score was 3.0. This finding agrees with Sigel and Olmsted (1970) who reported that classification training produces a significant increase in grouping responses. Training is designed to encourage the children's verbal responses by using open-ended questions. The children in Group I were provided opportunities to verbalize their reasons for classifying and thus showed a significant increase on the post-test.

Hypothesis VII (B): On the post OCT, there will be no significant difference among boys in all groups on style of categorization. No significant difference was found among the three groups on structure, relational, and categorical style responses when the data were examined by using the Kruskal-Wallis one-way analysis of variance. A significant difference at the .05 level was found for color and form responses. Table VIII gives H scores obtained.

The Mann-Whitney U Test was used to determine the significance of the differences between independent groups of boys on color responses. A U score of 8.5 was obtained between Groups I and II which was significant at the .05 level. When Groups I and III were compared, the U score was 6.0. This was also significant at the .05 level. A U score of 15.0 showed no significant difference between Groups II and III. As previously mentioned, color was one of the attributes discussed during training with Group I and thus, the children were familiar with using it as

a basis for grouping.

Analysis of form responses for the three groups of boys was done by means of the Mann-Whitney U Test. A significant difference at the .05 level was found between Groups I and II. The U score obtained was 8.0. Comparison of Groups I and III gave a U score of 5.0 which was significant at the .01 level. No significant difference was found between the boys in Groups II and III. The boys in the instructional group gave more form responses than the boys in the other groups.

When a non-scorable verbal response was given, no style response could be given and thus the response was recorded as "none" when scoring. As the boys in Group I improved in the level of verbal response, they had more responses to score for style. The style responses that were affected were the descriptive--form, color, and structure--responses and categorical responses. See Table XV in Appendix F for percentages of responses. The increased facility to use grouping responses increased the ability of the boys to give style responses and caused the significant difference in color and form responses to occur between Groups I and II and Groups I and III.

Hypothesis VIII (A-1): There will be no significant difference between initial and post OCT scores for Group I on verbal level of response. The Wilcoxon matched-pairs signed ranks test was used to analyze the data for this hypothesis. The results of this analysis are presented in Table IX. A significant difference in grouping and non-scorable responses from initial to post-test was found. Inspection of percentages of responses presented in Appendix F, Table XIV shows the children in Group I increased in grouping responses while decreasing in non-scorable responses. This might be attributed to the manner in which

training was presented. The children were encouraged to verbalize about the attributes of the items and became familiar with many criteria which could be used for grouping.

TABLE IX

WILCOXON MATCHED-PAIRS SIGNED-RANKS TEST
COMPARISON OF INITIAL AND POST OCT
SCORES FOR GROUP I

Response	N	T Score	Level of Significance
Verbal Level			
Grouping	13	4.0	.01
Non-grouping	9	13.5	n.s.
Non-scorable	12	4.0	.01
Style			
Color	9	10.0	n.s.
Form	10	12.0	n.s.
Structure	2	1.5	n.s.
Relational	14	33.0	n.s.
Categorical	11	24.0	n.s.

No statistical analysis was done to determine differences from pre- to post-tests for boys or girls in Group I. Table XV in Appendix F gives differences in percents of responses from pre- to post-test for boys and girls. It can be seen that both boys and girls in Group I gained in percent of grouping responses. However, it was the boys who gained the most in grouping responses. Non-scorable responses decreased considerably as the boys learned to use more grouping responses. It

would seem that the significant difference found in grouping and non-scorable responses for the entire group might be due to the difference in boys scores. It appears that instruction had a greater effect on the ability of the boys to use grouping responses than girls.

Hypothesis VIII (A-2): There will be no signifcant difference between initial and post OCT scores for Group I on style of categorization. In order to examine this hypothesis the Wilcoxon matched-pairs signed-ranks test was applied. Results are reported in Table IX. There was no significant difference between initial and post-test scores for style of categorization. Instruction had no significant effect on style used for categorizing. One possible reason for the lack of difference after instruction had been presented might be because the initial scores of Group I were spread over all the styles of response. This limited the possibilities for a significant shift to occur on the post test.

Hypothesis VIII (B): There will be no significant difference between initial and post OCT scores for Group II on verbal level of response or style of categorization. The initial and post OCT scores of Group II were compared by using the Wilcoxon matched-pairs signed-ranks test. No significant difference was found for verbal level of response or style of categorization as can be seen in Table X. Allowing the children to manipulate the materials during self-selected activity periods did not affect the children's performance on the OCT.

Hypothesis VIII (C): There will be no significant difference between initial and post OCT scores for Group III on verbal level of response or style of categorization. Analysis of this hypothesis was done by use of the Wilcoxon matched-paris signed-ranks test and results are

TABLE X

WILCOXON MATCHED-PAIRS SIGNED-RANKS TEST
COMPARISON OF INITIAL AND POST OCT
SCORES FOR GROUP II

Response	N	T Score	Level of Significance
Verbal Level			
Grouping	12	32.0	n.s.
Non-grouping	12	28.0	n.s.
Non-scorable	11	14.5	n.s.
Style			
Color	4	2.0	n.s.
Form	9	18.5	n.s.
Structure	2	0.0	n.s.
Relational	10	16.5	n.s.
Categorical	8	5.0	n.s.

shown in Table XI. Group III showed no significant change in verbal level of response or style of categorization when the initial OCT score was compared with the post score. No gains were made due to maturation in the elapsed time from the pre- to the post-test.

TABLE XI

WILCOXON MATCHED-PAIRS SIGNED-RANKS TEST
COMPARISON OF INITIAL AND POST OCT
SCORES FOR GROUP III

Response	N	T Score	Level of Significance
Verbal Level			
Grouping	8	9.0	n.s.
Non-grouping	6	9.0	n.s.
Non-scorable	9	12.5	n.s.
Style			
Color	0	0.0	n.s.
Form	5	3.0	n.s.
Structure	1	0.0	n.s.
Relational	10	18.0	n.s.
Categorical	8	7.5	n.s.

Hypothesis IX (A): On the initial OCT, the responses of the subjects of this study will not vary greatly from the responses of similar subjects reported by Sigel and Olmsted (1969) on verbal level of response. Sigel and Olmsted (1969) found that four-year-old lower-class children gave a greater percentage of non-scorable responses than grouping and non-grouping responses for the items on the OCT. Inspection of

Table XII shows that for the middle-class four-year-old subjects reported in this study the reverse is true. Comparisons of the responses of both groups shows that the middle-class subjects of this study consistently gave a much greater proportion of grouping responses than the lower-class children. This result is in agreement with the findings reported by Sigel, et al (1966) that middle-class children produce more grouping responses than lower-class children.

Hypothesis IX (B): On the initial OCT, the responses of the subjects of this study will not vary greatly from the responses of similar subjects reported by Sigel and Olmsted (1969) on style of categorization. Percentage counts done in this study show relational and form responses to be the most prominent while color responses were used infrequently. The subjects reported by Sigel and Olmsted (1969) used color and relational responses most frequently while form responses were seldom used. Differences of style responses between the subjects of this study and those of Sigel and Olmsted (1969) can be compared in Table XIII for each item of the OCT.

TABLE XII

COMPARISON OF PERCENTAGES OF DIFFERENT TYPES OF VERBAL LEVELS OF RESPONSE FOR EACH ITEM ON OCT

Item	Verbal Response	Sigel		Naegeli		Item	Verbal Response	Sigel		Naegeli	
		Female N = 22	Male N = 15	Female N = 22	Male N = 19			Female	Male	Female	Male
Pencil	G[1]	22.5	26.8	68.2	63.2	Pipe	G	27.1	46.7	77.3	73.2
	NG[2]	18.0	6.7	18.2	15.8		NG	18.0	13.4	0.0	10.5
	NS[3]	59.0	66.7	13.6	21.0		NS	54.5	40.0	22.7	15.8
Ball	G	27.1	40.0	59.4	47.4	Cup	G	27.1	20.1	54.5	31.6
	NG	18.0	13.4	4.5	26.3		NG	13.5	26.7	18.2	42.1
	NS	54.5	46.7	36.4	26.3		NS	59.1	53.3	27.3	26.3
Cigarette	G	36.2	40.1	81.8	68.4	Notebook	G	27.2	26.8	81.8	58.0
	NG	22.6	26.8	9.1	15.8		NG	18.1	26.7	9.1	21.0
	NS	40.9	33.4	9.1	15.8		NS	54.6	46.7	9.1	21.0
Crayons	G	27.1	40.2	77.3	58.0	Matches	G	27.1	53.4	81.8	63.2
	NG	13.5	13.4	4.5	21.0		NG	9.0	13.3	9.1	15.8
	NS	59.1	46.7	18.2	21.0		NS	63.7	33.3	9.1	21.0
Bottle	G	9.0	6.7	50.0	21.0	Blocks	G	31.7	26.7	40.9	31.6
Opener	NG	31.5	20.1	0.0	36.8		NG	18.0	6.7	13.6	15.8
	NS	39.1	73.3	50.0	42.1		NS	50.0	66.7	45.5	52.6
Top	G	27.1	40.0	68.2	42.1	Spoon	G	40.9	46.8	59.0	36.8
	NG	18.0	13.3	4.5	15.8		NG	9.0	26.7	4.5	26.3
	NS	54.5	46.6	27.3	42.1		NS	50.0	26.6	36.4	36.8

[1]Grouping responses

[2]Non-grouping responses

[3]Non-scorable responses

TABLE XIII

COMPARISON OF PERCENTAGES OF DIFFERENT TYPES OF STYLES OF CATEGORIZATION FOR EACH ITEM ON OCT

Item	Style Response	Sigel		Naegeli		Item	Style Response	Sigel		Naegeli	
		Female N = 22	Male N = 15	Female N = 22	Male N = 19			Female	Male	Female	Male
Pencil	Co	33.3	20.0	--	--	Pipe	Co	40.0	--	--	--
	F	--	20.0	21.0	13.3		F	--	11.1	23.5	6.2
	S	--	40.0	--	--		S	20.0	--	--	--
	R	33.3	--	63.2	53.3		R	20.0	44.4	58.9	56.3
	Ca	33.3	20.0	15.8	33.1		Ca	20.0	44.4	17.6	37.5
Ball	Co	60.0	62.5	7.1	--	Cup	Co	55.5	14.3	6.2	--
	F	10.0	12.5	57.1	35.7		F	--	--	50.0	28.6
	S	--	--	--	--		S	--	--	6.2	--
	R	20.0	12.5	7.1	28.6		R	33.3	71.4	31.2	63.4
	Ca	10.0	12.5	28.6	35.7		Ca	11.1	14.3	6.2	7.1
Cigarette	Co	38.5	10.0	10.0	--	Notebook	Co	40.0	12.5	--	--
	F	--	10.0	20.0	12.5		F	--	--	25.0	20.0
	S	--	--	--	6.2		S	10.0	--	--	--
	R	30.8	60.0	40.0	37.8		R	30.0	50.0	65.0	60.0
	Ca	30.8	20.0	30.0	43.8		Ca	20.0	37.5	10.0	20.0
Crayons	Co	44.4	25.0	5.6	6.6	Matches	Co	50.0	40.0	5.0	--
	F	--	--	27.7	6.6		F	--	--	25.0	20.0
	S	--	--	--	--		S	--	--	--	--
	R	33.3	50.0	50.0	60.0		R	12.5	50.0	55.0	55.0
	Ca	22.2	25.0	16.7	26.6		Ca	37.5	10.0	15.0	25.0
Bottle	Co	33.3	--	--	--	Blocks	Co	54.5	20.0	--	11.1
Opener	F	--	--	54.6	18.2		F	9.1	--	58.3	44.4
	S	22.2	--	--	--		S	--	--	--	--
	R	44.4	50.0	36.4	81.8		R	27.3	40.0	25.0	11.1
	Ca	--	50.0	9.0	--		Ca	9.1	40.0	17.3	33.3
Top	Co	50.0	50.0	12.5	--	Spoon	Co	54.5	18.2	7.1	8.3
	F	--	--	62.5	36.4		F	9.1	9.1	50.0	33.3
	S	--	--	--	--		S	--	--	7.1	--
	R	20.0	25.0	--	18.2		R	36.4	54.5	35.7	50.0
	Ca	30.0	25.0	25.0	45.4		Ca	--	18.2	--	8.3

Co - Color responses

F - Form responses

S - Structure responses

R - Relational responses

Ca - Categorical responses

CHAPTER V

SUMMARY

The general purpose of this study was to investigate the classification styles of four-year-old children from middle-class backgrounds and to determine the effects of two types of learning experiences on these classification styles. The children's responses as to style of categorization and verbal level of response were examined in relation to sex of the children and type of learning experience provided.

The sample was composed of 41 children selected from the Oklahoma State University Child Development Laboratories and the Kollins Kiddie Kollege in Stillwater, Oklahoma. There were 22 girls and 19 boys in the sample ranging in age from 4 years 1 month to 4 years 11 months. All the children were from middle-class backgrounds.

Sigel and Olmsted's (1969) OCT was administered to all subjects. Group I received an instructional program, Group II was allowed opportunity to manipulate the materials without instruction, and Group III served as a control group. The OCT was readministered after a two-month interval.

The results of the analysis of the data of this study were as follows:

1. The scores of the three groups were comparable on the initial OCT.

2. On the post OCT, there was a difference significant at the .05 level between Groups I and II and Groups I and III on color response. After instruction, the children in Group I gave significantly more color responses than the children in the other two groups. No other difference among the three groups was found for style of categorization or verbal level of response on the post-test.
3. Girls gave more grouping responses than boys while boys gave a significantly greater number of non-grouping responses than girls. Z scores were significant at the .05 level.
4. There was no significant difference between performance of boys and girls on style of categorization on the initial OCT.
5. Instruction produced no significant difference between scores of boys and girls in Group I on the post OCT.
6. Self-selected use of materials had no differential effect on scores of boys and girls in Group II on the post OCT.
7. Type of learning experience produced no significant difference on performance of the girls in the three groups on style of categorization or verbal level of response.
8. Type of learning experience produced a significant difference on verbal level of response of boys in Group I when compared with boys in Group III. Group I boys who had instructional training gave more grouping responses than the boys in the control group. Significance was at the .01 level.
9. Group I boys gave significantly more color and form responses than the boys in Groups II and III on the post OCT.

10. Instruction produced a significant change in the level of verbal responses of children in Group I. Grouping responses increased while non-scorable responses decreased. These changes were significant at the .01 level.
11. Instruction had no significant effect on style of categorization for the children in Group I.
12. Use of materials during self-selected play periods had no significant effect on the performance of children in Group II on verbal level of response or style of categorization.
13. A difference was observed between the responses of subjects reported by Sigel and Olmsted (1969) and the responses of subjects in this study. Sigel and Olmsted (1969) reported four-year-old lower-class children gave more non-scorable responses than scorable (grouping and non-grouping) responses. The subjects of this study gave more scorable responses than non-scorable ones. The difference is very likely due to difference in social class. The subjects of Sigel and Olmsted (1969) used color and relational responses most frequently and form responses infrequently while the subjects of this study gave form and relational responses most frequently and color responses infrequently.

General conclusions that can be drawn from this study are (1) Instruction produces more mature behavior on verbal level of response. Grouping responses increase while non-scorable responses decrease; (2) Instruction has no effect on styles used to categorize; and (3) Providing the children with opportunities to manipulate the materials is not enough to produce a significant change in response patterns. Direction

must be given to help the children discover the many criteria they may use in grouping items.

Implications

The results of this study demonstrated that formalized instruction with pre-school children could enhance acquisition of classification skills. Allowing the children to manipulate the provided instructional materials did not produce an effect on the ability of the children to classify. It would appear that help must be given by an adult to guide the children in discovering the multiple attributes of objects and in learning to verbalize their reasons for grouping.

A program for teaching classification skills has relevance and applicability for the preschool and primary grades. Teachers can easily obtain the materials used in this investigation and apply the instructional procedure described. It would perhaps be most beneficial to provide instruction such as was done in this study in conjunction with use of the materials during a self-selected activities period. Further research needs to be done to determine the effectiveness of combining instruction with free use of materials to encourage classification.

Sigel (1971) found that immediately after a program of training the subjects in the experimental group scored significantly higher than the subjects in the control group. Eight months later, both groups were retested. No continuation of the training program had been provided during this eight-month period. The scores of the group which had received training remained at a relatively high level while the scores of the control group increased so there was no difference between the control group subjects and the experimental group subjects in ability to

group on single dimensions. The subjects in the experimental group continued to use more groupings involving multiple dimensions than did the subjects in the control group. Sigel (1971) believed that it is unreasonable to expect progress in the development of classification skills unless the environment provides continued reinforcement or support of acquired skills. He stated that "short-term training programs will be ineffective unless there is continued reinforcement in the educational environment to maintain and extend these accomplishments" (p. 181). Perhaps one method of providing the desired reinforcement for classification skills would be to present instruction as provided in this study and then give the children freedom to manipulate the materials during self-selected activities periods as a later time. Further research is needed to develop classification games and materials which could be used in the curriculum to expand the skills of the children who have received instruction in classification. It may well be that the children would continue to make gains in classification skills if such reinforcement were provided.

Recommendations for Further Research

The investigator feels that further study of the classification skills of children is indicated as a result of this study. It is suggested that a similar study compare the responses of lower-class children with the responses of those subjects reported in this study and those subjects reported by Sigel and Olmsted (1969).

The investigator also recommends that a study be conducted in which one group of children receives an instructional program and a second group receives an instructional program in conjunction with

self-selected use of the materials. Investigating the free use of the instructional materials as concurrent reinforcement for an instructional program might provide further understanding of the nature of the intellectual process of classification and of the factors involved in maintaining and improving skill is classifying.

Research to develop classification training materials and games which can be used in preschool and primary programs is suggested by the current study. Additional materials seem to be needed particularly for use after instruction to reinforce and perhaps increase the gains made in classification skills as a result of an instructional program.

SELECTED BIBLIOGRAPHY

Allen, Linda S. The Relation of Classification Skills to Readiness for First Grade. Oklahoma State University, Unpublished Masters Thesis, 1971.

Annett, Marian. "The Classification of Instances of Four Common Class Concepts by Children and Adults." British Journal of Educational Psychology, XXIX (1959), 223-36.

Asch, Harvey. "An Investigation and Attempted Modification of Classification Style Among Disadvantaged Preschool Children." Dissertation Abstracts International, XXVII (November, 1970), 2949 (Abstract).

Bowers, Mary Dee. "The Effects of Different Sequences of Instruction and Social Class on Children's Classification Activity." Dissertation Abstracts International, XXX (November, 1969) (Abstract).

Bruner, Jerome S., Jacqueline J. Goodnow, and George A. Austin. A Study of Thinking. New York: John Wiley and Sons, Inc., 1956.

Corah, Norman. "The Influence of Some Stimulus Characteristics on Color and Form Perception in Nursery-School Children." Child Development, XXVII (1966), 205-11.

Corah, Norman, and Eva J. Gospodinoff. "Color-Form and Part-Whole Perception in Children." Child Development, XXVII (1966), 837-42.

Edwards, Joseph C. "The Effect of Instruction and Concommitant Variables on Multiple Categorization Ability." Dissertation Abstracts International, XXVIII (May, 1968) (Abstract).

Edwards, Joseph C. "Effect of Instruction and Concommitant Variables on Methods of Categorization Ability." Journal of Educational Psychology, LX (1969), 138-43.

Formanek, Ruth, and Greta Morine. "Categorizing in Young Children: Two Views." The Teachers College Record, LXIX (1968), 409-20.

Harris, Laureen, Joseph Schaller, and Merrill Mitler. "The Effects of Stimulus Type on Performance in a Color-Form Sorting Task With Preschool, Kindergarten, First-Grade, and Third-Grade Children." Child Development, XXXI (1970), 177-91.

Hurt, Maure. "Relationships of the Mode of Categorization Style to Achievement on Selected Intellectual Measures." Dissertation Abstracts International, XXX (March, 1970), 3783 (Abstract).

Kagan, Jerome, H. A. Moss, and Irving Sigel. "Psychological Significance of Styles of Conceptualization." Society for Research in Child Development Monographs, XXVIII (1963), 73-112.

Kofsky, Ellin. "A Scalogram Study of Classification Development." Child Development, XXXVII (1966), 191-204.

Kofsky, Ellin, and Sonia F. Osler. "Free Classification in Children." Child Development, XXXVIII (1967), 927-37.

Mitler, Merril M., and Lauren Harris. "Dimension Preference and Performance on a Series of Concept Identification Tasks in Kindergarten, First-Grade, and Third-Grade Children." Journal of Experimental Child Psychology, VII (1969), 734-84.

Modriski, Regina. "Young Children's Initial and Changed Names for Form-Color Stimuli." Journal of Experimental Child Psychology, VIII (1969), 402-9.

Nowak, Stanley Marion. "The Development and Analysis of the Effects of an Instructional Program Based on Piaget's Theory of Classification." Dissertation Abstracts International, XXX (November, 1969), 1875 (Abstract).

Olmsted, Patricia, Carolyn Parks, and Annette Rickel. "The Development of Classification Skills in the Preschool Child." International Review of Education, XVI (1970), 67-79.

Sachman, Rosslyn Gains, and Tom Trabasso. "Color and Form Preference in Young Children." Journal of Exceptional Child Psychology, III (1966), 177-87.

Sigel, Irving. "The Dominance of Meaning." Journal of Genetic Psychology, LXXXV (1954), 201-7.

Sigel, Irving. "The Development of Classificatory Skills in Young Children: A Training Program." Young Children, XXVI (1971), 170-84.

Sigel, Irving, L. M. Anderson, and H. Shapiro. "Categorization Behavior of Lower- and Middle-Class Negro Preschool Children." Journal of Negro Education, XXXV (1966), 218-29.

Sigel, Irving, Paul Jarman, and Helen Hanesian. "Styles of Categorization and Their Perceptual, Intellectual, and Personality Correlates in Young Children." ED 001 815, ERIC Microfishe, 1965.

Sigel, Irving, and Bonnie McBane. "Cognitive Competence and Level of Symbolization Among Five-Year-Old Children." The Disadvantaged Child: Volume 1, Jerome Hellmuth, editor. Seattle: Special Child Publications, 1967, 435-53.

Sigel, Irving, and Patricia Olmsted. "Analysis of the Object Categorization Test and the Picture Categorization Test for Preschool Children." ED 038 174, ERIC Microfishe, 1969.

Sigel, Irving, and Patricia Olmsted. "Modification of Cognitive Skills Among Lower-Class Black Children." Disadvantaged Child: Volume 3, Jerome Hellmuth, editor. New York: Bruner/Mazel, Inc., 1970, 300-338.

Snell, Galen. "Relation of Cognitive Strategies to Certain Measures of Intelligence and Creativity." Dissertation Abstracts International, XXVIII (February, 1968) (Abstract).

Ward, Robert Leland. "The Effect of Instruction and Age on the Classificatory Behavior of Culturally Deprived Preschool Children." Dissertation Abstracts International, XXX (April, 1970), 4295 (Abstract).

APPENDIX A

ORDER OF PRESENTATION OF ITEMS IN OCT

Order of Presentation
of Items in OCT

1. Matches
2. Blocks
3. Spoon
4. Pencil
5. Top
6. Pipe
7. Cup
8. Notebook
9. Ball
10. Cigarette
11. Crayons
12. Bottle Opener

Appearance of Array for OCT

Matches	Blocks	Spoon	Pencil
Notebook	Cup	Pipe	Top
Ball	Cigarette	Crayons	Bottle Opener

APPENDIX B

SCORE SHEET FOR OCT

Number 112 Sex F
Age 4:6 Test B

Code 01 Score App-Fo Items Pe-Ba

M Bl S Pe
Nb Cu Pi T
Ba Ci Cr (BO)

Sort Pencil
A. They all have points
B.
C.

Code 38 Score DS2-HF Items Ba-M-Bl-T

(M) (Bl) S Pe
Nb Cu Pi (T)
Ba Ci Cr BO

Sort Ball
A. Those three you can play with and are blue and
B. matches are blues and for children not to play
C. with.

Code 07 Score App-LF Items Ci-Pi

M Bl S Pe
Nb Cu (Pi) T
Ba Ci Cr BO

Sort Cigarette
A.
B. Smoke with them.
C.

Code 02 Score App-Co Items Cr-M-Bl-S. Pe-Nb-Cu-Pi-T-Ba-Ci-BO

(M) (Bl) (S) (Pe)
(Nb) (Cu) (Pi) (T)
(Ba) (Ci) Cr (BO)

Sort Crayons
A. They all have colors.
B.
C.

Number 112 Sex F
Age 4:6 Test B

Code 01 Score App-Fa Items RD-S-Pe-Pi-Ci-Cr

M Bl (S) (Pe)
Nb Cu (Pi) T
Ba (Ci) (Cr) BO

Sort Bottle Opener
A. They are all straight.
B.
C.

Code 01 Score App-Fa Items T-S-Cu-Pi-Ba

M Bl (S) Pe
Nb (Cu) (Pi) T
(Ba) Ci Cr BO

Sort Top
A. They are all round.
B.
C.

Code 07 Score App-LF Items Pi-Ci

M Bl S Pe
Nb Cu Pi T
Ba (Ci) Cr BO

Sort Pipe
A. You smoke with them.
B.
C.

Code 05 Score App-Th Items Cu-BO

M Bl S Pe
Nb Cu Pi T
Ba Ci Cr (BO)

Sort Cup
A. Open cans and pour into the cup.
B.
C.

Number 112 Sex F
Age 4.6 Test B

Code	Score	Items	Sort Notebook
02	App-Co	Nb-M-Bl-S-Ci	A. They are all white.
(M) (Bl) (S) Pe			B.
Nb Cu Pi T			
Ba (Ci) Cr BO			C.

Code	Score	Items	Sort Matches
04	App-RF	M-Ci	A. Light matches, then put on to cigarette.
M Bl S Pe			B.
Nb Cu Pi T			
Ba (Ci) Cr BO			C.

Code	Score	Items	Sort Blocks
01	App-Fo	Bl-Nb-Cr	A. They are all squares.
M Bl S Pe			B.
(Nb) Cu Pi T			
Ba Ci (Cr) BO			C.

Code	Score	Items	Sort Spoon
05	App-Th	S-Cu	A. Eat soda out of cup with the spoon.
M Bl S Pe			B.
Nb (Cu) Pi T			
Ba Ci Cr BO			C.

APPENDIX C

ORDER OF PRESENTATION OF STIMULUS OBJECTS IN OCT

Order of Presentation of Stimulus Objects in OCT

1. Pencil
2. Ball
3. Cigarette
4. Crayons
5. Bottle Opener
6. Top
7. Pipe
8. Cup
9. Notebook
10. Matches
11. Blocks
12. Spoon

APPENDIX D

LESSON UNIT MATERIALS AND PROBE QUESTIONS

Lesson Unit Materials and Probe Questions

Unit 1--Men's Clothing

Materials: Man's shoe, shirt, sock, tie, hat, pants and pictures of man's shoe, shirt, sock, tie, hat, and pants.

Probe Questions:

a. What do you do with it?
b. What color is it?
c. How is it made?
d. What different parts does it have?
e. What is it made of?
f. Where do you get it?
g. Who uses it?
h. What other things are like it?

Unit 2--Transportation Vehicles

Materials: Toy airplane, car, bus, train, and boat and pictures of airplane, car, bus, train, and boat.

Probe Questions:

a. What does it do?
b. Where does it travel?
c. What different parts does it have?
d. What does it sound like?
e. What is the toy _____ made of?
f. What is a real _____ made of?
g. What other things are like it?
h. What color is it?
i. Who uses it?
j. Who operates it?

Unit 3--Zoo or Wild Animals

Materials: Toy lion, elephant, zebra, monkey, hippopotamus, and giraffe and pictures of lion, elephant, zebra, monkey, hippopotamus, and giraffe.

Probe Questions:

a. Where does this animal live?
b. What does it look like? (furry, spotted, long neck etc.)
c. What color/s is this animal?
d. How many places can you find this animal?
e. What sound does it make?
f. What do you think it eats?

Unit 4--Fruits

Materials: Plastic apple, banana, lemon, pear, orange, and grapes and pictures of apple, banana, lemon, pear, orange, and grapes.

Probe Questions:

a. What do you do with it?
b. How many ways can it be used?
c. What different parts does it have?
d. How does it taste?
e. How does it feel inside? outside?
f. What parts can you eat?
g. What shape is it?
h. What color is it inside? outside?
i. Where does it come from?

Unit 5--Tools

Materials: Hammer, paint brush, nails, screwdriver, and toy saw and pictures of hammer, paint brush, nails, screwdriver, and saw.

Probe Questions:

a. What is it used for?
b. Who uses it?
c. How does it sound when being used?
d. What color/s is it?
e. What parts does it have?
f. When is it used?
g. What is it used with?
h. How many ways can it be used?
i. What is it made of?

Unit 6--Women's Clothing

Materials: Dress, purse, glove, shoe, blouse, and hat and pictures of dress, purse, gloves, shoe, blouse, and hat.

Probe Questions:

a. What color is it?
b. What do you do with it?
c. How is it made?
d. What parts does it have?
e. What is it made of?
f. Where do you get it?
g. Who uses it?
h. What other things are like it?

Unit 7--Musical Instruments

Materials: Toy piano, guitar and horn and actual drum and bells and pictures of piano, guitar, horn, drum, and bell.

Probe Questions:

a. What do you do with it?
b. What different parts does it have?
c. What does it sound like?
d. How do you make the sound?
e. What is the toy made of?
f. What is the real instrument made of?
g. What color is it?

Unit 8--Farm Animals

Materials: Toy sheep, dog, cow, pig, and horse and pictures of sheep, dog, cow, pig, and horse.

Probe Questions:

a. Where does this animal live?
b. What does it look like?
c. What color is it?
d. What does its hair feel like?
e. What sound does this animal make?
f. What does it eat?
g. What is it used for on the farm?

Unit 9--Eating Utensils

Materials: Fork, spoon, plate, glass, bowl, and knife and pictures of fork, spoon, plate, glass, bowl, and knife.

Probe Questions:

a. What do you do with it?
b. How is it used?
c. What parts does it have?
d. Who can use it?
e. When is it used?
f. What color is it?
g. What shape is it? (if appropriate)

Unit 10--Furniture

Materials: Toy bed, sofa, table, chair, lamp, and dresser and pictures of bed, sofa, table, chair, lamp, and dresser.

Probe Questions:

a. Where in the house is this found?
b. What is the toy _____ made of?
c. What is the real _____ made of?
d. What color is it?
e. What is it used for?
f. When do you use it?
g. What other things are found in the room with it?

APPENDIX E

CONDENSED SCORE SHEET

Group I Number 112

Sex F Age 4:6

TYPES OF VERBAL RESPONSE

	Test A		Test B	
	#	%	#	%
Grouping	10	83	11	92
Non-Grouping	1	8	1	8
Non-Scorable	1	8		

STYLES OF CLASSIFICATION

	Test A		Test B	
	#	%	#	%
Form	3	25	4	33
Color	4	33	2	17
Structure				
Relational	1	8	3	25
Categorical	3	25	3	25

APPENDIX F

PERCENTAGE SCORES OF GROUPS

TABLE XIV

PERCENTAGES OF DIFFERENT TYPES OF RESPONSES BY GROUP

Response	Group I		Group II		Group III	
	A[1]	B[2]	A	B	A	B
Verbal Level						
Grouping	51.7	82.8	66.7	72.4	59.0	66.0
Non-grouping	15.0	10.0	12.8	17.9	15.4	15.4
Non-scorable	33.3	7.2	20.5	9.6	25.6	18.6
Style						
Color	3.9	8.9	3.2	0.6	--	--
Form	16.1	26.7	36.5	32.7	14.1	17.3
Structure	1.1	1.1	--	1.3	0.6	--
Relational	28.9	35.0	36.9	34.0	43.6	39.1
Categorical	16.7	21.1	12.8	22.1	16.0	25.0
None[3]	33.3	7.2	20.5	9.6	25.6	18.6

[1]Pre-test

[2]Post-test

[3]Style scored as None when no scorable response was given

TABLE XV

PERCENTAGES OF DIFFERENT TYPES OF RESPONSES BY GROUP AND SEX

Response	Group I				Group II				Group III				Groups I, II and III			
	Female		Male		Female		Male		Female		Male		Female		Male	
	A[1]	B[2]	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Verbal Level																
Grouping	60.4	77.0	41.7	89.3	76.2	73.8	55.5	70.8	64.3	70.9	52.8	48.6	**66.7**		49.6	
Non-grouping	13.5	13.5	16.7	5.9	5.9	21.4	20.8	13.9	3.6	5.9	29.2	26.4	**7.9**		21.5	
Non-scorable	25.4	9.4	41.7	4.7	11.9	4.8	23.6	15.3	32.1	13.1	18.0	25.0	**25.0**		28.5	
Style																
Color	7.3	8.3	--	9.5	2.4	--	4.2	1.4	--	--	--	--	**3.4**		1.3	
Form	13.5	18.8	19.0	35.7	52.4	45.2	18.1	18.1	19.0	26.2	8.3	6.9	**27.6**		14.9	
Structure	2.1	--	--	2.4	--	--	--	2.8	--	--	1.4	--	**0.8**		0.4	
Relational	33.3	47.0	23.8	21.4	17.9	29.8	37.5	38.9	39.3	33.3	48.6	45.8	**30.3**		36.0	
Categorical	17.7	16.6	15.5	26.2	9.5	20.2	16.7	23.6	9.5	27.4	23.6	22.2	**12.5**		18.4	
None[3]	25.4	9.4	41.7	4.7	11.9	4.8	23.6	15.3	32.1	13.1	18.0	25.0	**25.0**		28.5	

[1] Pre-test

[2] Post-test

[3] Style scored as None when no scorable response was given

VITA

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