

THE RELATION OF CLASSIFICATION SKILLS
TO READINESS FOR FIRST GRADE

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CHAPTER I

INTRODUCTION

The overall purpose of this study is to compare a measure of the classification skills of kindergarten children to two other measures of their readiness for first grade.

Classification skills are central to cognitive development in general and logical thinking in particular. Classification skills refer to the ability of the individual to organize similar and/or dissimilar materials into rational or logical groups. The ability to accomplish these objectives presupposes the comprehension of rules of grouping (Inhelder and Piaget, 1958).

The knowledge that preschool children are capable of producing groupings in different ways can be an important diagnostic tool to the teacher of young children. Understanding of each child's skill in categorizing will assist her in planning the curriculum so that children can acquire additional skills necessary for meaningful classifications.

If children have difficulty in such cognitive acts as classifying, then it is assumed that their learning to know and to deal with the environment effectively and efficiently is impaired. This is particularly true when children have to deal with linguistic and other types of symbolic materials. In fact, an inability to cope representatively, with objects may contribute significantly to difficulties in

learning to read as well as in other areas where representational content is presented, such as arithmetic. In fact, this same intellectual requirement is necessary in performing on many of the intelligence tests which utilize pictures as test items. These tests employ pictures on the assumption that these are nonsymbolic stimuli, and therefore that these pictures have comparable meaning for the individual as a three-dimensional object.

There is general agreement among cognitive theorists as to the desired goals of the process of cognitive development. Three of the primary end-products of cognitive development are: (a) the ability to think abstractly, (b) the ability to reason inductively and deductively, and (c) the ability to adapt to new situations. All of these abilities require skill in the use of concepts and symbols (Piaget, 1954; Inhelder and Piaget, 1958; 1964; Sigel, 1964).

One of the essential elements in attaining concepts is the ability to see commonalities among diverse stimuli. Piaget (1954) defines this behavior as the grouping of instances on the basis of one or more observable or inferred characteristics. Piaget (1954) suggests that classification behavior, like all areas of cognitive development, is viewed as being comprised of a series of successive stages, with skills developing in each stage being built upon those of previous stages.

Piaget (1950) describes four major periods of cognitive development as: (a) sensorimotor period (birth to two years of age), (b) preoperational period (two to seven years of age), (c) the period of concrete operations (seven to eleven years of age), and (d) the period of formal operations (eleven to fifteen years of age).

Piaget (1954) suggests that the developmental sequence of classification behavior begins in the sensorimotor period. During this period the infant attains basic knowledge necessary for ordering his world. The child differentiates himself from the environment, begins to localize himself in time and space, and identifies the permanence and materiality of objects.

During the preoperational period classification behavior is exhibited in increasingly complex ways beginning with two objects being grouped on the basis of one attribute. As the period progresses, both the number of objects grouped and the number of characteristics used increases. The child also moves from sorting on observable attributes to grouping on the basis of unseen or inferred characteristics (Inhelder and Piaget, 1958).

Sigel (1964) maintains that classification skills are significant because they are integral to adaptation in a complex and diverse environment. Sigel (1971) also suggests that classification skills are "preludes" to concept attainment. Arrays of items are organized into coherent groups and labeled or named. The formal label is the concept name. But children create groupings even though a formal label is not produced. Therefore, they are in the beginning stages of concept attainment when a formal label is not produced.

Considering the theoretical position that skill in classifying is an essential prerequisite to cognitive development in general and particularly to logical thinking, concept attainment, and the ability to deal with symbolic materials, the question arises: Are classification skills related to readiness for first grade? Classification skills provide children with a mode of adaptation. The opportunity to

learn to see objects in their complexity and in their multiple functions should provide the child with richer information about the world around him. Classification skills are relevant to intellectual activities other than that of reading, writing, and arithmetic. They are relevant to conservation, understanding the logical relations between events, and coping with new or novel stimuli. All of these are used as tools to help determine a child's readiness for first grade. It would, therefore, seem appropriate to compare the classification skills of kindergarten children with other means of predicting readiness for first grade.

Purpose of the Study

The overall purpose of this study is to relate a measure of the classification skills of kindergarten children to two other measures of their readiness for first grade, the Stanford Early School Achievement Test (hereafter referred to as the SESAT) and rating by their kindergarten teachers. In addition to the test of classification skills the children's responses will be examined in relation to the variables of age, sex, and mode of categorization.

More specifically, the purposes of this study are to examine evidence related to the following hypotheses:

1. Scores of kindergarten children on a test of classification skills are independent of:
 - a. Level of stanine score on SESAT.
 - b. Rating of readiness for first grade by kindergarten teacher.
 - c. Sex.

- d. Age.
2. The percentage of relational-contextual responses on the test of classification skills is independent of:
 - a. Level of stanine score on SESAT.
 - b. Sex.
 - c. Age.
 3. The percentage of categorical responses on the test of classification skills is independent of:
 - a. Level of stanine score on SESAT.
 - b. Rating of readiness for first grade by kindergarten teacher.
 - c. Sex.
 - d. Age.
 4. The percentage of descriptive—form and color responses on the test of classification skills is independent of:
 - a. Level of stanine score on SESAT.
 - b. Sex.
 - c. Age.

CHAPTER II

REVIEW OF LITERATURE

Over the years, classification skills have been studied with various populations and it has been learned that classification competence and styles vary with age, sex, and type of child (Kagan, Moss, and Sigel, 1963; Sigel, Jarman, and Hanesian, 1967; Sigel, 1953, 1954, 1956).

Sigel (1971) suggests that all objects are multidimensional. Size, shape, color, and function are among the attributes possessed by all objects. The selection of particular attributes is a function of a variety of psychological and experiential characteristics of the individual. Emphasis on a particular dimension as a basis for grouping has been referred to as cognitive style (Kagan, et al., 1963; Sigel, et al., 1967).

Concepts are acquired through a complex set of processes. The child has to learn to recognize and identify objects. Identification and subsequent naming follows. He then learns the characteristics of each object. Language both facilitates and directs the categorization process, since it provides the tools by which to identify the commonalities. Not every language, however, has the same sets of labels for categories of physical or social reality (Brown, 1958).

"Styles of categorization" or "mode of classification" refers to the individual's preference for particular bases for grouping.

Basically, three modes of categorization have been identified: descriptive, relational-contextual, and categorical-inferential.

Grouping by form, color, or structure are considered descriptive classifications based on physical criteria (Sigel, 1971). The studies that have focused on descriptive responses have shown that groupings based on such responses increase steadily with age (Sigel, 1964). The use of descriptive labels, especially those dealing with structure or form qualities, have been interpreted as reflecting a process of differentiation, where the child is able to deal with parts of items as criteria without necessarily destroying the intricate character of the item. When employing descriptive labels, an abstraction of parts from a cohesive context is required, which further requires scanning an array to discover commonalities. Therefore, the descriptive response has been interpreted as an indicator of reflection and impulse control (Kagan, et al., 1963; Sigel, Anderson, and Shapiro, 1966).

The second major style of categorization, relational-contextual, refers to groupings made either because of interdependence of the items, e.g., "You stir in a cup with a spoon," or because the items selected belong to the same person or locale, e.g., "The bed and the dresser go in the bedroom." Such a mode of classification requires the awareness of objects as having integrity independently of the classifier (Sigel, 1971).

Previous investigators have reported that the frequency of use of relational-contextual responses decreases with age, is negatively related to analytic intelligence, and is positively related to dependency and impulsivity for boys but not for girls (Kagan, Rossman, Day, Albert, and Phillips, 1964; Sigel and McBane, 1967). The more

frequent use of the relational-contextual responses is made by girls.

Use of relational-contextual responses has been interpreted as an index of cognitive immaturity. It would be expected, therefore, that lower-class children and younger children would use more relational than descriptive responses when classifying groups of objects (Sigel, et al., 1966; Sigel, 1956). Preference for a relational-contextual orientation has been consistently found to be negatively related to "analytic" thinking in both children and adults (Kagan, et al., 1964; Sigel, et al., 1967).

Sigel (1953) suggests that use of relational-contextual labels expresses a relationship between classifying and direct experience that is essentially egocentric. "You sit down in the chair and look in the mirror to comb your hair," is one illustration of this style of categorization.

A third major style of categorization has been entitled "categorical-inferential." In this mode of classification the child applies a class label to an array of stimuli in which every part in the array is a member of the class. Objects can be organized according to use or just as to a class (Sigel, 1971). Sigel, et al., (1967) found that among middle-class preschool children the word for animal is used appropriately, but only with respect to creatures which have four legs. Such organisms as snakes and bees are not usually included. Therefore, the use of this category in its most extensive sense is infrequent among young middle-class children.

Sigel, et al., (1966) reported that styles of categorization vary as a function of the content of the material. Middle-class elementary school children use more descriptive and relational-contextual responses

with stimuli depicting human figures than with objects and animals. With increases in age, however, use of descriptive part-whole responses increases for all types of materials, with a decrease in relational-contextual and an increase in categorical-inferential responses. In a study with lower-class Negro children, Sigel (1971) found that: (a) styles of categorization employed by these children vary as a function of the representational nature of the stimuli involved, and (b) styles vary as a function of the content of the material employed.

Sigel (1953) found that categorization behavior does not vary with level or representation. It was argued that if a child had acquired the meaning of the object, he would respond to it consistently whether it was presented as a three-dimensional item or a pictorial representation of the object. This did not occur with lower-class children, therefore suggesting that the definition of an object is contingent on its mode of presentation (Sigel, et al., 1966; Sigel, et al., 1967).

In a study of lower-class preschool children it was found that the children could create groupings when presented with three-dimensional life-sized objects, such as a cup, spoon, pencil, notebook and the like; but quantitative and qualitative differences were found when photographs of these objects equal in size to the original objects were used. The fact that the lower-class children could group the three-dimensional objects and could give some rationale for their groupings rules out the issue of "ability to group" and places the problem clearly in the context of mode of representation (Sigel, et al., 1966; Sigel, et al., 1967). Sigel (1967) found that with children

from ages three to five years, lower-class children were significantly less consistent in categorization of pictures as compared to three-dimensional life sized objects. This was not true for middle-class children. The ability to deal with representational material was less developed in the lower-class children than in their middle-class counterparts, even though there was no difference between the groups in the ability to identify and label the pictures.

Sigel (1964) reported that a group of underprivileged children, aged six, were given a sorting task in which black and white pictures were employed. A number of these children had difficulty creating groupings; rather, they would "chain" (relate one picture to another in a serial way) or not perform at all.

Sigel (1954) administered tests involving the same basic meaningful items, but presented these items in three varied forms of symbolization, i.e., toy objects, black and white photographs, and word-names of the objects, to three age levels (seven, nine, and eleven years). The instructions were to classify the material on the basis of similarity or belongingness. Analysis of the quantitative and qualitative results showed that the classifying concepts used by the children were in terms of meaning and that stimulus characteristics of the objects or items were seldom used as categorizing concepts. Groupings representing structural, functional, or locational similarities were classified as perceptual. Groupings classified according to a class name were classed as conceptual. The data presented revealed a decrease with age in perceptual classification of items. This decrease between the ages of seven and nine years was significant, but not between nine and eleven years, when children were asked to reduce groupings to a few

groupings as possible. The use of conceptual classifications increased steadily with age. This finding substantiates the hypothesis that with increases in age, significant changes in classificatory behavior occur.

In a study with school-age children, Kagan, et al., (1963) found that some children showed a consistent tendency to analyze visually presented stimuli and to group familiar objects together on the basis of objective elements of similarity that were part of the total stimulus. The measure of this preference for analytic conceptualizations was a set of thirty stimuli, each with three black and white line drawings of familiar objects. Analytic pairings were based on a similarity in an objective attribute that was a differentiated part of the stimulus. Relational pairings were based on a functional relationship between the stimuli. The main finding was that with age, analytic responses increased while relational responses decreased.

In a study of middle- and lower-class Negro children between the ages of three and five, Sigel, et al., (1967) found that with kindergarten experience, the lower-class children began to use more form responses. Form responses denote shape and contour; in contrast to isolating a structural part of the object, e.g., handles, wheels, legs, etc. The middle-class children used parts of the object as a basis for grouping much more frequently than did the lower-class children. In fact, such part-whole responses were rarely found among the lower-class group. Among the lower-class children those who did not verbalize a rationale for their groupings tended to use form as the more frequent basis for grouping. For those children who could verbalize, color was more frequently the preferred criterion.

Ling (1941) has reported that children as young as six months were able to discriminate form and manifest "primitive abstraction." The infant was sitting in a crib, with a tray containing a semicircle of five holes in front of him. Blocks of different shapes could be fastened into holes or left free. Since the infant would naturally try to put the blocks in his mouth, that fact was taken advantage of. The unfastened form was sweetened with saccharin, giving him a "reward" for picking it up. Ling found that the infant could learn to choose the correct block (the sweetened one) when the two differed in shape. Fantz (1958) found that infants could discriminate form even earlier than reported by Ling. Fantz presented infants simultaneously with two visual patterns, one containing horizontal stripes and the other, concentric circles. He observed which type of pattern the infant fixated on longer. He found that pattern preferences change toward a preference for complexity. Discrimination of pattern was found to occur as young as three weeks.

Kagan and Lemkin (1961) reported that girls are more likely to use form as mode of categorization than boys. Sigel, et al., (1967) found that color is the more primary response requiring minimal abstraction, and involves maximal opportunity for providing sensory comparison. The child is not required to deal with objects representationally. According to Hurlock and Thompson (1934) and Reichard, Schneider, and Rapaport (1944), children are able to discriminate colors before they can name those colors. Sigel (1953) reported that for children seven to eleven years of age, color is not a meaningful basis of organization when the items are familiar and realistic. It has also been found that a few children could

handle color, form, and size simultaneously as bases for classification before five years of age. This is in contrast to Piaget's findings (1950) which indicated that multiple abstractions do not occur until the period of concrete operations (seven to eleven years).

Summary

Differences in criteria and capabilities for making classifications between lower- and middle-class children are evident. The lower-class child seems to show high preferences for his use of color and/or form, but these children rarely, if ever, use part-whole descriptions for the classifying of objects. Lower-class children use more relational-contextual responses than descriptive, and they rarely use the categorical labels for identifying groupings of objects. Classification competence and styles have been found to vary with age, sex, and type of child.

The three basic modes of categorization which have been identified in the literature are: descriptive, relational-contextual, and categorical-inferential. Descriptive classification includes grouping by color, form, or structure. Grouping on the basis of use is considered a relational-contextual response. Grouping on the basis of a class label is a categorical-inferential response.

Use of relational-contextual responses has been interpreted as an index of cognitive immaturity, and, therefore, it would be expected that lower-class children and younger children would use more relational than descriptive classifications.

It has been noted that increase in age significantly changes the classificatory behavior of a child. The younger the child, the more

relational responses he will use. As his age increases, more descriptive and categorical responses will be used.

Girls are more likely to use form than boys. It has been reported that more girls than boys use the relational-contextual mode as a major style for categorizing. Color is considered the more primary descriptive response, requiring minimal abstraction and involving maximal opportunity for providing sensory comparison.

CHAPTER III

METHOD

Subjects

The subjects selected for the study were drawn from three kindergarten groups in the Cushing Public Schools, Cushing, Oklahoma. A random sample of five boys and five girls was taken from each of five sections in the three schools. There was a total of twenty-five boys and twenty-five girls in the sample. The ages of the subjects ranged from five years, seven months to six years, six months. The mean age was six years, one month.

Instruments

Test of Classification Skills

A test for measuring the classification behavior of children through the use of toy objects developed by Sigel (1954) was adapted for use in this study. The experimenter attempted to duplicate each object exactly but found this impossible. The experimenter then substituted some available objects which had the same attributes in general as those in the original collection, in order that the toy objects would present the same stimuli which might serve as a basis for grouping the toys. Included were twenty-four items which were familiar to all of the children. No measures of reliability or validity were

reported by Sigel (1954) nor was there an attempt made by the current investigator to establish measures of these factors. Table I in Appendix A presents a description of the test objects, and also shows the physical characteristics of each object.

Standardized Test of Readiness for First Grade

The Stanford Early School Achievement Test was selected for use as a standardized test for predicting readiness for first grade. The Stanford Early School Achievement Test, Level I (SESAT-I), is designed to provide a measure of the child's cognitive abilities at various levels, as follows: upon entrance into kindergarten, at the end of kindergarten, or upon entrance into first grade. The test consist of four parts: Environment, Mathematics, Letters and Sounds, and Aural Comprehension.

According to the Spearman-Brown Prophecy Formula, the reliability for the SESAT-I at the end of kindergarten is .825 with a standard error of measurement of 2.12. The reliability coefficient concerns the homogeneity of content or internal consistency of each part of the test. The coefficients obtained are of the magnitude expected since each part of the test is intentionally short, and reliability increases with test length.

Teacher Rating

At the end of the school term each kindergarten teacher rated the children in her room on a four point scale. The scale was: Excellent, Good, Average, or Poor. She placed each child in one of the four categories on the basis of her opinion as to the child's readiness for first grade.

Collection of Data

Test of Classification Skills

Arrangements were made with the administration and the individual teachers to allow the experimenter to administer the test of classification skills to the children during the regular school program. A small room with a table and two chairs was used as the testing center. Before starting the test, the experimenter talked to the child in order to establish a rapport. Then the experimenter proceeded with the test. The experimenter said, "I am going to play a game with you. We will play with some toys. I want you to tell me the name of each toy as I take it out of the bag." The experimenter placed the toys randomly on the table so that no two objects of the same obvious class were next to each other. The experimenter said, "Now I want you to put all of the things that belong together or go together in piles or bunches. You can have as many piles or bunches as you want. Do you understand?" After the child did this the experimenter checked each of the groups on to a score sheet. A sample score sheet may be found in Appendix B. Indicating each grouping of objects, the experimenter said, "Tell me why these things go together." The experimenter recorded verbatim the reasons the child gave for each grouping. When this was completed the experimenter mixed all of the toys together again. The experimenter then said, "Think of a different way to put the things that go together in piles or bunches. You can have as many piles or bunches as you want. Do you understand?" Recordings of their reasons for the groupings were made in the same manner as for the first trial. It took a mean time of twenty minutes per child to complete the trials of grouping

the objects which comprised the total test.

Scoring of Test of Classification Skills. Responses were scored on the basis of a system derived from the work of Kagan, Moss, and Sigel (1963) and Sigel (1961). The modes of classification were arranged in order of increasing maturity, as reported in the literature, and weighted values assigned as follows:

1. One point—No classifying.
2. Two points—Chaining—Relating one picture to another in a serial way.
3. Three points—Relational—Contextual.
 - a. Functional—When one or two objects are placed together on the basis of interaction in context.
 - b. Thematic—When one or two objects are related to another in story sequence.
4. Four points—Relational—Contextual.
 - a. Functional—When three or more objects are placed together on the basis of interaction in context.
 - b. Thematic—When three or more objects are related to one another in story sequence.
5. Five points—Descriptive—Color—Organized using color dimensions.
6. Six points—Descriptive—Form—Organized using properties such as round, flat, and straight.
7. Seven points—Descriptive—Structure—Based on descriptions designating specific intrinsic or inherent parts.
8. Eight points—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.

9. Nine points—Categorical—Class Label—When one term is used to define all objects.

A score sheet was developed for recording the responses of each subject at the time of the test. A sample score sheet with explanatory legend may be found in Appendix B. Each child's individual score was calculated on his score sheet. Individual scores were then transferred to a group score sheet. This information for all subjects along with other descriptive information may be found in Table II, Appendix B.

Standardized Test of Readiness for First Grade

The kindergarten teacher administered the SESAT-I to groups of ten children at one time. The test was administered in the regular classroom. Five sittings with a total time of ninety minutes were used to complete the entire test. The teacher called the test a choosing game rather than a test. Each child had a crayon and a marker. A practice page was done first to help familiarize the children with the test procedures.

Scoring of Standardized Test of Readiness for First Grade. Each part of the SESAT-I provides a separate score. These raw sub-scores and the total raw score are converted into stanines, a type of standard score. These standard scores range from nine for the highest scores through five for the middle scores to one for the lowest. Stanines always have the same percentile equivalents from one test to another.

The pupil's score on any part of the test should not be thought of as an exact determination of his level of achievement, but as an

approximation of this level. In any test situation some pupils are likely to guess occasionally; the attention of some may wander due to distractions; some children may not be feeling well physically; and many others may be affected by extraneous factors which may influence a test score. Such factors may change a child's test score, but usually not by more than one stanine. For this reason, it is advisable to consider a pupil's "true score" to be the stanine he obtains, plus and minus one stanine.

Each SESAT-I was scored by hand. A raw score, stanine, and percentage was obtained for each of the four individual parts and also a total score for the entire test.

Teacher Rating

The kindergarten teachers rated their class at the end of the school year in terms of readiness for first grade. This rating was done independently of any knowledge of the children's scores on either test. A more detailed description of the teacher rating process is given on page 16.

Analysis of Data

The one-way analysis of variance was used to examine the hypotheses set up for the study. The stanine scores were divided into four levels; level one including stanines two and three, level two including stanines four and five, level three including stanines

six and seven, and level four including stanines eight and nine.

A percentage count was used to determine the amount of different styles of classification, such as relational-contextual, descriptive, or categorical used by each child.

The total classification test score was determined by the use of the nine point scale. A sample of how to find the total classification score can be found in Appendix B.

The one-way analysis of variance was used to examine the following null hypotheses:

1. There is no significant difference in the test of classification skills for children according to:
 - a. Level of stanine score on SESAT-1.
 - b. Rating by teacher.
 - c. Sex.
 - d. Age.
2. There is no significant difference in the percentages of relational-contextual responses according to:
 - a. Sex.
 - b. Age.
 - c. Level of stanine score on SESAT-I.
3. There is no significant difference in the percentage of categorical responses according to:
 - a. Age.
 - b. Sex.
 - c. Level of stanine score on SESAT-I.
 - d. Rating by teacher.
4. There is no significant difference in the percentage of form

and color responses according to:

- a. Level of stanine score on SESAT-I.
- b. Sex.
- c. Age.

CHAPTER IV

RESULTS AND DISCUSSION

Examination of Major Hypotheses

Hypothesis I (a): Scores of kindergarten children on a test of classification skills are independent of the level of stanine score on the Stanford Early School Achievement Test. (SESAT) An F Score of 2.101 was obtained when the one-way analysis of variance was used to analyze the data in relation to this hypothesis. This result indicates the null hypothesis cannot be rejected and that the scores obtained on the test of classification skills are not significantly related to the level of stanine scores on the SESAT.

The SESAT measures several areas of children's cognitive abilities and combines the score of each area to obtain a total score. A child's Aural Comprehension score might be very high but his other scores could lower it. The Aural Comprehension section of the SESAT is designed to measure a child's ability to pay attention, organize, interpret, and infer, and to retain what has been heard. Relating the subscore for Aural Comprehension to a child's classification test score might conceivably show a relationship which is not found when comparing total SESAT score (converted into categories) with scores of the test for classification skills.

Hypothesis I (b): Scores of kindergarten children on a test of classification skills are independent of the rating of readiness for first grade by the kindergarten teacher. In order to examine this hypothesis, the one-way analysis of variance was also applied. An F score of .625 was obtained, showing the null hypothesis cannot be rejected. From this result, the conclusion is that the score obtained on the classification skills test and the rating by the teacher of the children's readiness for first grade are not significantly related.

A rating of children by a teacher undoubtedly includes subjective judgment and synthesis of a variety of influences. Even though skill in classifying may be basic to cognitive development, a teacher who has worked with a group of kindergarten children for an entire school year would consider many other factors in rating the children as to readiness for proceeding to the first grade.

Hypothesis I (c): Scores of kindergarten children on a test of classification skills are independent of the sex of the child. The kindergarten boys who participated in this study used a much greater proportion of modes of classification which the literature reported as more mature styles. Categorical-inferential and descriptive modes have both been reported to be more mature modes of categorizing than relational-contextual mode. This finding agrees with the findings reported in previous studies of classification skills.

The result showing that boys use a significantly greater proportion of more mature modes of classification than do girls at the kindergarten age poses some provocative questions with regard to

how parents socialize their children and how teachers interact with children even in kindergarten to encourage the development of different abilities between boys and girls. Another question meriting serious consideration is whether this result is desired and if it is not desired, what courses of action might change the pattern?

There is a possibility, also, that sex is masking an underlying variable which may in reality be the significant factor. Examination of the information available in the literature along with the information gathered in this study suggests that classification skills may more closely relate to dependency than to either age or sex.

Hypothesis I (d): Scores of kindergarten children on a test of classification skills are independent of the age of the child. An F score of .246 was obtained when the one-way analysis of variance was used to analyze the data regarding this hypothesis. The F score is not significant; therefore, the null hypothesis cannot be rejected indicating that age of these subjects was not related to the score on the classification skills test.

One possible reason for this lack of significant difference is because the age range was only from five years seven months to six years six months. If the range had been greater, it is quite possible that there would have been a significant difference.

Sigel (1953) found with children who were seven, nine, and eleven years of age that with increasing age, the trends were downward for perceptual categories and upward for the conceptual classification, thus a higher score on the classification test would be obtained.

Hypothesis II (a): The percentage of relational-contextual responses on the test of classification skills is independent of the level of stanine score on the SESAT. No significant relationship was found when the one-way analysis of variance was utilized to determine if there was a relationship between the percentage of relational-contextual responses and the level of stanine score on the SESAT. The F score obtained was 1.305.

The relational-contextual responses make up only a part of the possible responses on the classification skills test. The SESAT measures many areas and obtains a total score which were then converted into categories. It might be worthwhile to compare the aural-comprehension sub-score on the SESAT with the percentage of relational-contextual responses on the test of classification skills.

Hypothesis II (b): The percentage of relational-contextual responses on the test of classification skills is independent of the sex of the child. The one-way analysis of variance was used to analyze the data for examining this hypothesis. An F score of 5.388 was obtained which was significant at the .05 level. The girls used a much larger percentage of relational-contextual responses than did the boys in the study.

This result is in agreement with the findings reported by Sigel, et al. (1967) that girls use more relational-contextual responses than do boys. Kagan, et al. (1964) and Sigel, et al. (1967) found that for kindergarten boys, the use of relational-contextual responses is positively correlated with passivity, impulsivity, and dependency.

As evaluated by previous investigators, relational-contextual responses are at the low end in the hierarchy of the responses. A smaller percentage of boys used the relational-contextual responses than did girls, so this finding coincides with the finding that boys score higher on the classification test in general than girls.

Further work needs to be done to assess whether these responses reflect differences in cognitive skills and abilities or whether they are an indication of certain personality characteristics. With increasing emphasis on equality of opportunity for women, it may be important to study in greater depth whether some discriminatory factors are built into the life experience of many females from very early in their lives.

Hypothesis II (c): The percentage of relational-contextual responses on the test of classification skills is independent of the age of the child. In order to examine this hypothesis, the one-way analysis of variance was applied to the data. An F score of 2.923 was obtained, showing that a significant difference exists at the .05 level. Those children whose ages ranged five years, seven months through five years, nine months used more relational-contextual responses than did the older children.

This finding agrees with Sigel (1965) who reported that with increase in age there is a decrease in relational-contextual responses. Careful examination of the data reveals that of the fourteen children in the five years, seven month to five years, nine month range, seventy-one per cent of them were girls. Since previous investigators and the investigator in the current study have found that more girls than boys use the relational-contextual responses, the question arises

whether the skewness of the sample might be influencing the results.

Sigel (1971) found low impulse control to be positively related to relational-contextual styles of categorization. One would expect that the younger child would have lower impulse control than the older child.

Relational-contextual responses have been consistently found to be negatively related to "analytic thinking." Kagan, Moss, and Sigel (1963) found that with age, analytic responses increase. Therefore, the younger the child, the more relational-contextual responses he would be expected to use in classifying.

Hypothesis III (a): The percentage of categorical responses on the test of classification skills is independent of the level of stanine score on the SESAT. The utilization of the one-way analysis of variance to examine the data regarding this hypothesis revealed an F score of 1.409 which was not significant. The null hypothesis that the percentage of categorical responses on the test of classification skills is independent of the level of the stanine score on the SESAT cannot be rejected.

The total SESAT score was a combination of several subtests. The categorical responses were only a part of the total classification score. From examination of Table II in Appendix B, it would appear that the children who had a larger percentage of categorical responses had a stanine score of six or seven on the SESAT. It might be advisable to analyze these data further to compare possible differences between groups.

Hypothesis III (b): The percentages of categorical responses on the test of classification skills is independent of the rating of readiness for first grade by the kindergarten teacher. The one-way analysis of variance was used to analyze the data, to examine this hypothesis. An F score of .582 was obtained, which was not significant. Thus, one could not reject the null hypothesis that categorical responses on the test of classification skills is independent of teacher's rating by the children as to readiness for first grade.

As previously mentioned, there are many variables that enter into a teacher's rating of children. Discipline problems, personality, and preconceived ideas are a few of them. A classification test does not reflect these variables.

Hypothesis III (c): The percentage of categorical responses on the test of classification skills is independent of the sex of the child. In order to examine this hypothesis, the one-way analysis of variance was applied to the data. An F score of 4.680 was obtained, indicating a significant difference at the .05 level, with boys obtaining a larger percentage of categorical responses than the girls.

This finding coincides with the finding under Hypothesis I (c) that boys score higher on the total classification test. This finding also coincides with, and is related to, the finding under Hypothesis II (b) that boys use fewer relational-contextual responses than do girls. Categorical responses are at the upper end of the hierarchy

of classification scale. Therefore, the boys in this study are considered more mature than the girls in their ability to classify. The results reported in the literature also suggest that boys may be expected to use more categorical responses in classifying.

Hypothesis III (d): The percentage of categorical responses on the test of classification skills is independent of the age of the child. An obtained F score of .456 when the one-way analysis of variance was used indicates there is no significant difference in the percentage of categorical responses according to the age of the child.

As in the other comparisons involving age, range in age of the children would make it unlikely that major maturational changes would appear. If there were a wider range of ages, as there was in the study by Sigel (1953), one could expect that with increase in age, there might be changes in the percentages of categorical responses.

Hypothesis IV (a): The percentage of descriptive—form and color responses on the test of classification skills is independent of the level of stanine score on the SESAT. Since only eleven children chose this style of categorization as a response, the data related to this hypothesis were not examined by statistical analysis. Seven children chose color, three children chose form, and one child chose both color and form. Seven of the eleven children who chose form and color had a stanine score on the SESAT of seven or above. Of the children who chose to use this style of categorizing, sixty-four percent scored above average on the SESAT. From this information one might conclude that the use of the descriptive mode of categorization may not reflect immaturity or be undesirable for kindergarten children.

Seven of the eight children choosing color as a response used it twenty-five percent or more of the time. Three of the seven children using color used it sixty-six percent or more of the time. Sigel (1971) has suggested that the emphasis on the learning of colors in many kindergarten programs may bring about a greater use of this style of classification while a child is in kindergarten.

The four children who used form as a response used it only six percent of the time. Therefore, there was no further analyzing done. The question has been raised whether an emphasis on form that was equal to or greater than the emphasis on color in the kindergarten program might be reflected in greater use of form for classifying.

Hypothesis IV (b): The percentage of descriptive--form and color responses on the test of classification skills is independent of the sex of the child. Since the frequencies of use of the descriptive categories were so small this hypothesis was not examined by statistical analysis. There were eight boys and three girls that used color and form as a style of categorization. Form was chosen by three boys and one girl. Each only used it six percent of the time. Color was chosen by five boys and three girls in a range of five percent to ninety-two percent of the time. It was observed that seventy-three percent of those choosing the descriptive category of color and form as a response were boys.

Hypothesis IV (c): The percentage of descriptive--form and color responses on the test of classification skills is independent of the age of the child. Due to the small number of cases, this hypothesis was not examined by statistical analysis. The age range of the

children choosing form and color was from five years, nine months to six years, six months. Percentages of descriptive—form and color responses for each individual subject may be found in Table II, Appendix B.

CHAPTER V

SUMMARY

The general purpose of this study was to relate the classification skills of kindergarten children to their readiness for first grade. The specific purposes of this study were to examine evidence related to the scores of kindergarten children on a classification test according to: (a) level of stanine score on SESAT, (b) rating of readiness for first grade by kindergarten teacher, (c) sex, (d) age.

The sample was composed of fifty kindergarten children selected randomly from three sections of kindergarten in the Cushing Public Schools, Cushing, Oklahoma. There were twenty-five boys and twenty-five girls in the sample. The data were obtained during May of 1971.

The instruments used in this study were: (a) classification skills test administered by the experimenter, (b) Stanford Early School Achievement Test administered by the kindergarten teacher, and (c) teacher rating of the children in her class.

The one-way analysis of variance test was used to examine the data relating to each of the hypotheses. No statistical analysis was done for the hypotheses concerning color and form because of the small number of cases involved.

The results and conclusions of this study were as follows:

1. The F score was not significant; therefore, the score

obtained on the test of classification skills for children is independent of: (a) level of stanine score on the SESAT, (b) rating of readiness for first grade by kindergarten teacher, or (c) age.

2. The F score was significant beyond the .001 level in the scores obtained on the classification skills test for children according to the sex of the child. Boys scored significantly higher on the classification skills test than did the girls.
3. The F score was significant beyond the .05 level in the percentage of relational-contextual responses according to the sex of the child. Girls used a significantly greater percentage of relational-contextual responses than did the boys.
4. The F score was not significant; therefore, the percentage of relational-contextual responses is independent of:
(a) the age of the child, or (b) the level of the stanine score on the SESAT.
5. The F score was not significant; therefore, the percentage of categorical responses is independent of: (a) age, (b) the level of the stanine score on the SESAT, or (c) rating of readiness for first grade by the kindergarten teacher.
6. The F score was significant beyond the .05 level in the percentage of categorical responses according to the sex of the child. Boys used a significantly greater percentage of categorical responses than did the girls.

7. No observed difference was found to exist in the percentage of color and form responses according to: (a) the level of the stanine score on the SESAT, or (b) age.
8. An observed difference existed in the percentage of color and form responses and the sex of the child. Seventy-three percent of those choosing color and form were boys.

A general conclusion that can be drawn from this study is that boys appear to be more mature in their classifying abilities than the girls. The results of this study show that boys obtained higher scores on the classification skills test. The results also indicated that girls use more relational-contextual responses than do boys. Boys used a larger percentage of categorical responses. The results also showed that a larger percentage of boys chose color and form.

Recommendations of the Study

The author feels that further investigation of the classification skills of children are indicated as a result of this study. It is suggested that further studies be conducted with children of a wider age range.

The author further recommends that an ongoing study be directed to determine if children who made the lowest scores on the classification skills test in kindergarten would also make the lower scores at the end of first grade. It would be interesting to see if the children whose scores on the classification skills test were low also had difficulty with learning to read or understanding mathematic concepts as they progressed in school.

Further ideas are that this study be replicated with kindergarten subjects to obtain additional information about the modes of categorization. In addition, subscores for each of the individual parts on the SESAT might be correlated with the parts on the classification test.

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APPENDIX A

TABLE I

DESCRIPTION OF OBJECTS USED IN TEST OF CLASSIFICATION SKILLS

OBJECT	COLOR	MATERIAL	SIZE (IN INCHES)		
			L.	W.	H.
<u>Transportation</u>					
Boat	Blue/Red	Plastic	4 $\frac{1}{2}$	2 $\frac{1}{2}$	2
Car	Black	Metal	2 $\frac{1}{2}$	1	1 $\frac{1}{2}$
Airplane	Red	Plastic	5	4 $\frac{1}{2}$	1 $\frac{1}{2}$
Train Engine	Red/Blue	Plastic	5 $\frac{1}{2}$	1	3 $\frac{1}{2}$
Truck	Green	Metal	2 $\frac{1}{2}$	1	1
Tractor on red circle	Red	Metal/Plastic	2	1 $\frac{1}{2}$	1 $\frac{1}{2}$
<u>Furniture</u>					
Dresser	Black	Plastic	3	1	4
Bed	Black/White	Plastic	3 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$
Table	White	Plastic	4	2 $\frac{1}{2}$	2
Sofa on blue circle	Blue	Plastic	3 $\frac{1}{2}$	1 $\frac{1}{2}$	2 $\frac{1}{2}$
Office Chair	Red	Plastic	1	1	2
Lounge Chair	Green	Plastic	2	1 $\frac{1}{2}$	2 $\frac{1}{2}$
<u>Animals</u>					
Duck	Red	Plastic			2 $\frac{1}{2}$
Cow	Black/White	Plastic			1 $\frac{1}{2}$
Dog	Black/White	Plastic-Soft			2
Horse	Red	Plastic			2 $\frac{1}{2}$
Snake	Green	Wood	14		
Chicken-orange circle	Black/White	Plastic			1 $\frac{1}{2}$
<u>People</u>					
Man	Blue/Orange	Plastic/Cloth			5
Woman	Red/Black	Plastic/Cloth			11 $\frac{1}{2}$
Girl	Pink/Orange	Plastic			7
Baby	Pink/White	Plastic/Cloth			4 $\frac{1}{2}$
Soldier-green circle	Green	Plastic			2 $\frac{1}{2}$
Sailor	Blue/White	Plastic-Squeeze			4 $\frac{1}{2}$

Summary of Attributes of Objects

Six Furniture

All plastic.

Five colors--black, white, blue, red, and green.

Six Animals

Four plastic, one soft plastic, one wood.

Five colors--red, black, white, green, and orange.

Six People

Three plastic with cloth, one squeeze plastic, two plastic.

Seven colors--blue, orange, red, black, pink, white, and green.

Six Transportation

Three plastic, two metal, one metal and plastic.

Four colors--blue, red, black, and green.

APPENDIX B

SCORE SHEET FOR TEST OF CLASSIFICATION SKILLS

GROUP	TRIAL I												TRIAL II											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
MAN	✓																✓							
WOMAN	✓												✓											
GIRL	✓																			✓				
BABY	✓																					✓		
SOLDIER	✓																					✓		
SAILOR	✓																					✓		
DRESSER		✓																				✓		
TABLE		✓																				✓		
SOFA		✓																				✓		
LOUNGE CHAIR		✓																				✓		
OFFICE CHAIR		✓																				✓		
BED		✓											✓											
CHICKEN			✓																			✓		
DOLL			✓											✓										
DOG			✓												✓									
ROCK			✓													✓								
HORSE			✓														✓							
SNAKE			✓															✓						
BOAT				✓												✓								
CAR				✓																		✓		
PLANE				✓																			✓	
TRACTOR				✓											✓									
TRAIN				✓												✓								
TRUCK				✓																		✓		

Name Child no. 1
 Date May 18, 1971
 Birthdate December 17, 1964
 Age Six years five months
 Sex Male
 SESAT Stanine Score 9
 Teacher Rating Excellent
 Classification Score 6.47

Mode of Classification	Weighted Value
No classifying-----	1
Clustering-----	2
Relational-Contextual-one or two objects-----	3
Relational-Contextual-three or more objects-----	4
Descriptive-Color-----	5
Descriptive-Form-----	6
Descriptive-Structure-----	7
Categorical-Functional-----	8
Categorical-Class Label-----	9

Classification Test Score = $\frac{\text{sum of weighted value for each grouping}}{\text{total number of groupings}}$

TRIAL I

Group	Verbal explanation for grouping	Mode of Classification*	Weighted Value	
1	All dolls or people.	9	9	
2	All furniture.	9	9	
3	All animals.	6	6	
4	You ride them.	8	8	
			Sub Total	35

TRIAL II

Group	Verbal explanation for grouping	Mode of Classification*	Weighted Value	
1	She sleeps on it.	3	3	
2	Both go on a farm.	8	8	
3	Both run on a track or road.	8	8	
4	Some people take their dog on a boat.	3	3	
5	Sometimes men find snakes.	3	3	
6	They are both birds.	9	9	
7	Both run on wheels.	7	7	
8	People sit on chairs.	9	9	
9	Both have flat tops.	6	6	
10	Both work with guns.	6	6	
11	People ride on airplanes.	3	3	
			Sub Total	62

Total Weighted Value-----97
 Total number of groupings-----15
 Classification Test Score-----6.47

TABLE II

DESCRIPTION OF SUBJECTS TEST SCORES, TEACHER RATING, AND PERCENTAGES OF RESPONSES IN EACH CATEGORY OF THE CLASSIFICATION TEST

Child	Age	Sex	S E S A T Stanine Score	Teacher Rating	Classification Test Score	Percentages of Responses in Each Category of the Classification Test									
						No Classifying	Chaining	Relational-Contextual 1 or 2 Objects	Relational-Contextual 3 or More Objects	Descriptive Color	Descriptive Form	Descriptive Structure	Categorical Functional	Categorical Class Label	
1	6-6	F	7	Good	5.88		5.9	11.7			35.3			41.2	
2	6-6	M	7	Ave.	4.68			52.7	21.1		5.9			10.5	15.8
3	6-6	F	4	Ave.	3.76			76.2	9.5			4.8		9.5	
4	6-6	M	7	Ave.	6.10	40.0	40.0	10.0	20.0					60.0	
5	6-6	F	5	Ave.	2.00			20.0							
6	6-6	M	5	Good	4.63		5.3	36.8	26.3		5.3	5.3		15.7	5.3
7	6-6	M	7	Exc.	6.78			35.7	7.1					42.9	14.3
8	6-6	F	7	Good	4.80			53.4	13.3					33.3	
9	6-6	M	9	Exc.	6.40			26.7			6.6	6.6		26.7	26.7
10	6-6	F	5	Ave.	4.52		5.3	42.1	26.3					26.3	
11	6-6	M	6	Good	6.64			17.6	11.8					70.6	
12	6-6	F	7	Exc.	3.57	10.5	5.3	42.1	31.6					10.5	
13	6-6	M	5	Good	6.37			25.0		25.0				12.5	37.5
14	6-6	M	8	Exc.	5.52			11.8	47.0					41.2	
15	6-6	M	5	Good	4.08		6.3	8.3							
16	6-6	M	6	Exc.	5.12			31.2	25.0		6.3			12.5	18.7
17	6-6	F	9	Exc.	5.71			35.7	14.3					42.9	7.1
18	6-6	F	5	Ave.	4.52			5.3							
19	6-6	F	7	Good	6.61	5.6	5.6	5.6	11.0		78.9			66.6	5.6
20	6-6	F	5	Ave.	2200	75.0	12.5							12.5	
21	6-6	M	7	Ave.	6.50			16.7	16.7		66.6				
22	6-6	F	4	Ave.	5.00			35.7	35.7					7.2	21.4
23	6-6	M	3	Poor	5.58			50.0						41.7	8.3
24	6-6	F	7	Good	4.04		14.3	47.6	14.3		4.8			19.0	
25	6-6	M	5	Good	4.58			41.2	35.3					17.6	5.9
26	6-6	F	3	Poor	3.57			71.4	21.4					7.2	
27	6-6	F	6	Ave.	5.37			12.5	50.0					37.5	
28	6-6	M	8	Ave.	5.36	9.1		27.3	18.1					36.4	9.1
29	6-6	M	7	Exc.	5.16	8.3	6.2	25.0	25.0					41.7	
30	6-6	F	7	Good	4.18		6.2	43.8	31.2					18.8	
31	6-10	M	6	Exc.	6.00		37.5							37.5	25.0
32	6-10	M	4	Ave.	6.71			14.3	14.3					71.4	
33	6-10	M	6	Ave.	6.92			23.1	7.7					30.8	38.4
34	6-10	M	5	Ave.	3.35		23.5	47.0	11.8			5.9		5.9	
35	6-10	M	6	Ave.	5.40			40.0	20.0					20.0	20.0
36	6-10	M	4	Good	5.69			15.4			38.4			7.7	
37	6-10	F	7	Exc.	4.21			50.0	31.2					12.5	6.3
38	6-10	M	7	Exc.	4.06		6.3	43.7	31.1		6.3			6.3	6.3
39	6-10	F	6	Good	8.75									25.0	75.0
40	6-10	F	4	Ave.	2.72		27.8	72.2							
41	6-10	F	5	Ave.	6.50				37.5					62.5	
42	6-10	F	7	Exc.	4.40			40.0						20.0	
43	6-10	F	5	Ave.	5.00			33.3				6.7		20.0	6.7
44	6-10	F	7	Exc.	4.91	8.3		33.3	25.0					16.7	16.7
45	6-10	F	5	Ave.	3.18	18.1	9.1	34.6	9.1					9.1	9.1
46	6-10	M	5	Ave.	6.50			31.2	6.4					31.2	31.2
47	6-10	F	3	Poor	4.00		5.3	63.2	15.7					5.3	10.5
48	6-10	M	6	Ave.	3.30			86.9	8.7					4.4	
49	6-10	M	3	Poor	4.71		7.2	42.8	21.4					14.3	14.3
50	6-10	M	6	Ave.	5.93			43.8				12.5		31.2	12.5

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