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EFFECT OF TYPE OF PLANNED EXPERIENCE ON EQUIVALENCE-CHOICES OF FOUR-YEAR-OLD CHILDREN

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Marian Colonna Marion, B.S., M.S.

* * * * *

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CHAPTER I

INTRODUCTION

Background of the Problem

Since the 1960's interest in the theory of cognitive development proposed by Piaget has become widespread. Educational programs for preschool children have been designed to incorporate Piagetian concepts in their teaching strategies (Weikart, 1971; Kamii, 1970; Lavatelli, 1968). Teachers in other preschools have begun to ask what Piagetian theory means for curriculum development in their classrooms.

Almy (1976) says that educators have often used Piaget's research to "...determine 'what' children should be taught," i.e., to determine just which activities belong in classrooms and in what sequence the activities should be presented. Almy suggests, however, that educators should use Piagetian research to determine not only what children should be taught but also how they should be taught. An understanding of how children are to be taught evolves from a knowledge of what contributes to the movement from one level of intellectual functioning to another.

Piaget (1970) cites classical factors of development, the factors responsible for the transition from one stage to another. There are four: maturation, equilibration, experience, and social interaction. Two of these have particular relevance in the present study. They
are action on the physical environment and social transmission.

One of the major assumptions of Piaget's theory is that organism-environment interaction is crucial in cognitive development. Piaget views the organism as an active agent. The operation is basic to his theory, i.e., the child, in order to know an object must act on it in some way. Organisms of different ages perform operations using different modalities. The preschool child needs much contact with real objects (Piaget, 1968). Several researchers have supported Piaget's contention regarding the need for experience with objects (Held, 1965; Miller, 1969; Wolff and Levin, 1972; Torrance, 1974).

In addition to experience with objects, social interaction is important in moving children to higher levels of thinking. Both Piaget (1970) and Kamii (1972) view this in a broad sense. They see some knowledge as transmitted only through persons in the environment, through the reading of books or through other media. They are speaking of knowledge not attainable merely through manipulation of objects. Almy (1976) states that while action on objects is important in development, so are words which describe and/or question the action performed. One of a teacher's functions is to help a child think about what he has done when he has manipulated an object. A major objective of this study was to examine the relationship of the Piagetian concepts of action on objects and social interaction to the process known as equivalence-making. Equivalence-making is the ability to detect similarities between or among objects (Bruner and Olver, 1966).

Human beings are constantly bombarded with changing stimuli. Chaos would result should we try to deal with each stimulus separately.
For economy of operation—Bruner and Olver (1970) call this "achieving a reduction in load"—seemingly diverse stimuli are grouped, i.e., equivalence is placed on two or more objects. This ability to group objects is considered to be a basic intellectual skill. The importance of grouping skills has been emphasized by both Olmsted et al. (1970) and Osborn (1975) who view the ability to see similarities among stimuli as a requisite competence in the attainment of concepts. Indeed Bruner (1966) views both the ability to make equivalence choices and the ability to conserve as learning how two things are alike, whether the things are a coat and a hat or two rows of poker chips. Olmsted et al. (1970) view grouping skills as basic to many subject matter areas in school.

The growth of the ability to make equivalence-choices, like many other cognitive abilities, develops gradually in a series of stages, each building on the stages that preceded it. These stages in the ability to group objects are discussed by Ginsburg and Opper (1969) in a review of Piagetian experiments. During stage one (ages two to five) children who are presented with toys for grouping showed an inability to form true classes. Yet they could observe similarities among the objects. During this stage, the child begins by grouping two things on the basis of one attribute. Later, the number of things grouped and bases for grouping become more numerous. The older child groups, not only on the basis of observed characteristics, but also on the basis of inferred characteristics (Olmsted, 1970).

Every object in the environment, because it possesses multiple characteristics, can be grouped on many bases, e.g., size, shape,
function. Each of these attributes is potentially the basis for including an object in a particular group. These different criteria for placing items in categories are the basis for preferred modes of grouping objects (Olmsted et al., 1970).

Several modes of equivalence-making have been identified, some of which are used more by children at different ages. Of interest here are two of the modes of making equivalence-choices, the perceptible and the functional modes. Perceptible grouping involves grouping on the basis of available cues such as color, size, shape. Functional grouping is based on what the object can do or what can be done to the object (Olver and Hornsby, 1966, pp. 71-72). Olver and Hornsby found that the basis for equivalence-making changes with age. The six-year-olds in their study grouped more often according to perceptible cues. With increasing age, there was an increase in the use of the functional mode for equivalence-making between objects. The authors maintain that functional equivalence-making is a more mature form of grouping than the perceptible mode. The older child, unlike a younger child, is not bound by surface features of objects. A conflict arises when the uses of things are pitted against the appearance of things. This conflict, according to Olver and Hornsby (1966) promotes cognitive growth.

The centrality of grouping skills in cognitive development and in other school activities and the stage-like development of grouping skills has implications for curriculum planners of programs for preschool children. Several studies have shown that experiences can
be planned which increase equivalence-making and grouping skills (Denny and Acito, 1974; Butters, 1972; Miller, 1969). There has been, however, a paucity of experiments which test the efficacy of one type of experience over another. In the present study, four specific methods of fostering higher level equivalence-choices in preschool children were tested.

In planning experiences for young children, a primary consideration must be the children's level of development. The general objective of the present study was to extend the experimental procedures used in the equivalence-making research to investigate the question raised: Which of the types of planned experiences are most effective in fostering higher levels of equivalence-making in preschool children? Jean Piaget's theory of cognitive development stresses the importance of organism-environment interaction at all stages and action on concrete objects during the preoperational stage. It would seem reasonable to hypothesize that, during the preschool years, activities involving overt manipulation of objects would result in higher levels of equivalence-making than would activities not involving overt manipulation of objects.

Evidence supporting this general hypothesis would strengthen Piaget's theory of organism-environment interaction in the construction of knowledge by adding to a growing literature on the need for motor activity in learning (Held, 1965; Wolff, 1972; Wolff et al., 1974). Such evidence would also have a practical application. Classroom teachers could use the findings when deciding which specific methods to use to foster equivalence-making skills of the children in their
classes. Teachers could also use such results in deciding how much
credence to place in the ability of "Sesame-Street type" observational
learning methods to facilitate equivalence-making skills. Together
with other studies indicating superiority of manipulation of objects
in the learning process of young children, this study would add to
a body of knowledge showing the desirability of using teaching methods
appropriate to a child's developmental level. The study would have
relevance to persons in child development, nursery education, and
developmental psychology.

Statement of the Problem

What is the effect of different types of planned experiences on
the equivalence-making behavior of four-year-old preschool children?
Specifically the study examined the effects of two independent vari­
ables, type of manipulation and type of verbal mediation on the
dependent variables of acquisition and retention of equivalence-making
skills. Research hypotheses, derived from related theory and research
are listed at the end of Chapter II, "Review of Literature."

Plan of the Study

This study was designed to test and compare the effectiveness
of four types of planned experiences on the equivalence-making skills
of four-year-old nursery school children. The independent variables
were type of manipulation and type of verbal mediation. The dependent
variables were level of equivalence-making judged to be functional
as measured on a test of equivalence-making (1) after four weeks of
planned experience sessions, i.e., gain scores, and (2) six weeks
after the first posttest, i.e., retention scores.

Eleven preschools were randomly selected for the study from 150 preschools in Franklin County, Ohio. Seventy-six children, 43 boys and 33 girls served as subjects. Subjects were randomly selected for pretesting from the population available in the eleven schools. The study had four experimental groups with 19 subjects in each group. A total of 71 subjects were available for the retention test.

To test for levels of equivalence-making, the Fisher-Miller Test of Equivalence-Making was used (see pp. 35-38 for a description of the test). This test was administered to subjects for both pretest and posttests.

Each experimental group was exposed to a different type of planned experience. Five planned experiences per subject were completed in four weeks. Experiences extended over five weeks for one of the schools. The first posttest was given immediately after the last planned experience session. The second posttest was given six weeks after the first posttest.

The data were analyzed by a two-way factorial analysis of variance to allow sources of variation in independent variables (type of manipulation and type of verbal mediation) to be analyzed at the same time. Multiple comparison hypotheses were tested by performing t-tests on the gain means of various combinations of the independent variables. A two-way analysis of variance was performed to determine the retention effect of the different types of planned experiences on the equivalence-making gain scores. For each type of planned
experience the first posttest mean was compared with the second post-
test mean six weeks after Posttest 1 to determine which of the methods
was effective in maintaining or increasing the level of equivalence-
making.

Definitions

The definitions used in this study are presented in this section.
The terms associated with Piagetian Theory are derived from original
work of Piaget (1970) and the terms dealing with equivalence-making are
derived from the original writings of Bruner (1966).

Equivalence-making

Grouping discriminately different things and treating them as
the same or alike. Equivalence-making is a learned achievement which
parallels changes in cognitive development. The basis for grouping
seemingly different objects into classes based upon a single attribute
shifts as children grow older. Equivalence-making can be done
according to any one of several modes such as perceptible, functional,
nominal, or fiat (Olver and Hornsby, 1966, p. 68).

Perceptible equivalence-making

The child makes an equivalence-choice based on immediate
phenomenal qualities, i.e., color, size, shape, number, or position
in time or space (Olver and Hornsby, 1966, p. 71).

For example, the coat and hat are alike because they are
the same color.

Functional equivalence-making

The child makes an equivalence-choice based on the use or
function of the items, considering what they do or what can be done to them (Olver and Hornsby, 1966, p. 72).

For example, the coat and hat go together because you can wear them.

**Nominal equivalence-making**

The child may group the items by giving a name that already exists in the language (Olver and Hornsby, 1966, p. 72).

For example, the coat and hat go together because they are clothes.

**Fiat equivalence-making**

The child may merely state that items go together without giving any further information as to the basis of his grouping even when he is prodded (Olver and Hornsby, 1966, p. 72).

For example, the coat and hat go together because my Mommy told me so.

**Cognitive development**

"The development of a logical method of looking at the world, utilizing one's perceptual and conceptual powers" (Developmental Psychology Today, p. 550).

**Sensorimotor stage**

The first of the periods of development in Piagetian theory.

"A sensorimotor period lasts until approximately 1½ years of age with a first subperiod of contration on the subject's own body (lasting about 7 to 9 months) followed by a second one of objectivization of the schemes of practical intelligence." (Piaget, 1970, p. 711).
Preoperational stage

One of the periods of development in Piagetian theory. In this stage, "... (there is no reversibility or conservation, but the beginnings of directional functions and qualitative identities), ... begins around 1½ to 2 years of age with the formation of semiotic processes such as language and mental imagery" (Piaget, 1970, p. 711).

Logicomathematical experience

"... involves acting upon objects. ... knowledge derived from it is. ... based on ... properties of the actions that are exerted on them [objects]. This knowledge seems to be derived from the objects because it consists of discovering by manipulating objects, properties introduced by action which did not belong to the objects before these actions" (Piaget, 1970, p. 721).

Physical experience

"... consists of extracting information from the objects themselves through a simple process of abstraction. This abstraction reduces to dissociating one newly discovered property from the others and disregarding the others. ..." (Piaget, 1970, p. 721).

Operation

"... knowledge is always linked with actions or operations, that is, with transformations." The operation, then, is the acting of an organism on an object and transforming the object. The organism "... must displace, connect, combine, take apart and reassemble them." (Piaget, 1970, p. 704).
CHAPTER II

REVIEW OF LITERATURE

The literature reviewed in this chapter is grouped into two major sections. In the first section, emphasis is on Jean Piaget's theory of intellectual development with a concentration on the need for experience in the form of manipulation of objects and social interaction during the preoperational stage. The second section emphasizes research in two areas: (1) organism-environment interaction--motor activity in sensorimotor coordination, and (2) development of equivalence-making skills through instruction. The review of literature is concluded with the research hypotheses for the study derived from the theory and research cited in this chapter.

Theory

Nature of Intelligence

In Piaget's framework, intelligence evolves as a result of an organism's continuous interaction with the environment (Piaget, 1970). The development of intelligence in this view is always connected with action, whether this action be the sensorimotor type or the purely mental operations. The organism performs some act and receives a new sensory message as a consequence of that action. By this process a complex of adaptive, reality-oriented acts is accumulated, linked, integrated and, according to Piaget (1963a), finally abstracted from the sensorimotor to higher levels of intelligence. Uzgiris (1967)
found a need for such interaction when, in her study of infant-toy interaction, she noted that the sequential acquisition of schemata represent a developmental hierarchy growing out of the infant's numerous interactions with the objects. Almy (1976) maintains that the essence of Piagetian theory is that children arrive at an understanding of the world through their own efforts. She believes that children must discover ideas for themselves.

**Operations.**—Piaget maintains that the essence of knowledge is the operation, i.e., the act of doing something to an object to make it comprehensible. To know an object, an organism must act on that object. He must "...displace, connect, combine, take apart, and reassemble. . ." (Piaget, 1970, p. 704).

**Stages.**—In Piaget's theory, the construction of intelligence occurs through different cognitive modalities at different stages. These modalities delineate the nature of the operations an individual uses in his interactions with the environment. The infant's environmental encounters are at first dominated by reflexive behaviors. With maturation and experience, the baby develops additional schemata -- e.g., examining, holding, shaking, mouthing -- which enable her to respond more effectively to objects she encounters (Uzgiris, 1967).

Preschool children, in Piaget's second or preoperational stage, begin to internalize their actions and derive a mental picture of the object on which they have acted. This does not, however, mean that preschool children can perform operations in the absence of concrete objects. On the contrary, Piaget maintains that
until a child is eleven or twelve years old, the operations of intelligence are bound up with concrete objects which can be manipulated (Piaget, 1968, p. 62). A preschool child's thought is based on action and manipulation (Piaget, 1968, p. 29).

Need for Experience and Manipulation of Objects

The notion that young children learn best when they sit quietly is viewed by Elkind (1974) as a misunderstanding about how young children learn. The view of the development of intelligence underlying this assumption is that the organism is a passive recipient of facts. Such a view of learning is not held by those working within a Piagetian framework. In a discussion of the classical factors of development, Piaget cites experience in the sense of acquisition of new knowledge through manipulation of objects as critical in intellectual development (Piaget, 1970, pp. 719-721). Piagetians, then, maintain that manipulation of objects can be done either physically or mentally depending on the organism's level of operation. The thought of children, Elkind (1974) states, is qualitatively different from adult thought. Children construct their thought differently than do adults. Elkind maintains that young children learn by acting on real things whether the things are pieces of playdough, blocks, or food.

Experiences affecting the development of intelligence.—Piaget feels that this "action on things" leads to two types of experiences:

1. Physical experience is drawn directly from observing the physical environment. It involves the extraction of the physical
properties of objects. In terms of equivalence-making skills, a child looking at an object might learn perceptible characteristics of that object, e.g., a ball is round, soft, and smooth.

2. Logical-mathematical experience results in knowledge acquired through an internal coordination of the child's actions and not just through physical experience. An example is that of physical arrangement. Given, for example, 12 poker chips with which to play, the child will eventually "discover" that the number of chips remains the same despite rearrangement. This discovery will be made only through repetitions of counting and recounting, arranging and re-arranging (Ginsburg and Opper, 1969).

In terms of equivalence-making behavior, if one accepts the functional as superior to the perceptible mode, and if perceptible cues can be gleaned from physical experience, then functional cues should be attainable from the logical-mathematical experience that would result from making an object "do something" so that one discovers its various functions. Subjects in planned experience types I and III in the present study engaged in such a logical-mathematical experience by overtly manipulating objects.

Need for manipulation of objects.--Logical-mathematical experience requires concrete objects for the child to manipulate. In an interview with Piaget, Duckworth (1973) raised questions about the need for a child's interactions with objects. Piaget replied that one of the best things a teacher could do to foster intellectual development would be to provide a child with real things to manipulate. The only beneficial aspect of the ready-made kits available to teachers,
Piaget maintains is the fact that they supply real objects to manipulate (Duckworth, 1973). Because such manipulation is central in his theory, Piaget does not approve of the substitution of photographs or films for the experience with real objects. In planning experiences to foster equivalence-making skills, then, real objects and not pictures or films should be used. A major objective of this study was to ask whether manipulation of real objects would foster equivalence-making skills more readily than would observation both on immediate and delayed posttests. Two of the main effects hypotheses tested this question.

If, Ginsburg and Opper say, that the theoretical stance of Piaget on the need for manipulation of concrete objects is accurate, then teaching young children by simply telling them something is superficial learning for children and this learning does not equal true understanding. Real comprehension involves action. They maintain that higher levels of understanding (verbal expression of ideas) depend on the lowest level (motoric expression). Verbal understanding is dependent on the child's having established a solid basis in concrete manipulation of objects.

The importance of motoric activity in the development of higher levels of understanding is illustrated by Ginsburg and Opper (1969) with an example germane to the present study. The example involves the notion of class inclusion. Class inclusion involves the knowledge that a hypothesized grouping is larger than the sub-groups of which it is composed. The authors maintain that a grasp of this sophisticated
concept begins with just being able to detect similarities and differences. Detection of similarities, or equivalence-making begins with physical manipulation of the objects by which the child gains, in Piaget's theory, physical experience. Only later, after much manipulation of the objects, can an older child begin to manipulate objects, not with his hands, but in his head. These mental operations of the older child are entirely dependent on earlier manipulation of concrete objects.

If manipulation of objects is necessary before verbal operations have meaning, then, in terms of fostering equivalence-making skills, a child would probably have more success if motor practice accompanied any verbal instruction. A multiple-comparison hypothesis tested this idea in the present study.

Piaget's main contention is that real learning for the child evolves only after the child has invented her own knowledge. Piaget (1970) maintains that if we prematurely "teach" something that the child should have invented, then we hold the child back from true understanding. However, Piaget stresses the teacher should establish situations in which the child's invention through manipulation of objects is facilitated (Piaget, 1973). The teacher can provide the time, materials, and space so that the child will invent knowledge, but the teacher cannot invent the knowledge for the child solely through verbalization.

The teacher, however, can use words to foster higher levels of thought if the words relate directly to a child's actions. The role of the teacher in this situation is to use her listening and questioning
skills to find out what the child understands about the manipulations and to help the child think about what she has done. In the present study, the effect of combining a verbal mediating experience with overt manipulation of objects on the equivalence-making skills of the subjects was examined.

Research

Organism-Environment Interaction—
Motor Activity in Sensorimotor Coordination

Several studies, carried out both with animals and children, have indicated the importance of motoric activity in sensorimotor coordination. The results of this research lend support to one of the central issues in Piaget's theory, that organism-environment interaction is necessary in the construction of knowledge and that during the preoperational stage, overt manipulation of objects is the preferred mode of interaction.

One example of the work done to illustrate the importance of motor activity in sensorimotor coordination is that of Held (1965). Kittens, reared in the dark, were the subjects. For the practice condition, pairs of kittens were hitched to an apparatus which allowed the kittens to move in a circle. One kitten walked; the other rode in a basket. It was during these sessions that the kittens received their only visual stimulation. After thirty hours of walking and riding, only the active (the kitten who walked) showed normal behavior in visual tests. Held concluded that the ability to understand changing perceptual information requires feedback from the muscles and motor components of the central nervous system.
Results of studies with young children point to the importance of overt manipulation of objects in the child's learning. Uzgiris (1967) noted that previously an infant's increasing ability to interact efficiently with toys was thought to be indicative only of the infant's more advanced motor ability. In an observational study of 84 infants (ages 1 to 23 months) however, she found, that in addition to being an index of motor dexterity, manipulation of objects fostered coordination and extension of cognitive schemata (Uzgiris, 1967, p. 318).

Piaget and Inhelder (1963b) found that the ability to recognize and describe three-dimensional objects and flat geometric shapes (when vision was blocked) was linked to the way in which the figures were handled. Preschool children who could recognize the figures were those children who explored them, traced around them, and felt the shapes.

Torrance (1970), in a study with small groups of six-year-old first grade children found that these children asked a greater number of as well as more complex questions when they were allowed to actively manipulate objects than when they were shown the object and asked to watch the object being demonstrated by the experimenter. A major objective of the present study was to determine whether active manipulation of objects facilitated a cognitive ability other than question-asking. The ability under study in the present experiment was the making of equivalence-choices.

Wolff and Levin (1972) and Wolff, Levin, and Longobardi (1974) investigated the effect of overt manipulation of objects on paired-associate learning of kindergarten children. Wolff and Levin (1972) found in the first experiment that children who manipulated objects
themselves or watched the experimenter manipulate objects performed better on the paired-associate task than did either the group who held the object but did not manipulate or the comparison (control) group who were neither allowed to engage in or observe overt manipulation of objects. In the second experiment, Wolff and Levin (1972) found that even when vision was blocked, children who manipulated objects had a superior performance on the paired-associate task when compared with children who were not permitted to move the objects. The effectiveness of subject-manipulation as well as experimenter-manipulation on a different cognitive skill, equivalence-making was examined in the present study.

Wolff et al., (1974) found no difference in either performer or observer (those who manipulated vs. those who watched an object manipulated) paired-associate recognition when kindergarten children were tested immediately following the experimental conditions. However, after a twenty-four hour delay, the children who motorically acted on the objects performed significantly better than did the children who observed another person manipulate the objects. In the present study, as in the Wolff study, the difference between S-Manipulate and E-Manipulate were examined, both on an immediate as well as on a delayed posttest. In terms of the present study, it was hypothesized that children who manipulated objects would perform better on the retention level, the second posttest of equivalence-making, than children who observed the examiner manipulate objects.

In summary, Wolff et al., (1974) concluded that the worst performance resulted when a child was not permitted to engage in or to observe overt activity on objects. A significantly better performance
resulted when the child was allowed to (1) actively manipulate the toys with no visual feedback or (2) watch interacting pairs with no motor involvement, i.e., observation of another's performance. Retention was best when a child was allowed to both actively manipulate the toys and to observe the effects of his activity. They conclude that learning in young children seems to involve the perceptual and motor systems in a closed-loop feedback system (Wolff et al., 1974, p. 223).

Wolff's studies dealt with paired-associate learning. In the present study the possibility was investigated of obtaining similar results for equivalence-making skills in preschool children.

Development of Equivalence-Making Skills Through Instruction

Several studies have shown that equivalence-making skills can be enhanced in young children through the use of special "training" techniques.

Denny and Acito (1974) used a modeling technique which was effective in raising the equivalence level of two and three-year-old children. The modeling method consisted of the child watching the experimenter group the items and listening to the verbalization of the procedure by the experimenter. The child was then given the chance to manipulate the materials. In the present study the subjects watched the experimenter manipulate objects while listening or not listening to verbal mediation. Of interest in the present study was the effect of not allowing manipulation of the objects by subjects who watched the experimenter.
Olmsted et al., (1970) carried out a project with seventy-two kindergarten children in which "training" was done by classroom teachers. Training significantly enhanced the child's ability to group items. The teachers, working with small groups of children, conducted the "training" sessions fifteen to twenty minutes per day for twenty days. Using real objects, teachers encouraged children to talk about the objects. Thus, the method was mainly observation combined with verbalization on the part of the child. The authors maintained that the classification training given the children significantly raised the child's ability to group items.

The effect of manipulation on equivalence-making skills was of primary concern in the present investigation. Manipulation was, therefore, treated as a manipulated, independent variable. Children either performed themselves or watched manipulation of objects performed by others.

Butters (1968) carried out one of the few studies that compared training methods for equivalence-making. The subjects were forty-seven first grade children (mean age six years, seven months). Each child was pretested and then one training session for each child was completed. Three methods were used: (1) Verbal Practice—the subject was presented with the names of items typed on cards and was asked "How is ________ like ________?" (2) Perceptual Practice—the child was shown an exemplar of the typed list but was not allowed to touch the objects, (3) Functional Practice—this group used exemplars of the practice list in appropriate functions. A comparison group worked with puzzles for the length of time of training—thirty minutes.
No changes in equivalence groupings were found for the functionally trained group. Butters (1968) maintained that the presentation of concrete objects actually consolidated the child's low level perceptible mode of equivalence choices. The effect of functional practice with four-year-old subjects was examined in the present study.

Chiapetta (1972) found in his study that verbal training enhanced grouping three-dimensional objects more than did grouping without verbal training for second grade children. Meichenbaum (1971) found that having subjects verbalize about the nature of a task and a plan of attack while performing a task caused impulsive children to slow down their reaction time and make fewer errors on Kagan's Matching Familiar Figures test. He concluded that explicit verbalizing of strategies is likely to enhance cognitive development. He recommends that concept-formation activities should include a chance to verbalize strategy as the task is being carried out and not after the task is completed. The present study examined the effect of verbalizing the function while performing the function of the object, something not done by Butters but recommended by Meichenbaum two years after Butter's study.

The subjects in Miller's (1969) study were four-year-old children. Training was accomplished in eight, ten-minute sessions completed in four weeks. Three levels (one level was a control) of the variable type of training were examined: (1) Manipulative—the child was given a set of twenty pictures and played with them as he/she wished, (2) Verbal Manipulative—the child was presented with a set of cards and the trainer elicited equivalence-choices from the child. Results
showed that the verbal manipulative group responded at a significantly higher level than did controls. No significant changes were found with the manipulative-only group. After eight weeks, training effects were maintained. The present study included a subject-manipulative group as well as a group which combined subject-manipulation with verbal mediation. However, instead of pictures, the present study used life-size objects on which the child performed actions. This is consistent with theory and research previously cited concerning the need for real objects with which to work during the preschool years.

Summary of Review of Literature

Reviewed in this chapter was the nature of intelligence according to the theory of Jean Piaget. An emphasis was placed on one of the central ideas of the theory, that intelligence evolves as a result of organism-environment interaction. Also emphasized was the idea that preschool children, because their thought is constructed differently from an adult’s thought, learn by acting on real, concrete objects.

Empirical studies reviewed give support to the idea that organism-environment interaction in the form of motor activity is important in the construction of knowledge and that during the pre-operational stage, the preferred mode of performing operations on the environment is through overt manipulation of objects.

Several studies reviewed showed that equivalence-making skills could be enhanced through instruction. Denny and Acito (1974) found that having two and three-year-old children watch an experimenter group items and listen to a verbalization of the procedure was effective
in raising grouping skills of that group. Olmsted (1970), working with small groups, found that observation of objects and having children talk about grouping the objects increased the grouping skills of kindergarten children. Chiapetta (1972) found that verbal training enhanced the ability to group three-dimensional objects more effectively than did grouping without verbal practice. Miller (1969) whose subjects were four-year-old children found that manipulation of pictures combined with verbalization of equivalence choices from the child to be an effective method for enhancing equivalence-making skills. She also found that the higher level equivalence-making skills gained through instruction were maintained after eight weeks.

Objectives of the Study

The general objective of the present study is presented on page 5 and the statement of the problem on page 6 in Chapter I, "Introduction." The following objectives were developed so that the question asked in the statement of the problem could be investigated.

1. To develop four different types of planned experiences to be used in equivalence-making instruction of four-year-old preschool children.

2. To determine the main effect of the independent variable, type of manipulation, on the acquisition of equivalence-making skills in four-year-old preschool children.

3. To determine the main effect of the independent variable type of verbal mediation on the acquisition of equivalence-making skills in four-year-old children.
4. To compare the effectiveness between various combinations of the independent variables on equivalence-making skills of four-year-old preschool children.

5. To test the effect of each of four types of planned experience on the acquisition of equivalence-making skills of the subjects.

6. To determine the main effect of the independent variable, type of manipulation, on the retention scores of the subjects.

7. To determine the main effect of the independent variable type of verbal mediation on the retention scores of the subjects.

8. To determine the effect of each of the four types of planned experiences in maintaining levels of equivalence-making achieved through the series of planned experience sessions.

Research Hypotheses

To meet the objectives of the study, the following research hypotheses were developed. The research hypotheses were derived from theory and research reviewed in this chapter.

1. Four-year-old children whose planned experience consists of overtly manipulating objects will make significantly higher gain scores than will four-year-old children whose planned experience consists of observing the examiner manipulate objects.

2. Four-year-old children whose planned experience involves verbal mediation will make significantly higher gain scores than will four-year-old children whose planned experience does not involve verbal mediation.
3. Four-year-old children who participate in a verbal mediating experience while overtly manipulating objects will make significantly higher gain scores than will four-year-old children who do not participate in a verbal mediating experience while overtly manipulating objects.

4. Four-year-old children who participate in a verbal mediating experience while observing the examiner manipulate objects will make significantly higher gain scores than will four-year-olds who do not participate in a verbal mediating experience while observing the examiner manipulate objects.

5. Four-year-old children who participate in a verbal mediating experience while overtly manipulating objects will make significantly higher gain scores than will four-year-old children who participate in a verbal mediating experience while observing the examiner manipulate objects.

6. Six weeks after Posttest 1, the retention scores of four-year-old children whose planned experience consisted of overtly manipulating objects will be significantly greater than the retention scores of four-year-olds whose planned experience consisted of observing the examiner manipulate objects.

7. Six weeks after Posttest 1, the retention scores of four-year-old children whose planned experience involved verbal mediation will be significantly greater than the retention scores of four-year-old children whose planned experience did not involve verbal mediation.
CHAPTER III

METHOD

In this experimental study, the effect of type of planned experience on the equivalence-making skills of four-year-old preschool children was investigated. In this chapter five elements of the study are described: (1) the target population and sampling procedure, (2) the research design and rationale, (3) instrumentation, (4) data collection methods, and (5) methods used in analyzing the results.

Sample

Criteria for Selection of Preschool Centers

This study was conducted in eleven preschool centers in Franklin County, Ohio. Centers were selected because they (1) were located in Franklin County, Ohio, and (2) enrolled children in the required age group.

Selection of Preschool Centers

To ensure a randomized sample of nursery schools in Franklin County, a list of all such nursery schools was secured. The list used was compiled in May, 1974 by the Department of Family Relations and Human Development, School of Home Economics, The Ohio State University. The title of the list is "Day Care Centers and Preschools in Franklin County." Not included in the study were the preschools for mentally retarded children as listed on the last page.
Cluster sampling was used to select the nursery schools in this study (Van Dalen, pp. 323-24). From the list of 150 nursery schools cited above, a random selection of thirty nursery schools was made using a table of random numbers (Kerlinger, 1973, pp. 714-717). From this list of thirty schools the final sample was selected. The investigator wrote down the name and telephone number of the nursery school as its number turned up in the table of random numbers. The investigator called schools, beginning with the first school on the list of 30 schools until contact had been made with 15 schools. Contact was defined as speaking with a representative of the school who had the power to authorize the carrying out of the study.

The directors of fifteen nursery schools were contacted by telephone to request permission to conduct the study. At this time, the general objectives of the study were explained. Of the fifteen schools contacted, one refused, without stating a reason, to permit the investigator to carry out the study. One other school was not included. The investigator talked four times with a teacher at the school who said that the director would call back. The director, however, failed to return phone calls regarding a decision on whether the school would participate.

After the initial telephone contact, the investigator met with a representative of each of the thirteen remaining schools. At this time the investigator delivered a packet to each school. The packet contained (1) a cover letter to directors and teachers explaining both the nature of the study and parental permission form, (2) a letter to parents explaining the general objectives of the study and the activities involved, and (3) parental permission forms (See
Appendices A, B, and C for a copy of these documents). The director of each center was requested to distribute the parent's letter and parental permission form to parents of children in the required age range. After receiving the packet, one school director called the investigator to say that the school would not be able to participate. The reason given was that the director did not have enough time to distribute parent permission forms. One other school did not distribute the forms. No reason was given. Thus, 11 of the 15 schools contacted provided subjects for the study.

Criteria for Selection of Subjects

To be eligible for inclusion in the study, subjects had to (1) range in age from four years and zero months to four years and eight months at the time of testing, i.e., birthdays had to be between April, 1971 to December, 1971, (2) attend nursery school in one of the randomly selected Franklin County schools, (3) have parental permission to participate in the study, and (4) score not more than two functional equivalence choices on the pretest (See pp.35 - 38 for a description of the pretest).

Selection of an Adequate Sample Size

Previous research studies of similar design and focus were used to obtain an estimate of sample size needed. Olmsted et al., (1970) trained thirty-three children and used thirty-nine subjects as controls. Olmsted's sample size was seventy-two. Butters (1968) used a sample of forty-eight subjects assigned to four cells of twelve each. Miller used a sample of eighty four-year-olds. Kerlinger (1973) states that means of larger samples (of approximately 20 subjects
or more) are closer to population means than are means of smaller 30
samples (10 subjects). The present study, therefore, originally had a
sample size of 80 randomly chosen subjects. The 80 subjects were
randomly assigned to four groups of 20 subjects each.

Selection of Subjects

The eligible centers had a larger population of children who
met the age criteria than was needed in the study. After receiving
parental permission, children meeting the criteria for the study were
pretested until 80 children met the fourth criteria for selection
(See p. 29). All children whose parents gave permission were pre-
tested. The parental permission form for each child was attached to
a pretest form. The experimenters took all the forms for a particular
school to the school on the pretesting day. Children were chosen for
pretesting in the order in which their names came up on the pretest
forms. Of the 80 subjects, 43 were boys and 37 were girls. Two sub-
jects were dropped from the study after the pretest, leaving unequal
numbers in the cells. One child, from one of the day care centers,
was dropped from the study because her mother found a babysitter to
stay with the child at home. The other child selected for and event-
ually dropped from the study was kept out of school for the entire
time the study was in progress by her parents because they were in-
volved in litigation over her custody.

Kerlinger (1973) very strongly recommends equal numbers of
cases in the cells of a factorial design. Small discrepancies can be
eliminated by dropping cases at random from the appropriate cells,
thus equalizing numbers in all cells. Two subjects were randomly
dropped. Therefore, 76 of the original 80 subjects participated in
both planned experience and first posttest. Mean age of the 76 subjects was 52.3 months. Table 1 shows the number of boys and girls in each cell.

Seventy-one of the original sample of 7^ children were available for the second posttest. Mean age of the second posttest sample was 55.7 months. Table 1 shows the number of subjects from each of the four experimental groups who remained in the study for the first and second posttests.

Design

The design of this study is a true experimental 2x2 factorial design, the purpose of which, according to Kerlinger (1973) is to study the independent and interactive effects of two independent variables on a dependent variable.

Independent Variables

This 2x2 factorial design had two independent, manipulated variables, each of which had two levels. Independent variable I, type of manipulation was divided into two levels (1) S-Manipulate in which the subject manipulated the practice objects so that some function was performed on or with the objects, and (2) E-Manipulate in which the experimenter manipulated the objects (See pp. 38-39 for a description of the practice objects and Appendix F for a photograph of the objects).

Independent variable II, type of verbal mediation was also divided into two levels (1) Verbal Mediation, in which the experimenter guided and interpreted the manipulation of objects through comments such as, "What is a hat used for?" and "What can you do with soap and a washcloth?", and (2) No Verbal Mediation in which no verbal guidance was given.
<table>
<thead>
<tr>
<th>Type of Planned Experience</th>
<th>Pretest</th>
<th></th>
<th></th>
<th>Test</th>
<th>Posttest 1</th>
<th></th>
<th></th>
<th>Test</th>
<th>Posttest 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Total</td>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Total</td>
<td></td>
<td>Boys</td>
</tr>
<tr>
<td>I (S-Manipulate + Verbal Mediation)</td>
<td>12</td>
<td>7</td>
<td>19</td>
<td></td>
<td>12</td>
<td>7</td>
<td>19</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>II (E-Manipulate + Verbal Mediation)</td>
<td>10</td>
<td>9</td>
<td>19</td>
<td></td>
<td>10</td>
<td>9</td>
<td>19</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>III</td>
<td>10</td>
<td>9</td>
<td>19</td>
<td></td>
<td>10</td>
<td>9</td>
<td>19</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>IV (E-Manipulate)</td>
<td>11</td>
<td>8</td>
<td>19</td>
<td></td>
<td>11</td>
<td>8</td>
<td>19</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>TOTALS:</td>
<td>43</td>
<td>35</td>
<td>78</td>
<td></td>
<td>43</td>
<td>33</td>
<td>76</td>
<td></td>
<td>40</td>
</tr>
</tbody>
</table>
The purpose of this investigation was to examine the main effects of each of the independent variables, alone, on the dependent variables. Another purpose of this factorial design was to examine the effect of various combinations of the independent variables on the dependent variables.

**Dependent Variables**

The first dependent variable in this study was level of equivalence-making judged to be functional or above after the subject had been exposed to a treatment. A functional equivalence choice was defined as calling two objects alike because of some functional relationship, i.e., what the two items do or what can be done to them (Olver and Hornsby, 1966, p. 72). The second dependent variable was the retention level of equivalence-making judged to be functional or above after the subject had been exposed to the treatment.

**Subject Assignment Procedure**

Subjects were randomly assigned to the four cells using the method suggested by Kerlinger (1973). As a first step, separate lists were made for boys and girls in the study. Figure 1 is a graphic representation of the design of this study. Each child on each list was assigned a number from one through N. Using a table of random numbers, the numbers one through N were written down as they came up in the table. The numbers were placed into four groups by the following method. A sheet of paper was divided into four quadrants, each quadrant representing one group. As each number turned up in the table of random numbers, the number (representing a subject's name) was placed
Figure 1. Graphic representation of the factorial design used in the study and numbers of subjects in each cell.
into one of the quadrants, i.e., the first number was placed in the upper left quadrant, the second number in the upper right quadrant, the third number in the lower left quadrant, the fourth number in the lower right quadrant. This continued until all subjects had been placed in a group. Then, each of the four groups was randomly assigned to an experimental treatment at random.

Instrumentation

In this section the instrument used to test for levels of equivalence-making are described. Materials used in the planned experience sessions (experimental treatments) are also described. Test

The testing materials described here were used to measure pre-test and posttest levels of equivalence-making. The Fisher-Miller Test of Equivalence-Making was produced in 1969 at the University of Missouri in Columbia, Mo., by Dr. Virginia L. Fisher and Mrs. Sue Miller. This test was a modification of the picture task used by Olver and Hornsby (1966, chapter three). Olver-Hornsby's task was used with children from six to eighteen-years-old. Fisher-Miller's test was chosen for the present study because it was especially designed to be used with preschool children and because it requires no special training to administer.

Fisher-Miller's test consists of ten sets of pictures. Each set contains five pictures. One of the five pictures is called the stimulus picture and four of the five pictures are called response pictures. Each picture is mounted on two and one-half inch square
white card and is covered with clear plastic contact paper (See Appendix E for a picture of the test items).

Fisher-Miller's test requires subjects to choose from the four response pictures in each set the one that goes best with the stimulus picture. After choosing which response card goes with a stimulus card, subjects give a reason for the choice (See Appendix E for score sheets).

Each group of four response cards includes one picture each of similar (1) color, (2) shape, (3) function, and (4) nominal category. The expected responses for the chicken (stimulus card) include:

- **sheep**: Nominal (both are animals)
- **bell**: Shape
- **t.v.**: Color (both are the same color or both are brown)
- **eggs**: Function (Chickens lay eggs)

It is, however, not the response card chosen but the reason given for the choice which determines the child's level of equivalence-making. If a subject chooses "sheep" to go with "chicken," the expected response is ". . . both are animals." The subject, however, might say sheep and chicken go together because both ". . . can walk," (a functional response) or both ". . . have eyes and a nose," (a perceptible response). Thus, it is the subject's reason for the choice which determines the level of equivalence-making.

The scoring procedure used with Fisher-Miller's test of equivalence-making is as follows: (1) the subject gives a verbal response or points to the response card which ". . . goes best with. . ."
the stimulus card, (2) each response is recorded by circling the corresponding word on the score sheet (See Appendix E for a score sheet), (3) the subject is then asked to give a reason for his choice and this reason is recorded verbatim in the space provided on the score sheet, (4) the subject's response/reason is then coded as one and only one level of equivalence-making. The levels are (1) no choice, (2) no reason given for choice, (3) fiat, (4) perceptible a. color, b. other-size, shape, number, location in time or space, (5) functional, and (6) nominal (See pp. 8-9 for definitions). One point was placed in the appropriate square opposite the names of the cards in each set.

After coding, the number of points in each column were added. Subjects whose total scores contained no more than two functional and/or nominal equivalence-choices, the two highest levels, were considered to be operating below the functional level and were included in the study.

This was the fourth criterion for selection of subjects (See p. 29).

Certain rules were followed in the coding of equivalence-making responses. A brief description of the rules is given here. For a more detailed description, see Finch, 1970. A response of "I don't know was coded as "no response." Three types of responses were considered the same and were classified as "fiat." The three types of responses were (1) responses with no reason other than one like, "My mommy told me so," (2) a response which related to only one of the two pictures, and (3) errors. An error would be saying that the cow and the chicken are alike because "...chickens like milk." (Miller, 1969, p. 19).
A reliability check was done on the experimenter's scoring. Fisher, who originated the test, independently scored a random sample (25%) of the pretests. Fisher's scoring was compared to the experimenter's scoring. The Pearson Product Moment Coefficient of Correlation between the two scorings was .92.

Several studies using the Fisher-Miller test have yielded the same results in terms of percentages of each type of response at various age levels (Wirtz, 1972; Finch, 1970; Miller, 1969, and Pickering, 1975). The findings of these studies are in agreement with the original work of Olver-Hornsby regarding percentages of each type of response at various age levels.

The time required to administer the test is approximately 15 minutes per child. Because four experimenters participated in the data collection, four sets of the test cards were needed. The original set used by Miller (1969) was duplicated by a color xerox process which yielded colors identical to the original set. Each set of 50 cards cost approximately five dollars (See Appendix E for a color photograph of the testing materials). The detailed procedure for administering the test is given in Appendix E.

Treatment Instrument

Like previous studies in which children were trained for equivalence-making (Butters, 1968; Olmsted et al., 1970), the instrumentation for training of equivalence-making in this study employed three-dimensional objects. The groups of items were developed by the investigator. Because the study focused on raising equivalence-making skills to the functional level, each group of practice items was designed so that there was a readily observable "function" common to
all items in the group. The three groups of items were as follows:

Treatment Instrument--
Group 1

Pen
Pencil
Chalk
Magic Marker
Crayon
(paper)

Function of Items.--Each item in Group 1 was used for writing or drawing. The paper was used as a writing/drawing surface.

Treatment Instrument--
Group 2

Whisk broom
Washcloth
Soap
Sponge
Spray bottle and water
Paper towel
(doll or puppet)

Function of Items.--Each item in Group 2 was used for cleaning and/or washing things. The doll or puppet was used for two reasons (1) so that the experimenter or subject would have something to wash when using the soap, washcloth and sponge, and (2) to maintain the subject's interest.

Treatment Instrument--
Group 3

Pants
doll-size
Shirt
Hat
Socks
(doll)

Function of Items.--Each item in Group 3 was used for wearing or dressing. Again, the doll was used for dressing as well as for maintaining interest.
Data Collection

In this section the following elements of the data collection are described: (1) schedules of testing and treatment, (2) training of experimenters for administering pretests and planned experiences, (3) the pretest, (4) treatment, and (5) posttests.

Eleven preschools participated in this study. The principal investigator made arrangements for data collection with a representative of each center. Data were collected in six centers by the investigator. Data were collected in the other five centers by three experimenters trained by the principal investigator. The principal investigator gave Posttest 2 in seven centers.

The pretests were given during the weeks of December 8, 1975 and January 5, 1976. The planned experience sessions were begun on January 12, 1976. Four weeks were required to complete the planned experience sessions. In one school, the planned experience sessions took five weeks to complete. The first posttest was given immediately following the last planned experience session. The second posttest, given during the week of March 15, took place six weeks after the first posttest.

Schedule of Testing and Treatment

<table>
<thead>
<tr>
<th>Week of:</th>
<th>Preliminary work</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 3, 10, 17, 24 and December 1</td>
<td>Pretesting (55 subjects selected)</td>
</tr>
<tr>
<td>December 8</td>
<td>Pretesting (25 subjects selected)</td>
</tr>
<tr>
<td>January 5</td>
<td>Treatments 1, 2, 3, 4</td>
</tr>
<tr>
<td>January 12, 19, 26</td>
<td>Treatment 5 + Posttest 1</td>
</tr>
<tr>
<td>February 2 (10 schools)</td>
<td>Treatment 5 + Posttest 1</td>
</tr>
<tr>
<td>February 9 (1 school)</td>
<td>Posttest 2</td>
</tr>
<tr>
<td>March 15</td>
<td></td>
</tr>
</tbody>
</table>
Preliminary work took place over a five week span. This work included sampling which is described in detail on pp. 27-31. It also included securing parental written permission. Contact was made with parents through the teachers in their child's classroom. Teachers distributed a letter from the investigator and a Parental Permission Form to the parents of each child in the prescribed age range (See Appendices B and C for these forms). Parents who were willing to have their child participate in the study signed the form and returned it to the school. Center directors collected the forms from the parents and gave them to the investigator.

During the preliminary work period three additional sets of test pictures were prepared, three persons were trained to help with data collection, printed instructions were prepared for each experimenter (See Appendix E for test instructions), score sheets were prepared for each subject, and an individual filing folder was prepared for each subject in the study.

Additional preparations took place during the week of January 5. They included gathering a set of treatment items for each experimenter (See pp. 38-39 for a description and Appendix F for a picture of the items), and preparing a packet for each school. The packet contained (1) a checklist with space for the date of each experimenter-subject contact, and (2) a folder containing instructions for each planned experience session for each subject (See Appendices D and F for a copy of these documents). The additional preliminary work also included training of experimenters in planned experience session techniques and the preparation of posttest scoring sheets for individual subjects (See Appendix E for Posttest 1 and 2 Score Sheets).
Score sheets were color-coded to avoid confusion during the final analysis. The pretest score sheet was white, posttest 1 score sheet was pink and posttest 2 score sheet was blue.

Training of Experimenters

Four persons, the principal investigator and three persons trained by the investigator, gathered data for this study. All were female. Two of the additional experimenters were graduate students in Family Relations and Human Development in the School of Home Economics, The Ohio State University. The third experimenter had earned the Master's degree in counseling. Experimenters were paid by the investigator for their help in data collection. Each of the experimenters had experience teaching and/or working with children in the age range of this study.

The principal investigator conducted one session to train the experimenters on the administration of the pretest. At this training session each experimenter received (1) the cards for the pretest, (2) pretest score sheets for individual subjects, (3) written instructions for the pretest (See Appendix for instructions for Pretest), and (4) the names of the schools to which the experimenter had been assigned.

During the pretest training session one set of the pictures used in the test were given to and were examined by each experimenter. The test was demonstrated by the principal investigator by actually giving the test to one of the experimenters. While the test was demonstrated, each experimenter followed a set of written instructions which they would use when administering the test. At the training session, questions about administering the test were asked and answered.
The investigator conducted one session to train the experimenters on the techniques to be used in the planned experience sessions. At this training session each experimenter received (1) planned experience materials (described on pp. 38-39), (2) a folder for each child with detailed instructions for each planned experience for each session. The individual subject folders were grouped by school and placed in one large plastic envelope for each school. A checklist was attached to each envelope to provide a space for recording the date of each contact between experimenter and subject (See Appendix D for the checklist).

During the training session, the four treatment groups in the study were explained, each type of planned experience was demonstrated and questions were asked and answered. Plans were made at the training session for the principal investigator to maintain close contact with each experimenter during the four-week planned experience program.

**Pretest**

The pretest was administered during the first week of data collection. Each subject was tested individually. The pretest took approximately 15 minutes per child. Pretesting usually took place during a time when the class was not engaged in some group activity. Therefore, in nursery schools with only morning programs, the pretest was given during free play time. In the day care centers, pretests were given (1) after lunch and during the free time just before nap, or (2) during free play after naptime and before the child departed for home for that day.
Subjects were approached by both the experimenter and the classroom teacher after the experimenter had been in the classroom for a short time. For the pretest, in most cases, the teacher told the subject that the investigator had brought some pictures to school to show the child and asked the child if she/he would like to look at the pictures. When the subject agreed to come, the investigator held the child's hand and said, "We are going to be in the ______ room and your teacher will be waiting for you right here when we are through playing the game." Subject and investigator then proceeded to the examining room.

Of 120 subjects chosen for pretesting, only 2 refused to participate and one subject, although he went to the examining room and started the pretest, refused to continue after three sets of pictures were examined. The two subjects who refused were asked again but once again they refused to be tested. No further effort was made to encourage their participation.

Because 11 nursery schools and 4 different data collectors participated in this study, it was necessary to make testing conditions as uniform as possible in the 11 schools. Each center director, therefore, was apprised of the need for uniformity of testing conditions and asked if space were available apart from the classroom in which the pretest could be given. The test was given in all schools in a room apart from the classroom.

In most schools, a small table and two chairs were made available and in other schools the subject and investigator sat next to each other on a carpet. After sitting down, the experimenter engaged the subject in casual conversation and then the test was explained to
the subject. Then the pretest was begun with each experimenter following specific printed procedures (See Appendix E for Pretest Instructions). Subjects' responses were recorded by the experimenter during the testing session. At the conclusion of the pretest, the child was taken back to the room by the experimenter. When back in the room, the subject either reentered the activity in which he was engaged when he left for testing or he was introduced to a new activity by the teacher. The experimenter asked the next child to come and look at the pictures.

Treatment

For 53 subjects pretested and selected for the study during the week of December 8, 1975, the experimental treatment was begun 4 weeks after the pretest. For 23 subjects, tested and selected for the study during the week of January 5, 1976, the treatment was begun 1 week after the pretest. Seventy-six subjects completed the planned experience sessions. Each subject in the study participated in 5 planned experience sessions of 10 minutes each. Each planned experience session was an individual lesson. For subjects in 10 schools, all 5 planned experience sessions were completed in 4 weeks. The subjects were seen by the experimenter approximately once every four days. In one school, the planned experiences were completed in five weeks.

Of the 76 subjects, 12 missed 1 of the 5 planned experience sessions on their regularly scheduled days. During the next treatment session these 12 subjects received the missed planned experience as well as the planned experience scheduled for that day.
Gaining the cooperation of the subjects for the planned experience sessions was the same as for the pretest. Subjects were chosen for the planned experience sessions in an unplanned order. Planned experience sessions took place in the same room as the pretest in all centers. The arrangement of tables and chairs or carpet was the same in the treatment sessions as in the pretest session.

Each of the four experimental groups participated in a different type of planned experience. It was the purpose of this study to test the effectiveness of each of the four types of planned experience in raising a perceptible level of equivalence-making to a functional level (See p. 29 for "Criteria for Selection of Subjects").

Three groups of three-dimensional objects were used in the planned experience sessions (See p. 39 for a description of the objects and Appendix F for a photograph). Because there were five treatment sessions and three groups of objects, two of the sets of objects were used twice. One of the sets was used once (See Appendix F for the list of sessions in which each group of objects was used).

At the beginning of each planned experience session, the subject was reminded of the activities of the previous session. At the completion of each planned experience session, the subject was thanked for playing the game. The subject was also told that the examiner would be coming back to play the same kind of game but would use different things. The experimenter then accompanied the subject back to the classroom and asked the next subject to come and play the game.

Posttests

The first posttest was given immediately following the last planned experience session for each subject. The posttests were the
same as the pretest and the instructions were the same for both pre­
testing and posttesting (See Appendix F).

The second posttest was given six weeks after the first posttest. In one center the planned experience sessions took five weeks instead of four weeks to complete. The second posttest, therefore, was given as close as possible to the end (on Thursday) of the second posttesting week. The experimenters reminded subjects that they had played games together prior to giving the posttest. Subjects' responses were again recorded during the test. Pretests and posttests were filed separately.

Data Analysis

Dr. William A. Marion, Department of Mathematics, Westminster College, Fulton, Missouri, supervised the data analysis and helped in the processing of the data for analysis. Mr. Thomas Bishop, Department of Statistics, The Ohio State University was consulted for advice in handling the collected data for analysis purposes.

The test for equivalence-making contained 10 items. Of interest in this study was the number of equivalence-choices judged to be functional. To be included in the study, subjects could score no more than two functional or nominal choices.

The data consisted of scores on the pretest, posttest 1, and posttest 2. For purposes of analysis, gain scores were computed. Two sets of gain scores were obtained for the 76 subjects. The first set of gain scores were calculated by subtracting each pretest score from Posttest 1 score. The gain mean for each experimental group was then calculated by determining the mean of the gain scores. The
second set of gain scores—called retention scores—was calculated by subtracting Posttest 1 score from Posttest 2 score. Again, the gain mean for each experimental group was calculated.

The data were analyzed for the purpose of testing the research hypotheses. Research hypotheses were tested in the null form. A two-way factorial analysis of variance, two columns and two rows, was used to test hypotheses 1 and 2. This is commonly called a 2x2 factorial design. This technique allowed sources of variation in two factors to be analyzed at the same time. Hypotheses 3, 4, and 5, Multiple Comparison hypotheses, were tested by performing t-tests on the gain means of specific combinations of the two independent variables. Hypotheses 6 and 7 were tested by performing a two-way analysis of variance on retention scores obtained by subtracting Posttest 1 from Posttest 2 scores.

For each of the four experimental methods, the pretest mean was compared with Posttest 1 mean to determine which of the methods were effective in raising the level of equivalence-making. The Student t-test was used. Also, for each of the four experimental methods, the Posttest 1 mean was compared with the Posttest 2 mean to determine which of the methods was effective in maintaining or increasing the level of equivalence-making six weeks after the first posttest. Again, the t-test was used. Also computed were standard deviations and score ranges. Throughout the study the level of significance was set at .05.
CHAPTER IV

RESULTS

The statistical findings of the effects of four types of planned experiences on the acquisition and retention of equivalence-making skills of four-year-old preschool children are presented in this chapter. The study examined the effect of two independent variables, type of manipulation and type of verbal mediation, on the dependent variables, gain scores and retention scores. The main effects hypotheses for gain scores were analyzed by a two-way analysis of variance. Multiple comparison hypotheses were tested by using t-tests. The effectiveness of each type of planned experience was determined by testing differences between Pretest and Posttest 1 using t-tests. Data on retention scores were analyzed by a two-way analysis of variance. As with gain scores, t-tests were performed on retention scores (Posttest 2 — Posttest 1) of each experimental group to determine effectiveness of each method in maintaining the level of equivalence-making.

To present the results, this chapter is divided into two major sections: (1) results relating to gain scores, i.e., scores determined by subtracting Pretest from Posttest 1 scores, and (2) results relating to retention scores, i.e., scores determined by subtracting Posttest 1 from Posttest 2 scores.
Results Relating to Gain Scores

This section is divided into two sub-sections: (1) hypothesis testing and, (2) significance of changes in mean scores between pretest and posttest 1.

Hypothesis Testing

Research hypotheses were tested in null form. In this section, each research hypothesis as well as each null hypothesis is stated and then data specifically related to each hypothesis are presented.

Research hypothesis 1 was the main effects hypothesis for the independent variable, type of manipulation. Research hypothesis 1:

Four-year-old children whose planned experience consists of overtly manipulating objects will make significantly higher gain scores than will four-year-old children whose planned experience consists of observing the examiner manipulate objects.

when written in the null for statistical analysis took the following form:

There will be no difference in the gain scores on a test of equivalence-making between four-year-old children whose planned experience consists of overtly manipulating objects and four-year-old children whose planned experience consists of observing the examiner manipulate objects.

Table 2 shows the Analysis of Variance for the gain scores for the test of equivalence-making. Analysis of variance was performed to test null hypothesis 1. The F ratio was found to be less than 1.

Therefore, the null hypothesis failed to be rejected. Little difference was found between the effect on gain scores produced by variations in the type of manipulation (columns, F=.20). The F ratio
TABLE 2

ANALYSIS OF VARIANCE OF THE GAIN SCORES
FOR THE EQUIVALENCE-MAKING TEST
(POSTTEST 1 — PRETEST)

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares (SS)</th>
<th>df</th>
<th>Mean Squares (MS)</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columns (Manipulation)</td>
<td>1.07</td>
<td>1</td>
<td>1.07</td>
<td>.20</td>
</tr>
<tr>
<td>Rows (Mediation)</td>
<td>99.59</td>
<td>1</td>
<td>99.59</td>
<td>18.27*</td>
</tr>
<tr>
<td>Interaction (Manipulation x Mediation)</td>
<td>14.33</td>
<td>1</td>
<td>14.33</td>
<td>2.63</td>
</tr>
<tr>
<td>Error</td>
<td>392.42</td>
<td>72</td>
<td>5.45</td>
<td>---</td>
</tr>
<tr>
<td>Total</td>
<td>507.41</td>
<td>75</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05
was not significant at the .05 level set for this study.

Research hypothesis 2 was the main effects hypothesis for the independent variable type of verbal mediation. Research hypothesis 2:

Four-year-old children whose planned experience involves verbal mediation will make significantly higher gain scores than will four-year-old children whose planned experience does not involve verbal mediation.

when written in the null for statistical analysis, took the following form:

There will be no difference in the gain scores on a test of equivalence-making between four-year-old children whose planned experience involves verbal mediation and four-year-old children whose planned experience does not involve verbal mediation.

Analysis of variance was performed to test null hypothesis 2. The F ratio was found to be more than 1. Van Dalen (1973) says that an F ratio greater than 1 means that the independent variable probably did cause a change in the dependent variable.

A distribution of F table was then consulted to ascertain whether the F value obtained (rows, F = 18.27) was statistically significant for the size of the sample. The table was entered with 1 df for the row mean square and 72 df for the error mean square. The table showed that to be significant at the .05 level set for this study, the F value had to be equal to or greater than 3.98. The obtained F for rows, 18.27, was more than 3.98, the value for significance at the .05 level. Therefore, because of the magnitude of the F value, the null hypothesis that there would be no difference in gain scores produced by variations in the type of verbal mediation
(rows) was rejected. A significant difference existed between the row means, i.e., between the effect on gain scores produced either by no verbal mediation or verbal mediation.

Research hypothesis 3 was a multiple comparison hypothesis used to compare the effects of subject-manipulation combined with verbal mediation against subject-manipulation with no verbal mediation, i.e., the difference between the gain means of groups I and III were compared. Research hypothesis 3:

Four-year-old children who participate in a verbal mediating experience while overtly manipulating objects will make significantly higher gain scores than will four-year-old children who do not participate in a verbal mediating experience while overtly manipulating objects.

when written in the null for statistical analysis took the following form:

There will be no difference in the gain scores on a test of equivalence-making between four-year-old children who participate in a verbal mediating experience while overtly manipulating objects and four-year-old children who do not participate in a verbal mediating experience while overtly manipulating objects.

A t-test was performed to test the significance of the difference between the gain means of Groups I (2.74) and III (1.32) (See Table 3).

The t-ratio for the Groups I and III comparison was 1.87. A distribution of t table was consulted to see whether the t-value obtained was statistically significant (Guilford, 1973). The table was entered with 72 df. The table showed that to be significant at the .05 level the t-value had to be equal to or greater than 1.69.
<table>
<thead>
<tr>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
<th>t-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.74</td>
<td>---------</td>
<td>1.32</td>
<td>---------</td>
<td>1.87**</td>
</tr>
<tr>
<td>---------</td>
<td>3.84</td>
<td>---------</td>
<td>.68</td>
<td>4.16**</td>
</tr>
<tr>
<td>2.74</td>
<td>3.84</td>
<td>---------</td>
<td>---------</td>
<td>1.45</td>
</tr>
</tbody>
</table>

*df = 72

** Significant at .05
Because the computed t-value (1.87) was found to be greater than 1.69, null hypothesis 3 was rejected. A significant difference existed between the effect on gain scores produced by subject-manipulation combined with verbal mediation and subject-manipulation alone.

Research hypothesis 4 was a multiple comparison hypothesis used to compare the effects of experimenter-manipulation combined with verbal mediation against experimenter-manipulation with no verbal mediation, i.e., the difference of the gain means of Groups II and IV were compared. Research hypothesis 4:

Four-year-old children who participate in a verbal mediating experience while observing the examiner manipulate objects will make significantly higher gain scores than will four-year-olds who do not participate in a verbal mediating experience while observing the examiner manipulate objects.

when written in the null for statistical analysis took the following form:

There will be no difference in the gain scores on a test of equivalence-making between four-year-old children who participate in a verbal mediating experience while observing the examiner manipulate objects and four-year-olds who do not participate in a verbal mediating experience while observing the examiner manipulate objects.

A t-test was performed to test the significance of the difference between the gain means of Groups II (3.84) and IV (.68) (See Table 3 for a contrast of pairs of means and t-values).

The t-ratio for the Groups II and IV comparison was 4.16. This t-ratio was found to be significant at the .05 level. Therefore, null hypothesis 4 was rejected. A significant difference existed between the effect on gain scores produced by experimenter-manipulation combined with verbal mediation and
experimenter-manipulation with no verbal mediation.

Research hypothesis 5 was a multiple comparison hypothesis used to compare the effects of subject-manipulation combined with verbal mediation against experimenter-manipulation combined with verbal mediation, i.e., the difference of the gain means of Groups I and II were compared. Research hypothesis 5:

Four-year-old children who participate in a verbal mediating experience while overtly manipulating objects will make significantly higher gain scores than four-year-old children who participate in a verbal mediating experience while observing the examiner manipulate objects.

When written in the null for statistical analysis took the following form:

There will be no difference in the gain scores on a test of equivalence-making between four-year-old children who participate in a verbal mediating experience while overtly manipulating objects and four-year-olds who participate in a verbal mediating experience while observing the examiner manipulate objects.

A t-test was performed to test the significance of the difference between the gain means of Group I (2.74) and Group II (3.84) (See Table 3 for a contrast of pairs of means and t-values). The t-ratio for the Groups I and II comparison was 1.45. This t-ratio was found not to be significant at the .05 level. Therefore, the null hypothesis of no difference between the gain means of S-Manipulate + Verbal Mediation and E-Manipulate + Verbal Mediation failed to be rejected.
Significance of Changes in Mean Scores between Pretest and Posttest 1

For each type of planned experience the mean score on the pretest was compared with the mean score on posttest 1 to check for significant differences. The Student t-test was used. The level of significance was set at .05.

Experimental group I (S-Manipulate + Verbal Mediation) had a mean pretest score of .68 and a mean posttest 1 score of 3.42 (See Table 4). This represented a gain of 2.47. A t-test was performed to see if the posttest 1 score was significantly better than the pretest score. The t-value of 3.65 proved to be significant at the .05 level. It was concluded that planned experience type I (S-Manipulate + Verbal Mediation) significantly increased the scores of the subjects in that experimental group.

Experimental group II (E-Manipulate + Verbal Mediation) had a mean pretest score of .84 and a mean posttest 1 score of 4.68 (See Table 4). This represented a gain of 3.84 from pretest to posttest 1. A t-test was performed to see if the posttest score was significantly better than the pretest score. The t-value of 5.49 was significant at the .05 level. Planned experience type II (E-Manipulate + Verbal Mediation) significantly increased the scores of the subjects in that experimental group.

Experimental group III (S-Manipulate) had a mean pretest score of .63 and a mean posttest 1 score of 1.95. This represented a gain of 1.32 from pretest to posttest 1. A t-test was performed to see if the posttest 1 score was significantly better than the pretest score. The t-value of 2.64 was significant at the .05 level.
<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>Pretest Mean</th>
<th>Posttest 1 Mean</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (S-Manipulate + Verbal Mediation)</td>
<td>.68</td>
<td>3.42</td>
<td>3.65*</td>
</tr>
<tr>
<td>II (E-Manipulate + Verbal Mediation)</td>
<td>.84</td>
<td>4.68</td>
<td>5.49*</td>
</tr>
<tr>
<td>III (S-Manipulate)</td>
<td>.63</td>
<td>1.95</td>
<td>2.64*</td>
</tr>
<tr>
<td>IV (E-Manipulate)</td>
<td>1.16</td>
<td>1.84</td>
<td>1.24</td>
</tr>
</tbody>
</table>

* Significant at .05
Planned experience type III (E-Manipulate) significantly increased the scores of the subjects in that experimental group.

Experimental group IV (E-Manipulate) had a mean pretest score of 1.16 and a mean posttest 1 score of 1.84, representing a gain of .68 from pretest to posttest 1. A t-test was performed to see if the posttest 1 score was significantly better than the pretest score. The t-value of 1.24 was not significant at the .05 level. Planned experience type IV (E-Manipulate) did not significantly increase the scores of the subjects in that experimental group.

Results Relating to Retention Scores

This section is divided into two sub-sections: (1) hypothesis testing, and (2) significance of changes in mean scores between posttest 1 and posttest 2.

Hypothesis Testing

Research hypotheses six and seven were tested in the null form. In this section, both research and null hypotheses six and seven are stated and then data specifically related to each null hypothesis are presented.

Research hypothesis 6 was the main effects hypothesis for the retention level for the independent variable type of manipulation.

Research hypothesis 6:

Six weeks after Posttest 1 the retention scores of four-year-old children whose planned experience consisted of overtly manipulating objects will be significantly greater than the retention scores of four-year-olds whose planned experience consisted of observing the examiner manipulate objects.
when written in the null for statistical analysis took the following form:

_Six weeks after Posttest 1, there will be no difference in the retention scores of four-year-old children whose planned experience consisted of overtly manipulating objects and four-year-old children whose planned experience consisted of observing the examiner manipulate objects._

Table 5 shows the analysis of variance chart for the retention scores for the test of equivalence-making. Analysis of variance was performed to test null hypothesis 6. A distribution of F table was consulted to ascertain whether the F value obtained (columns, \( F = 5.45 \)) was statistically significant for the sample size of 71. The table was entered with 1 df for the row mean square and 67 df for the error mean square. To be significant at the .05 level set for this study, the F-value had to be equal to or greater than 3.99.

The obtained F for columns, 5.45, was more than 3.99, the value for significance at the .05 level. Therefore, because of the magnitude of the F-value, the null hypothesis of no difference in retention scores produced by variations in type of manipulation (columns) was rejected. It was concluded that a significant difference did exist between the effect on retention scores produced either by subject-manipulation or experimenter-manipulation.

Research hypothesis 7 was the main effects hypothesis for the retention level for the independent variable type of verbal mediation. Research hypothesis 7:

_Six weeks after Posttest 1, the retention scores of four-year-old children whose planned experience involved verbal mediation will be significantly greater than the retention scores of four-year-old children whose planned experience did not involve verbal mediation._
### TABLE 5

**ANALYSIS OF VARIANCE OF THE RETENTION SCORES FOR THE EQUIVALENCE-MAKING TEST (POSTTEST 2 — POSTTEST 1)**

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares (SS)</th>
<th>df</th>
<th>Mean Squares (MS)</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Columns (Manipulation)</td>
<td>24.90</td>
<td>1</td>
<td>24.90</td>
<td>5.45*</td>
</tr>
<tr>
<td>Rows (Mediation)</td>
<td>2.53</td>
<td>1</td>
<td>2.53</td>
<td>0.55</td>
</tr>
<tr>
<td>Interaction (Manipulation x Mediation)</td>
<td>1.80</td>
<td>1</td>
<td>1.80</td>
<td>0.39</td>
</tr>
<tr>
<td>Error</td>
<td>306.88</td>
<td>67</td>
<td>4.57</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>344.00</td>
<td>70</td>
<td>4.91</td>
<td></td>
</tr>
</tbody>
</table>

*Significant at .05

Note: N = 71
when written in the null for statistical analysis took the following form:

Six weeks after Posttest 1, there will be no difference in the retention scores of four-year-old children whose planned experience involved verbal mediation and four-year-olds whose planned experience did not involve verbal mediation.

Analysis of variance was performed to test null hypothesis 7.

The F-ratio for rows, .55, was found to be less than 3.99, the value for significance at the .05 level. Therefore, the null hypothesis failed to be rejected. There seemed to be little difference between the effect on retention scores produced by variations in type of verbal mediation (rows).

Significance of Changes in Mean Scores between Posttest 1 and Posttest 2

For each type of planned experience the Student t-test was used to compare the mean score on Posttest 1 with the mean score on Posttest 2 to check for significant differences. The level of significance was set at .05.

Experimental group I (S-Manipulate + Verbal Mediation) had a mean on Posttest 1 of 3.39 and a mean on Posttest 2 of 5.33. This was a difference of 1.94 (See Table 6). A t-test was performed to see if the Posttest 2 score was significantly higher than the Posttest 1 score. The t-value of 1.81 proved to be significant at the .05 level. Planned experience type I (S-Manipulate + Verbal Mediation) was effective, not only in maintaining the effect of the planned experience, but also in significantly increasing the scores of the subjects in that experimental group during the six weeks between the first and second posttests.
# Table 6

**t-Test of Differences Between Posttest 1 and Posttest 2 Means for the Equivalence-Making Test for Each Experimental Group**

<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>Posttest 1 Mean</th>
<th>Posttest 2 Mean</th>
<th>t value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (S-Manipulate + Verbal Mediation)</td>
<td>3.39</td>
<td>5.33</td>
<td>1.81*</td>
</tr>
<tr>
<td>II (E-Manipulate + Verbal Mediation)</td>
<td>4.53</td>
<td>4.73</td>
<td>.16</td>
</tr>
<tr>
<td>III (S-Manipulate)</td>
<td>1.95</td>
<td>3.37</td>
<td>1.73*</td>
</tr>
<tr>
<td>IV (E-Manipulate)</td>
<td>1.84</td>
<td>2.16</td>
<td>.42</td>
</tr>
</tbody>
</table>

*Significant at .05*
Experimental group II (E-Manipulate + Verbal Mediation) had a mean on Posttest 1 of 4.53 and a mean on Posttest 2 of 4.73. This was a difference of .20. A t-test was used to test the significance of the difference. The t-value of .16 was not significant at the .05 level. Planned experience type II (E-Manipulate + Verbal Mediation) maintained the effect of the planned experience but did not significantly raise the equivalence-making farther during the six weeks between Posttest 1 and Posttest 2.

Experimental group III (S-Manipulate) had a mean of 1.95 on Posttest 1 and a mean of 3.37 on Posttest 2. This was a difference of 1.42. A t-test was performed to see if the Posttest 2 score was significantly higher than the Posttest 1 score. The t-value of 1.73 was significant at the .05 level. Planned experience type III (S-Manipulate) was effective, not only in maintaining the effect of the planned experience, but also in significantly increasing the scores of the subjects in that group during the six weeks between the first and second posttests.

Experimental group IV (E-Manipulate) had a mean of 1.84 on Posttest 1 and a mean of 2.16 on Posttest 2. This was a difference of .32. A t-test was used to test the significance of the difference. The t-value of .42 was not significant at the .05 level. Planned experience type IV (E-Manipulate) maintained the effect of the planned experience but did not significantly raise the equivalence-making scores farther during the six weeks between Posttest 1 and Posttest 2.
Summary-Results

A major objective of this study was to examine the effects of four types of planned experiences on the equivalence-making skills of four-year-old preschool children. The effect of two independent variables, type of manipulation and type of verbal mediation, on two dependent variables, gain scores and retention scores, was studied.

Findings of the statistical analysis were presented. For gain scores: (1) main effects null hypothesis for manipulation was not rejected, (2) main effects null hypothesis for verbal mediation was rejected, (3) multiple comparison null hypotheses 3 (S-Manipulate + Verbal Mediation = S-Manipulate) and 4 (E-Manipulate + Verbal Mediation = E-Manipulate) were rejected, (4) t-tests showed that planned experience types I (S-Manipulate + Verbal Mediation), II (E-Manipulate + Verbal Mediation), and III (S-Manipulate) were effective in significantly increasing equivalence-making scores. For retention scores: (1) main effects null hypothesis for manipulation was rejected, (2) main effects null hypothesis for verbal mediation failed to be rejected, (3) t-tests showed that planned experience types II (E-Manipulate + Verbal Mediation) and IV (E-Manipulate) were effective in maintaining the effect of planned experiences but did not significantly raise scores farther during the six weeks between Posttest 1 and Posttest 2, (4) t-tests showed that planned experience types I (S-Manipulate + Verbal Mediation) and III (S-Manipulate), were effective in maintaining the effect of the planned experience as well as in significantly increasing the scores from Posttest 1 to Posttest 2.
Presented in this chapter is a discussion of the major findings of the study. Evidence relating to each research hypothesis as well as a discussion of the relationship of the results in this study to findings in earlier research is given. A discussion of the effectiveness of each of the four types of planned experiences in producing gain scores and retention scores is also presented. As in the Results chapter, this chapter is divided into two major sections: (1) a discussion of results relating to gain scores and, (2) a discussion of results relating to retention scores. Also presented are major conclusions from the findings of the study. Implications of the study are given. Recommendations for further research on the topic of equivalence-making by preschool children seems warranted because of the significant findings of this study. The chapter closes with recommendations for further study.
Discussion

Discussion of Results Relating to Gain Scores

In this experiment the first hypothesis (research hypothesis 1) tested was that significantly higher gain scores would be obtained by subjects who manipulated objects than by subjects who observed the experimenter manipulate objects. The analysis of the data showed that there was little difference between the groups who manipulated the objects and the groups who watched someone else manipulate the objects. This result is in agreement with the findings of Wolff et al., (1974) who found no significant differences between performers and observers on a paired-associate recognition task at the time of the first posttest. One can only speculate why the S-Manipulate groups in the present study did as well as but not better than the E-Manipulate groups. Wolff attributed his results on the immediate posttest to the fact that the experimenter's interactions were always well formed while those of the children were not. The same explanation seems applicable to the results of the analysis of research hypothesis 1 in the present study.

In this experiment the second hypothesis (research hypothesis 2) tested was that significantly higher gain scores would be obtained by subjects whose planned experience involved verbal mediation than by subjects whose planned experience did not involve verbal mediation. The analysis of the data showed that the groups who had the verbal mediation had significantly higher gain scores than the groups who did not have the verbal mediation. This finding is in agreement with Chiapetta's study done with second grade children. Chiapetta (1972) showed that verbal training enhanced grouping of
three-dimensional objects. This supports Meichenbaum's (1971) finding that verbalization while performing a task contributed to fewer errors on Kagan's Familiar Figures test by impulsive children. Also supported is his contention that concept formation activities should include a chance to verbalize strategy while the task is being carried out.

After predicting significantly higher gain scores from verbal mediation, the effect of verbal mediation combined with each level of the independent variable type of manipulation for the effect on gain scores was tested in this study. The analysis showed that both S-Manipulate + Verbal Mediation (research hypothesis 3) and E-Manipulate + Verbal Mediation (research hypothesis 4) resulted in significantly higher gain scores than did either S-Manipulate or E-Manipulate not combined with verbal mediation. Once again, the analysis of the data for both hypotheses 3 and 4 lend support to Chiapetta's (1972) and Meichenbaum's (1971) studies. The effectiveness of verbalization in combination with manipulation of objects in producing higher gain scores is also in agreement with the results of Miller's (1969) study. Miller found that verbalization combined with a manipulative experience enhanced equivalence-making skills of four-year-old subjects. Not only is support given to previous empirical findings, but also to the part of Piagetian theory which cites social interaction as one of the factors necessary for movement to higher cognitive levels (Piaget, 1970; Almy, 1976). Almy maintains that when teachers use words that cause children to reflect on what they are doing, development can be enhanced. The analysis of research hypotheses 2, 3, and 4 bear this out.
Because the S-Manipulate condition was predicted to result in significantly higher gain scores than E-Manipulate (research hypothesis 1), and groups participating in verbal mediation would have higher scores than groups not participating in verbal mediation (research hypothesis 2), it was also hypothesized that the S-Manipulate + Verbal Mediation group would make significantly higher gain scores than the E-Manipulate + Verbal Mediation group (research hypothesis 5). The analysis of the data showed little difference between the two groups. This finding is consistent with the result from the analysis of hypothesis 1.

Hypothesis 1, 2, 3, 4, and 5 tested the effectiveness of one type of planned experience over another. Also of interest in this study was the effectiveness of each of the four types of planned experiences alone in producing higher gain scores.

Planned experience type I (S-Manipulate + Verbal Mediation) significantly increased the scores of the subjects in that group from the pretest to posttest 1. This is consistent with the results of studies by Miller (1969), Meichenbaum (1971), and Chiapetta (1972) as well as with Piagetian theory on the need for both experience with objects and social interaction in the movement to higher cognitive levels.

Planned experience type II (E-Manipulate + Verbal Mediation) significantly increased the scores of the subjects in that group. Denny and Acito (1974) also found that a modeling technique (child watching experimenter group objects while experimenter verbalized the procedure) was effective in raising the equivalence level of
two and three-year-old children. The subjects in group II in the present study were not, however, given a chance to manipulate objects themselves as were subjects in Denny and Acito's study.

Planned experience type III (S-Manipulate) significantly increased the scores of the subjects in that group. This finding is particularly interesting in view of the related theory and the results of previous research. The finding supports Piagetian theory which emphasizes manipulation of objects in the construction of knowledge. The gain scores for group III, who manipulated objects by themselves but had no verbal mediation, support this aspect of Piagetian theory. Almy (1976), in writing on curriculum implications of Piagetian theory, maintains that even though manipulation of things is essential to cognitive development, children left

"...entirely to their own devices miss many opportunities to derive fuller meaning from their experience." (Almy, 1976, p. 94).

She was emphasizing the need for social interaction, talking between teacher and child, in addition to manipulation of objects in movement to higher levels of thinking. Testing of hypotheses 2, 3, and 4 in this study showed that verbal mediation was effective in raising equivalence levels. The difference between pretest and gain scores of groups I and III shows that even though both methods significantly increased gain scores, the posttest mean of group I (3.42) was significantly greater than the posttest mean of experimental group III, thereby giving support to Almy's contention that social interaction as well as manipulation of objects is, indeed, important in cognitive development.
The finding in this study that subject-manipulation (planned experience type III) contributed to higher equivalence-making gain scores is not in agreement with results from previous research, even though this result is supported by theory. There are, however, methodological differences between previous studies and the present study which might account for the differences in results. Butters (1968) found that functional practice (i.e., subject manipulation) contributed to a less sophisticated mode of equivalence-making skills. He found that the functional use of three dimensional objects actually seemed to foster, not functional equivalence-choices, but lower level perceptible equivalence choices. This occurred in spite of the fact that Butters named the correct function of the objects used and encouraged correct usage by subjects.

Butters' functionally trained subjects participated in only one practice session. Subjects in the present study, however, participated in five practice sessions. Apparently the shift from a lower to a higher equivalence mode takes more time than that allotted to Butters' subjects. The fact that Butters introduced two classes of items (communication item and tools) during the same single session might have confused the subjects who were subsequently asked to make equivalence choices within each class of items. This, and not the functional practice with three dimensional objects might have contributed to a reliance on a well-established low level mode of equivalence-making. The present study, in addition to having five planned experience sessions, presented only one class of three dimensional objects at each session and the objects within each class had
obviously similar functions (See pp. 38 and 39 for a list of practice items used in the present study).

Miller (1969), like Butters (1968) found that manipulative training (i.e., subjects actively handled a set of pictures) did not foster higher level equivalence-making skills. The major difference between Miller's and the present study was that Miller used two-dimensional practice items (pictures on small white cards) while the present study employed three dimensional objects. In a discussion of her results, Miller stated that:

"In the training sessions for (the Manipulative practice group), after the child named the pictures and was allowed to play with them any way he desired, boredom seemed evident. Activities of the children ... included stacking the cards, turning them over, dropping them ... and building with them. No evidence of spontaneous classification was exhibited." (Miller, 1969, p. 28).

In the present study, interest in the practice items was high. Almost every child knew what each item was and, even without verbal guidance, used the items in appropriate functions. Thus, in the present study, the success of the S-Manipulate planned experience was probably due to the use of high interest three dimensional objects presented in five practice sessions with each session emphasizing only one class of items.

Planned experience type IV (E-Manipulate) did not significantly increase the scores of the subjects in that group. Piagetian theory emphasizes the need for motor activity as well as social interaction in cognitive development of preoperational children. Because the E-Manipulate planned experience incorporated neither of these concepts,
it is hardly surprising that the method was ineffective in significantly raising equivalence-making skills of the subjects.

Discussion of Results Relating to Retention Scores

In this experiment the sixth hypothesis (research hypothesis 6) tested was that subjects who manipulated objects would obtain significantly higher retention scores than would subjects who observed the experimenter manipulate objects.

The analysis of the data showed that six weeks after the first posttest, the groups who manipulated the objects did have significantly higher retention scores than the groups who watched someone else manipulate the objects (See Table 5 for the analysis of variance chart). This finding particularly supports the study by Wolff et al., who found no immediate posttest differences between performers and observers, but did find that performers, i.e., subjects who actually manipulated objects, did significantly better than observers on a paired-associate test on a second posttest. Wolff concluded that retention was best when children were able to manipulate as well as observe what they had done and that

"...optimal learning in the child under 5 or 6 years of age (and perhaps at any age) involves both perceptual and motor systems operating in a closed-loop feedback system..." (Wolff, 1974, p. 223).

On an immediate posttest for both paired-associate learning and equivalence-making, observers perform slightly but not significantly better than subjects who overtly manipulate objects. But in the present study, as in Wolff's study (1974) the manipulation of
objects seems to be the crucial variable responsible for longterm learning. Thus, very strong support is given to the Piagetian contention that motor activity on the part of a young child is an essential element in the movement to higher levels of thought.

In this experiment the seventh hypothesis (research hypothesis 7) tested was that significantly greater retention scores would be obtained by subjects who had a verbal mediating experience than by subjects who did not have a verbal mediating experience. The analysis of the data showed that on the retention test, Posttest 2, there was no significant difference on a test of equivalence-making attributable to verbal mediation. Thus, for retention of knowledge, verbalizing an experience seems to be a less essential variable than overt manipulation of objects.

An objective in this study was to determine which of the four types of planned experiences was influential in maintaining or increasing the effect of the planned experience sessions on a retention level.

The means of planned experience types II and IV (E-Manipulate + Verbal Mediation and E-Manipulate) increased only slightly over the six week period from Posttest 1 to Posttest 2. The increase was not significant at the .05 level set for this study. Therefore, subjects who observe an experimenter manipulate objects, even when the observation is combined with verbal mediation, maintained the effect of their planned experience but did not have significantly higher retention scores.
In contrast with planned experience types II and IV, types I and III (S-Manipulate + Verbal Mediation and D-Manipulate) were effective, not only in maintaining the effect of the planned experience sessions, but also in significantly increasing equivalence-making scores of subjects in those groups (I and III) over a six-week period. Thus, a child who manipulates objects seems to have a better chance of retaining what he has learned in terms of equivalence-making that a child who does not manipulate objects.

Conclusions

Results of this study suggest in the following major conclusions that:

1. planned experiences which include S-Manipulation + Verbal Mediation, E-Manipulation + Verbal Mediation, and S-Manipulation, are effective in enhancing significantly equivalence-making skills on an immediate posttest.

2. a planned experience which includes E-Manipulation is not effective in significantly raising equivalence-making skills on an immediate posttest.

3. planned experiences which include S-Manipulation + Verbal Mediation or S-Manipulation alone, on a delayed posttest, not only maintained the effects of the planned experiences but also significantly increased equivalence-making skills.

4. planned experiences involving verbal mediation are more effective in enhancing equivalence-making skills than are experiences not involving verbal mediation on an immediate posttest.
5. little difference in equivalence-making skills exist between those subjects who manipulate objects themselves and those who observe another person manipulate objects when subjects are given an immediate posttest.

6. little difference exists in equivalence-making skills between subjects whose planned experience included verbal mediation and subjects whose planned experience did not include verbal mediation when given a delayed posttest.

7. on a delayed posttest, evidence is strong for the need for overt manipulation of objects. Groups who manipulated objects themselves not only maintain what they learn but also increase their equivalence-making skills, while subjects who watch someone else manipulate objects merely maintain the effects of the planned experiences.

**Implications**

Implications were made from the results of this study. They follow.

1. Experiences can be developed and used in equivalence-making instruction with four-year-old preschool children.

2. Some types of planned experiences (S-Manipulate + Verbal Mediation, E-Manipulate + Verbal Mediation, S-Manipulate) are more effective in increasing equivalence-making skills than other experiences (E-Manipulate) on an immediate posttest.

3. Experiences in which four-year-old children actively manipulate objects are effective in maintaining as well as increasing
equivalence-making skills on a delayed posttest.

4. Preschool teachers can incorporate activities in equivalence-making instruction into their programs. Their students' longterm equivalence-making abilities would be enhanced best by letting children actively manipulate objects and while teacher and child talked about what the child was doing. The next most effective method for longterm learning of equivalence-making would be provided if the teacher chose to make available objects for the child to manipulate on his own with no verbal exchange with the teacher. Thus teachers who want to increase equivalence-making skills of their students should be aware of the effectiveness of overt manipulation of objects on this skill.

Recommendations for Further Research

The findings of this study indicate that further research dealing with equivalence-making by preschool children is warranted. Recommendations follow.

1. Further investigation of the S-Manipulate planned experience is needed. It was found in this study, but not in two related studies that subject-manipulation alone increased equivalence-making scores. The discrepancies were attributed, in the "Discussion" section of the report, to methodological differences among the studies. A separate study comparing Miller's (1969) S-Manipulative training and the S-Manipulative planned experience in the present study is warranted.
2. Research is needed of the effect of active manipulation of objects on other skills (e.g., seriation) to justify generalizability of the Piagetian concept of the need for action on objects during the preoperational stage. Previous research has shown that a child's active manipulation of objects enhances certain skills: paired-associate recognition and question-asking. The present study also found that a child's active manipulation enhanced equivalence-making skills.

3. Survey and/or observational research is needed to establish the following: (1) teacher's perceptions of the importance of stages in the development of "classification" or equivalence-making skills for young children and the need for activity in preschool classes, (2) activities employed by teachers to foster equivalence-making skills, and (3) whether activities chosen really do serve to foster higher levels of equivalence-making (functional/nominal levels) or whether the activities stress already well-established levels. This type of research is needed, because in order for teachers to incorporate the findings of the present study, they should know of the value of equivalence-making planned experiences as well as activities useful in fostering higher levels of equivalence-making of the children in their classes.

4. Research is needed on the feasibility of incorporating the methods in this study to a regular classroom setting.
5. Research is needed involving a longer span of time between the first and the second posttests to strengthen the finding that long-term learning of equivalence-making skills is best when children actively manipulate objects.
CHAPTER VI

SUMMARY

This study was designed to test the idea from Piagetian theory that action on objects and social interaction are two factors responsible for movement to higher levels of thought. The vehicle for the testing of this idea was the skill known as equivalence-making. A major purpose of this study was to test and compare the effectiveness of four types of planned experiences on the equivalence-making skills of four-year-old nursery school children. The independent variables in this study were type of manipulation and type of verbal mediation. Dependent variables were acquisition and retention of higher-level equivalence-making skills.

Eleven preschools were randomly selected for the study from 150 preschools in Franklin County, Ohio. Seventy-six four-year-old children, 43 boys and 33 girls served as subjects. Subjects were randomly selected for pretesting from the population in the eleven schools. The study had four experimental groups: (I) Subject-Manipulation + Verbal Mediation, (II) Experimenter-Manipulation + Verbal Mediation, (III) Subject-Manipulation, and (IV) Experimenter-Manipulation. Each group had 19 subjects. Random assignment was used to place subjects in the experimental groups. A total of 71 subjects were available for Posttest 2.
To test for levels of equivalence-making, the Fisher-Miller Test of Equivalence-Making was used. The same test was used for the pretest, Posttest 1, and Posttest 2. All subjects were given all tests except for four subjects who dropped from the study between Posttest 1 and Posttest 2. These four subjects did not participate in Posttest 2.

Each experimental group was exposed to one of the types of planned experience listed above. Five planned experiences were completed for each subject. Posttest 1 was given immediately after the last planned experience session. Posttest 2 was given six weeks after Posttest 1.

The data were analyzed by a two-way factorial analysis of variance to allow sources of variation in the independent variables to be analyzed at the same time. Multiple comparison hypotheses were tested by performing t-tests on the gain scores of various combinations of the independent variables. A two-way analysis of variance was performed to determine the retention effect of the different types of planned experiences on the equivalence-making gain scores. For each type of planned experience the Posttest 1 mean was compared to the Posttest 2 mean six weeks after Posttest 1 to determine which of the methods was effective in maintaining or increasing the level of equivalence-making.

Research hypotheses were tested in null form. Below, the significant findings relating to each null hypothesis are presented.
Main Effects-Type of Manipulation (Gain Scores)

There will be no difference in the gain scores on a test of equivalence-making between four-year-old children whose planned experience consists of overtly manipulating objects and four-year-old children whose planned experience consists of observing the examiner manipulate objects.

The null hypothesis of main effects for type of manipulation failed to be rejected. Little difference was found between the effect on gain scores produced by type of manipulation.

Main Effects-Type of Verbal Mediation (Gain Scores)

There will be no difference in the gain scores on a test of equivalence-making between four-year-old children whose planned experience involves verbal mediation and four-year-old children whose planned experience does not involve verbal mediation.

The null hypothesis of main effects for type of manipulation was rejected. The F-value of 18.27 was significant at the .05 level set for this study. A significant difference existed between the effect on gain scores produced by type of verbal mediation.
Multiple-Comparison Hypotheses

There will be no difference in the gain scores on a test of equivalence-making between four-year-old children who participate in a verbal mediating experience while overtly manipulating objects and four-year-old children who do not participate in a verbal mediating experience while overtly manipulating objects.

Null hypothesis (S-Manipulate + Verbal Mediation = S-Manipulate) was rejected. The t-value of 1.87 was significant at the .05 level. A significant difference existed between the effect on gain scores produced by subject-manipulation combined with verbal mediation and subject-manipulation alone.

There will be no difference in the gain scores on a test of equivalence-making between four-year-old children who participate in a verbal mediating experience while observing the examiner manipulate objects and four-year-olds who do not participate in a verbal mediating experience while observing the examiner manipulate objects.

Null hypothesis 4 (E-Manipulate + Verbal Mediation = E-Manipulate) was rejected. The t-value of 4.16 was significant at the .05 level. A significant difference existed between the effect on gain scores produced by experimenter manipulation combined with verbal mediation and experimenter manipulation alone.

There will be no difference in the gain scores on a test of equivalence-making between four-year-old children who participate in a verbal mediating experience while overtly manipulating objects and four-year-olds who participate in a verbal mediating experience while observing the examiner manipulate objects.
The null hypothesis failed to be rejected because the t-value of 1.45 was not significant at the .05 level. There was little difference between the gain means of the S-Manipulate + Verbal Mediation and the E-Manipulate + Verbal Mediation groups.

Main Effects Hypothesis-Type of Manipulation (Second Posttest)

Six weeks after Posttest 1, there will be no difference in the retention scores of four-year-old children whose planned experience consisted of overtly manipulating objects and four-year-old children whose planned experience consisted of observing the examiner manipulate objects.

Statistical analysis showed that the F-value of 5.45 was significant at the .05 level. Therefore, the null hypothesis was rejected. A significant difference existed between the effect on retention scores produced either by subject-manipulation or experimenter-manipulation.

Main Effects Hypothesis-Type of Mediation (Second Posttest)

Six weeks after Posttest 1, there will be no difference in the retention scores of four-year-old children whose planned experience involved verbal mediation and four-year-olds whose planned experience did not involve verbal mediation.

Statistical analysis showed that the F-value of .55 was not significant at the .05 level. Therefore, the null hypothesis failed to be rejected. There seemed to be little difference between the effect on retention scores produced by variations in type of verbal mediation.
The statistical analysis also included t-tests which determined the effectiveness of each type of planned experience for gain scores as well as for retention scores. The t-tests showed that planned experience types I (S-Manipulate + Verbal Mediation), II (E-Manipulate + Verbal Mediation), and III (S-Manipulate) were effective in significantly increasing equivalence-making gain scores. For retention scores, t-tests showed that planned experience types II (E-Manipulate + Verbal Mediation) and IV (E-Manipulate) were effective in maintaining the effect of planned experiences but did not significantly raise scores farther during the six weeks between Posttest 1 and Posttest 2. However, planned experience types I (S-Manipulate + Verbal Mediation and III (S-Manipulate) were effective not only in maintaining the effect of planned experiences but also in significantly increasing the scores from Posttest 1 to Posttest 2.
APPENDIX A

Letter to Center Directors
Explaining the Study
From: Marian C. Marion  
Graduate Student  
Department of Family Relations and  
Human Development  
School of Home Economics  
The Ohio State University  
Phone: 422-7705  

To: DIRECTORS AND TEACHERS OF NURSERY SCHOOLS  

Re: Letters explaining Marian Marion's research  
Parental Permission Forms  

First, let me thank you for agreeing to let me come to your  
preschool to work with some of your children for my research project.  
Enclosed are letters for parents. The letters explain what I am doing for my project. Also included are consent forms to be signed by parents whose children are to participate in the study.  
I would appreciate it very much if I could leave the letters and consent forms at the school and have the parents sign the consent forms at school. When the forms are signed, I will pick them up.  
I want to work with children whose ages range from 4 yrs.-0 months, to 4 yrs.-8 months, i.e., the child's birthdate should be between April, 1971 and December, 1971.  
Would you please call me when the forms are signed?
APPENDIX B

Letter to Parents
Explaining Study
Dear [Name],

I am writing to you because you are the parent of a preschool child. I am interested in ways preschool children learn and I know that as a parent you share my interest.

As a graduate student at Ohio State University, I am getting ready to write my dissertation. The study is being supervised by my faculty adviser, Dr. Jean D. Dickerscheid, Professor, Department of Family Relations and Human Development in the School of Home Economics. I would very much like to have your child participate in this study.

I am interested in learning two things about how young children think and learn. First, I would like to know how preschool children place things in groups or "classify" things. Second, I am especially interested in knowing how this ability changes over time.

To find out about how children classify, I will ask your child to look at a group of pictures and make some choices. To see how this ability changes over time, I will come to your child's preschool and meet with your child for five 10-minute individual play sessions.

Please be assured that your child's performance will be kept strictly confidential. His/her name will not be used when results are reported. This study will look at the results in terms of four-year-old children in groups and not in terms of the performance of individual children.

If you would be willing to have your child participate in these play sessions, please sign the attached Parental Permission Form and leave it with your child's teacher by [date].

I think that your child would enjoy the play sessions and I would appreciate your permission to have him/her participate in my study. If you have any questions, please feel free to call me.

Sincerely,

Marian C. Marion, Graduate Student
Dept. of Family Relations and Human Development
315 Campbell Hall
Ohio State University
Columbus, Ohio 43210
Phone: 422-7705
APPENDIX C

Parental Permission Form for Research Participation
Parental Permission Form for Research Participation

My child _________________________ has my permission to participate in the study to be conducted by Mrs. Marian C. Marion at my child's preschool.

I understand that Mrs. Marion will come to my child's preschool and will ask my child to make choices from among several pictures and in the following weeks will meet with my child in five 10-minute individual play sessions.

______________________________
(Parent's Signature)

______________________________
(Name of your child's preschool)

After signing the form, please leave it with your child's teacher.
APPENDIX D

Form for Recording Dates of
Experimenter-Subject Contacts
Form for Recording Dates of Experimenter-Subject Contacts

Experimenter's name: __________________________ Name of School __________________________

Note: 1. Please initial each space to indicate that you have carried out a session
2. Place the date of each contact in the appropriate space.

Name of School __________________________
Address of School __________________________
Name of Director __________________________
Phone Number __________________________

Times appropriate for visitation by Experimenter

<table>
<thead>
<tr>
<th>DATE OF:</th>
<th>Planned Experience#:</th>
<th></th>
<th>Posttest 1</th>
<th>Posttest 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child's Name</td>
<td>Pretest</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Name</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

*One form was used for each school in the study. See p. 41 for a description of the use of the form.
APPENDIX E

TEST OF EQUIVALENCE-MAKING

a) Figure 2. Photograph of Testing Instrument

b) Score Sheets
   1-Pretest
   2-Posttest 1
   3-Posttest 2

c) Procedure for Administering the Test
<table>
<thead>
<tr>
<th>Stimulus Pictures</th>
<th>Response Pictures</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Stimulus Picture 1]</td>
<td>![Response Picture 1]</td>
</tr>
<tr>
<td>![Stimulus Picture 2]</td>
<td>![Response Picture 2]</td>
</tr>
<tr>
<td>![Stimulus Picture 3]</td>
<td>![Response Picture 3]</td>
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<tr>
<td>![Stimulus Picture 4]</td>
<td>![Response Picture 4]</td>
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<tr>
<td>![Stimulus Picture 5]</td>
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<tr>
<td>![Stimulus Picture 6]</td>
<td>![Response Picture 6]</td>
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<tr>
<td>![Stimulus Picture 7]</td>
<td>![Response Picture 7]</td>
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<tr>
<td>![Stimulus Picture 8]</td>
<td>![Response Picture 8]</td>
</tr>
<tr>
<td>![Stimulus Picture 9]</td>
<td>![Response Picture 9]</td>
</tr>
<tr>
<td>![Stimulus Picture 10]</td>
<td>![Response Picture 10]</td>
</tr>
</tbody>
</table>

Figure 2. Photograph of the test
Score Sheet for Pretest (white paper)*

Child's Name: ____________________________
Child's Birthdate: _______________________
Child's Age: ____________________________
School: _________________________________
Date: ___________________________________

<table>
<thead>
<tr>
<th>Stimulus Card</th>
<th>Response Cards</th>
</tr>
</thead>
<tbody>
<tr>
<td>TREE WHY?</td>
<td>NC CLOWN LEAF FLOWER LAMP</td>
</tr>
<tr>
<td>CAT WHY?</td>
<td>NC DOG PIANO PEAR CHICKS</td>
</tr>
<tr>
<td>WAGON WHY?</td>
<td>NC BOX JACK-IN- BIKE TOMATO</td>
</tr>
<tr>
<td>CHICK WHY?</td>
<td>NC SHEEP BELL TV EGGS</td>
</tr>
<tr>
<td>TOMATO WHY?</td>
<td>NC SAND- SLED CARROTS BALL</td>
</tr>
<tr>
<td>SAND-WICH WHY?</td>
<td>NC JUG CORN BOOK BANANA</td>
</tr>
<tr>
<td>HOUSE WHY?</td>
<td>NC BARN TOP TENT CHILD</td>
</tr>
<tr>
<td>COW WHY?</td>
<td>NC FOOTBALL TABLE MILK ROOSTER</td>
</tr>
<tr>
<td>COAT WHY?</td>
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<tr>
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**SUB-TOTAL EACH COLUMN**

NUMBER FUNCTIONAL OR ABOVE

INCLUDE IN STUDY? YES NO

*Score sheets used for this study were color-coded to avoid confusion.
Score Sheet for Posttest 1
(pink paper)

Child's Name: 
Child's Birthdate: 
Child's Age: 
School: 
Date: 

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SUB-TOTAL EACH COLUMN
NUMBER FUNCTIONAL OR ABOVE 
CHANGE FROM PRETEST? 


Score Sheet for Posttest 2
(blue paper)

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SUB-TOTAL EACH COLUMN:
NUMBER FUNCTIONAL OR ABOVE
CHANGE FROM POSTTEST 1 TO POSTTEST 2?  

Child's Name: ____________________________
Child's Birthdate: ______________________
Child's Age: ____________________________
School: _________________________________
Date: _________________________________
**Procedure for Administering the Test**

(Experimenter's statements are in all CAPITAL letters).

WE'RE BOTH GOING TO PLAY THIS GAME. YOU WILL LOOK AT SOME PICTURES AND TELL ME WHAT THEY ARE. I WILL PLAY THE GAME BY WRITING DOWN WHAT YOU SAY.

Pick up the first group of pictures. Put picture #1-1 in front of the child.

Say: TELL ME WHAT THIS IS.

If the child answers correctly, say: GOOD or YES.

If the child answers incorrectly, say: WELL, THAT IS SOMETHING LIKE A _____. IT IS CALLED A _____.

Use the same procedure with all pictures in the group.

1-1 1-2 1-3 1-4 1-5

After naming the items, say: FOR THE NEXT PART OF THE GAME, I TAKE THIS PICTURE (1-1) AND MOVE IT TO HERE
NOW, LOOK AT THESE FOUR PICTURES, . . .

(point to each picture)

1-2  1-3  1-4  1-5

. . . AND TELL ME WHICH OF THESE FOUR PICTURES GOES WITH THIS (TREE).

Record the choice by circling the appropriate word on the score sheet.

Move card 1-1 next to the child's choice.

Say: THERE IS ONE MORE PART TO THIS GAME. NOW, TELL ME--HOW DOES THE (________) GO WITH THE (________)?

Record exactly what the child says in the space provided. Use this same procedure with each subset of pictures.

At the end of the test, say: WE'RE FINISHED WITH ALL THE PICTURES. THANK YOU FOR PLAYING THE GAME WITH ME.
APPENDIX F

PLANNED EXPERIENCE PROGRAM

a) Figure 3. Photograph of Items to be used in Planned Experience Sessions

b) Schedule—Sessions during which Specific Groups of Items should be used

c) Instructions for Planned Experience Sessions
   1-Instructions to use with Group I
   2-Instructions to use with Group II
   3-Instructions to use with Group III
   4-Instructions to use with Group IV
Figure 3. Photograph of Items used in Planned Experience Sessions
<table>
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<tr>
<td>2</td>
<td>Items to clean with</td>
</tr>
<tr>
<td>3</td>
<td>Items to wear</td>
</tr>
<tr>
<td>4</td>
<td>Items to write with</td>
</tr>
<tr>
<td>5</td>
<td>Items to wear</td>
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Directions for Planned Experience Sessions

In this study there were four types of planned experiences and there were five planned experience sessions for each of the four types. Therefore, this appendix is organized in the following manner: (1) planned experience type I, directions for sessions 1, 2, 3, 4, 5, (2) planned experience type II, directions for sessions 1, 2, 3, 4, 5, (3) planned experience type III, directions for sessions 1, 2, 3, 4, 5, and (4) planned experience type IV, directions for sessions 1, 2, 3, 4, 5.

Number of children in each session = 1
Time to be spent in each session = 10 minutes

Planned Experience type I: S-Manipulate + Verbal Mediation

Session number: 1

Materials: Items to write or draw with

Procedure

(Experimenter's statements are in all CAPITAL letters)

Greeting: HELLO (CHILD'S NAME__________). I AM (E'S NAME__________) I HAVE A GAME TO PLAY WITH YOU. LET'S SIT DOWN AT THIS TABLE TOGETHER (OR LET'S SIT DOWN ON THIS RUG TOGETHER).

Part I - Naming the Items to be used

I'M GOING TO START OUR GAME BY ASKING YOU TO TELL ME THE NAMES OF ALL THE THINGS THAT I SHOW YOU.

Show the child the first item and say: TELL ME WHAT THIS IS.

As the subject names the items in the group, E will comment "good," or "okay." If S needs help naming the items, E may name them but only after S has made an attempt or indicates that S needs help.

After all objects in the group are named, say: WE HAVE TALKED ABOUT THE NAMES OF ALL THESE THINGS.
FOR THE REST OF THE GAME, YOU WILL BE PLAYING WITH THE TOYS AND I WILL TALK TO YOU WHILE YOU PLAY.

Pick up the (crayon). THIS CRAYON IS SOMETHING THAT YOU CAN USE. IT IS SOMETHING THAT YOU USE TO DRAW OR WRITE WITH. YOU MAY USE IT TO DRAW A PICTURE ON THIS PAPER.

Comments while S is drawing: TELL ME WHAT YOU ARE DOING WITH THAT (crayon). YES, YOU ARE USING THAT (CRAYON) TO MAKE MARKS ON THE PAPER, . . . TO WRITE YOUR NAME, . . . TO DRAW WITH, . . . etc.

When the S is done, say: THE (CRAYON) IS SOMETHING THAT YOU USE TO DRAW WITH. FIND SOMETHING ELSE THAT YOU CAN DRAW WITH.

YES. THE (CRAYON) AND THE (MAGIC MARKER) ARE ALIKE BECAUSE YOU CAN USE THEM TO DRAW OR WRITE WITH. YOU MAY USE THE MARKER TO DRAW A PICTURE ON THIS PAPER.

Verbal Mediation/comments while S is drawing: TELL ME WHAT YOU ARE DOING WITH THAT (MARKER). YES, YOU ARE USING THE (MARKER) TO MAKE MARKS ON THE PAPER, . . . TO DRAW WITH, . . . TO WRITE WITH.

When the S is done, say: THE (MARKER) IS SOMETHING TO DRAW AND WRITE WITH. FIND SOMETHING ELSE THAT YOU USE TO WRITE AND DRAW WITH.

YES. THE (MARKER) AND THE (PENCIL) ARE ALIKE BECAUSE YOU CAN USE THEM TO DRAW AND WRITE WITH. YOU MAY USE THE (PENCIL) TO WRITE AND DRAW ON THIS PAPER.

Verbal Mediation: WHAT ARE YOU USING THAT (PENCIL) FOR? WHAT ARE YOU DOING WITH THE PENCIL? YES, YOU ARE USING THE (PENCIL) TO MAKE MARKS ON THE PAPER, . . . TO DRAW WITH, . . . TO WRITE WITH.

When S is done, say: THE (PENCIL) IS SOMETHING TO DRAW AND WRITE WITH. FIND SOMETHING ELSE THAT YOU USE TO WRITE AND DRAW WITH.

YES. THE (PENCIL) AND (CHALK) GO TOGETHER BECAUSE YOU CAN USE THEM TO DRAW AND WRITE WITH. YOU MAY USE THE (CHALK) TO WRITE AND DRAW ON THIS PAPER.

Verbal Mediation: TELL ME WHAT YOU ARE USING THAT (CHALK) FOR. YES, YOU ARE USING THE (CHALK) JUST LIKE YOU USED THE (PENCIL) AND THE (CRAYON). YOU ARE USING THE (CHALK) TO MAKE LINES ON THE PAPER, . . . TO WRITE YOUR NAME, . . . TO DRAW WITH, . . . etc.

When S is done: THE (CHALK) IS SOMETHING TO DRAW AND WRITE WITH. FIND SOMETHING ELSE THAT YOU USE TO WRITE AND DRAW WITH.

YES. THE (PEN) AND (CHALK) ARE ALIKE BECAUSE YOU CAN USE THEM TO DRAW AND WRITE WITH. YOU MAY USE THE (PEN) TO WRITE AND DRAW ON THIS PAPER.
Verbal Mediation:  WHAT ARE YOU USING THAT (PEN) FOR? YES, YOU'RE 106 USING THE (PEN) TO . . . WRITE WITH, . . . TO DRAW PICTURES WITH, . . . TO MAKE MARKS ON THE PAPER. YOU ARE USING THE (PEN) JUST LIKE YOU USED THE CHALK, THE MAGIC MARKER, THE CRAYON AND PENCIL. THE (PEN) IS SOMETHING TO DRAW WITH; IT IS A DRAWING THING.

Part III - Ending the Session

When the child (S) is done with the last item, or at the end of 10 minutes, say: OUR GAME IS (ALMOST) OVER. IT'S TIME TO GO BACK TO YOUR ROOM NOW. YOU HAVE USED ALL THESE THINGS TO WRITE OR DRAW WITH. THE NEXT TIME THAT I COME, WE WILL PLAY THIS GAME, BUT WE WILL USE SOME DIFFERENT TOYS.

Planned Experience type I:  S-Manipulate + Verbal Mediation

Session number: 2

Materials: Items to clean with

Procedure

Greeting: HELLO (____________). I WAS HERE AT YOUR SCHOOL BEFORE AND WE PLAYED A GAME TOGETHER. I BROUGHT THE GAME BACK, BUT THIS TIME I BROUGHT SOME NEW THINGS TO PLAY WITH.

TELL ME THE NAMES OF SOME OF THE THINGS THAT I BROUGHT WHEN WE PLAYED THE GAME BEFORE.

YES, I BROUGHT THE PENS, AND PENCILS, AND CHALK. AND WHAT DID YOU DO WITH THEM? YOU ARE RIGHT. YOU WROTE WITH THEM AND DREW PICTURES WITH THEM. THE PENCIL AND PEN AND CHALK AND MARKER WERE WRITING THINGS.

PART I - Naming the Items to be used

I'M GOING TO START OUR GAME BY ASKING YOU TO TELL ME THE NAMES OF ALL THE THINGS THAT I SHOW YOU.

Show the S the first item and say: TELL ME WHAT THIS IS.

As the S names the items in the group, E comments "GOOD" or "OKAY". If S needs help naming the items, E may name them but only after S has made an attempt or indicates that S needs help. After all objects in the group are named, say: WE HAVE TALKED ABOUT THE NAMES OF ALL THESE THINGS.
Part II - Making Equivalence-Choices at the Functional Level

FOR THE REST OF THE GAME, YOU WILL BE PLAYING WITH THESE THINGS AND I WILL TALK TO YOU WHILE YOU PLAY.

1. Pick up the (paper towel). THIS (PAPER TOWEL) IS SOMETHING THAT YOU CAN USE. IT IS SOMETHING THAT YOU USE TO CLEAN THINGS WITH. YOU MAY USE THE (TOWEL) AND THIS (SPRAY BOTTLE WITH WATER) TO CLEAN THE ...

Verbal Mediation: TELL ME WHAT YOU ARE DOING WITH THE (PAPER TOWEL). YES. YOU ARE USING THE (PAPER TOWEL) TO CLEAN THE (__) WITH. TO WIPE UP THE WATER, TO WIPE UP THE DIRT, etc.

2. When the S is done, say: THE (PAPER TOWEL) IS SOMETHING THAT YOU CAN USE TO CLEAN THINGS WITH. FIND SOMETHING ELSE THAT YOU CAN CLEAN THINGS WITH.

YES. THE (PAPER TOWEL) AND THE (SPONGE) ARE ALIKE BECAUSE YOU CAN USE THEM TO CLEAN THINGS WITH. YOU MAY USE THE SPONGE TO CLEAN THE...

Verbal Mediation: TELL ME WHAT YOU ARE DOING WITH THE SPONGE. YES, YOU ARE USING THAT (SPONGE) JUST LIKE YOU USED THE (PAPER TOWEL). YOU ARE USING THE (SPONGE) TO WIPE UP THE DIRT ON THE. TO DRY THE TABLE, TO CLEAN THE...

3. When the S is done, say: THE (SPONGE) IS SOMETHING THAT YOU CAN USE TO CLEAN THINGS WITH. FIND SOMETHING ELSE THAT YOU CAN USE TO CLEAN THINGS WITH.

YES. THE (WASH CLOTH) AND THE SPONGE ARE ALIKE BECAUSE YOU CAN USE THEM TO CLEAN THINGS WITH. YOU MAY USE THE (WASH CLOTH) TO CLEAN THE DOLL.

Verbal Mediation: WHAT ARE YOU DOING WITH THE (WASH CLOTH)? YES, YOU ARE USING THAT (WASH CLOTH) JUST LIKE YOU USED THE (SPONGE) AND THE (PAPER TOWEL). YOU ARE USING THE WASH CLOTH TO CLEAN THE DOLL, YOU ARE WIPING THE DIRT OFF THE DOLL, YOU ARE CLEANING THE DOLL'S FACE, etc.

4. When the S is done, say: THE (WASH CLOTH) IS SOMETHING THAT YOU CAN USE TO CLEAN THINGS WITH. FIND SOMETHING ELSE THAT YOU CAN USE TO CLEAN THINGS WITH.

YES. THE (BROOM) AND THE (WASH CLOTH) ARE ALIKE BECAUSE YOU CAN USE THEM TO CLEAN THINGS WITH. YOU MAY USE THE (BROOM) TO CLEAN THE...

Verbal Mediation: TELL ME WHAT YOU ARE DOING WITH THE BROOM. YES, YOU ARE USING THAT (BROOM) JUST LIKE YOU USED THE (WASH CLOTH) AND THE (SPONGE). YOU ARE USING THE (BROOM) TO CLEAN WITH. YOU ARE SWEEPING THE FLOOR, YOU ARE SWEEPING THE, YOU ARE USING THE (BROOM) TO CLEAN WITH.
Part III - Ending the Session

When S is done with the last item, or at the end of 10 minutes, say:
OUR GAME IS (ALMOST) OVER. IT'S TIME TO GO BACK TO YOUR ROOM NOW.
YOU HAVE USED ALL THESE THINGS TO CLEAN WITH. THE NEXT TIME THAT I
COME, WE WILL PLAY THIS SAME GAME BUT WE WILL USE SOME DIFFERENT TOYS.

Planned Experience type I: S-Manipulate + Verbal Mediation

Session number: 3

Materials: Items to wear or dress the doll with

Procedure

Greeting: HELLO (__________). I WAS HERE AT YOUR SCHOOL BEFORE
AND WE PLAYED A GAME TOGETHER. I BROUGHT THE GAME BACK, BUT THIS
TIME I BROUGHT SOME NEW THINGS TO PLAY WITH.

TELL ME THE NAMES OF SOME OF THE THINGS THAT I BROUGHT WHEN WE PLAYED
THE GAME BEFORE.

YES. I BROUGHT THE PENS AND PENCILS AND CHALK. AND WHAT DID YOU
DO WITH THEM? YOU'RE RIGHT, YOU WROTE/DREW PICTURES WITH THEM. THEY
ARE WRITING THINGS. AND THEN I BROUGHT THE SPONGE, AND BROOM, AND
SOAP, AND WASHCLOTH. WHAT DID YOU DO WITH THEM? YES, YOU WASHED
THINGS WITH THEM. THEY WERE WASHING THINGS.

Part I - Naming the Items to be used

I BROUGHT SOME DIFFERENT THINGS TODAY AND I'M GOING TO START OUR
GAME BY ASKING YOU TO TELL ME THE NAMES OF ALL THE THINGS THAT I
SHOW YOU.

Show S the first item and say: TELL ME WHAT THIS IS.

As S names the items in the group, comment "GOOD" or "OKAY." If S
needs help naming the items, E may name them but only after S has
made an attempt or indicates that S needs help. After all objects
are named, say: WE HAVE TALKED ABOUT THE NAMES OF ALL THESE THINGS.

Part II - Making Equivalence-Choices at the Functional Level

FOR THE REST OF THE GAME, YOU WILL BE PLAYING WITH THE THINGS AND
I WILL TALK TO YOU WHILE YOU PLAY.

1. Pick up the (socks). THESE SOCKS ARE SOMETHING THAT YOU CAN
WEAR. YOU MAY USE THE SOCKS TO DRESS THIS DOLL.
Verbal mediation: TELL ME WHAT YOU ARE DOING WITH THE SOCKS. YOU ARE USING THE SOCKS TO DRESS THE DOLL, . . . TO KEEP THE DOLL'S FEET WARM, . . . THE DOLL IS WEARING THE SOCKS.

2. When S is done, say: THE (SOCKS) ARE SOMETHING THAT YOU WEAR. FIND SOMETHING ELSE THAT YOU CAN WEAR.

YES THE (SOCKS) AND THE (PANTS) ARE ALIKE BECAUSE YOU CAN WEAR THEM. YOU MAY USE THE PANTS TO DRESS THE DOLL.

Verbal mediation: WHAT ARE YOU DOING WITH THE PANTS? YES, YOU ARE USING THE (PANTS) JUST LIKE YOU USED THE SOCKS. YOU ARE USING THE (PANTS) TO DRESS THE DOLL, . . . TO KEEP THE DOLL WARM, . . . THE DOLL IS WEARING THE PANTS.

3. When S is done, say: THE (PANTS) ARE SOMETHING THAT YOU CAN USE TO WEAR. FIND SOMETHING ELSE THAT YOU CAN USE TO WEAR.

YES, THE (SHIRT) AND THE (PANTS) ARE ALIKE BECAUSE YOU CAN USE THEM TO WEAR. YOU MAY USE THE SHIRT TO DRESS THE DOLL.


4. When S is done, say: THE (SHIRT) IS SOMETHING THAT YOU CAN USE TO WEAR. FIND SOMETHING ELSE THAT YOU CAN USE TO WEAR.

YES, THE (HAT) AND THE SHIRT ARE ALIKE BECAUSE YOU CAN USE THEM TO WEAR. YOU MAY USE THE (HAT) TO DRESS THE DOLL.


Part III - Ending the Session

When S is done with the last item, or at the end of 10 minutes, say: OUR GAME IS (ALMOST) OVER. IT'S TIME TO GO BACK TO YOUR ROOM NOW. YOU HAVE USED ALL THESE THINGS TO DRESS THE DOLL WITH. THE NEXT TIME THAT I COME, WE WILL PLAY THIS SAME GAME, BUT WE WILL USE SOME DIFFERENT THINGS.
Planned Experience type I: S-Manipulate + Verbal Mediation

Session number: 4

Materials: Items to write or draw with (the same items used in session 1)

Procedure

Greeting: HELLO (______). I BROUGHT THE GAME BACK AGAIN TODAY AND TODAY WE'RE GOING TO PLAY WITH SOME THINGS THAT WE HAVE ALREADY PLAYED WITH.

TELL ME SOME OF THE THINGS THAT I BROUGHT WHEN WE PLAYED THE GAME BEFORE.

YES. I BROUGHT PENCILS AND PENS. AND WHAT DID YOU DO WITH THEM?

YOU'RE RIGHT. YOU WROTE WITH THEM. THEY WERE WRITING THINGS. AND THEN I BROUGHT THE SPONGE, AND SOAP AND WASHCLOTH. WHAT DID YOU DO WITH THEM? YES, YOU CLEANED THINGS WITH THEM. THEY WERE WASHING THINGS. AND THEN, I BROUGHT THE DOLL AND CLOTHES. WHAT DID WE DO WITH THE CLOTHES? YES, WE PUT THE CLOTHES ON THE DOLL TO KEEP HER WARM. CLOTHES ARE THINGS TO WEAR.

TODAY, I BROUGHT BACK THE PENCIL AND PEN AND CHALK. TELL ME, CAN YOU USE THESE PENCILS, AND PENS AND CHALK TO:

EAT? (YOU'RE RIGHT, YOU CAN'T EAT PENS)

CLEAN THE WALL OR FLOOR? (PENS ARE NOT CLEANING THINGS)

PUT ON TO KEEP WARM? (YOU'RE RIGHT, PENS ARE NOT FOR WEARING.)

IF YOU CAN'T EAT THE PENS, OR CLEAN THINGS WITH THEM OR WEAR THEM, WHAT CAN YOU DO WITH THEM? RIGHT, YOU CAN USE THEM FOR WRITING.

Proceed with the rest of the session. The rest of this session is the same as for Planned Experience type I, session number 1, Parts I, II, and III, pp. 104-106.
Planned Experience type I:  S-Manipulate + Verbal Mediation

Session Number: 5

Materials: Items to wear or to dress with (the same items used in session 3)

Procedure

Greeting: HELLO (________). I BROUGHT THE GAME BACK AGAIN TODAY AND TODAY WE'RE GOING TO PLAY WITH SOME THINGS THAT WE HAVE ALREADY PLAYED WITH.

TELL ME SOME OF THE THINGS THAT I BROUGHT WHEN WE PLAYED THE GAME BEFORE.

YES. I BROUGHT PENCILS AND PENS. AND WHAT DID YOU DO WITH THEM?

YOU'RE RIGHT. YOU WROTE WITH THEM. THEY WERE WRITING THINGS. AND THEN I BROUGHT THE SPONGE, AND SOAP AND WASHCLOTH. WHAT DID YOU DO WITH THEM? YES. YOU CLEANED THINGS WITH THEM. THEY WERE WASHING THINGS.

TODAY, I BROUGHT BACK THE CLOTHES, THE PANTS, AND HAT AND SOCKS. TELL ME, CAN YOU USE THESE CLOTHES TO:

_____EAT? (YOU'RE RIGHT, YOU CAN'T EAT CLOTHES.)
_____CLEAN THE WALL OR FLOOR? (THAT'S RIGHT. CLOTHES ARE NOT FOR CLEANING.)
_____MAKE MUSIC? (YOU'RE RIGHT, CLOTHES ARE NOT FOR MAKING MUSIC.)

IF YOU CAN'T EAT CLOTHES, OR CLEAN WITH THEM, OR MAKE MUSIC WITH THEM, THEN WHAT CAN YOU USE CLOTHES FOR? THAT'S RIGHT. CLOTHES ARE FOR WEARING TO KEEP YOU WARM.

Proceed with the rest of the session. The rest of this session is the same as for Planned Experience type I, session number 3, Parts I, and II, pp. 108-109.

Part III - Ending the Session

WE ARE FINISHED WITH THE GAME. WE HAVE PLAYED THE GAME LOTS OF TIMES. NOW IT IS TIME TO LOOK AT THE PICTURES AGAIN.
Planned Experience type II: E-Manipulate + Verbal Mediation

Session number: 1

Materials: Items to write or draw with

Procedure

Greeting: HELLO (__________). I AM (__________). I HAVE A GAME TO PLAY WITH YOU. LET'S SIT DOWN AT THIS TABLE TOGETHER (OR LET'S SIT DOWN ON THIS RUG TOGETHER).

Part I - Naming the Items to be used

I'M GOING TO START OUR GAME BY ASKING YOU TO TELL ME THE NAMES OF ALL THE THINGS THAT I SHOW YOU.

Show the child the first item and say: TELL ME WHAT THIS IS.

As the subject names the items in the group, E will comment "GOOD," or "OKAY." If S needs help naming the items, E may name them but only after S has made an attempt or indicates that S needs help.

After all objects in the group are named, say: WE HAVE TALKED ABOUT THE NAMES OF ALL THESE THINGS.

Part II - Making Equivalence-Choices at the Functional Level

Introduce this part of the session by saying: FOR THE REST OF THE GAME, YOU WILL WATCH ME PLAY WITH THE THINGS AND I WILL TALK WHILE I WORK.

1. Pick up the (crayon). THIS (CRAYON) IS SOMETHING THAT YOU CAN USE. IT IS SOMETHING THAT YOU USE TO DRAW OR WRITE WITH. WATCH ME USE IT TO DRAW A PICTURE ON THIS PAPER.

Verbal mediation: TELL ME WHAT I AM DOING WITH THE CRAYON. YES, I AM USING THIS (CRAYON) TO MAKE MARKS ON THE PAPER, . . . TO DRAW WITH, . . . TO WRITE YOUR NAME WITH, . . . TO COLOR WITH, . . . etc.

2. After finishing with the crayon, say: THE (CRAYON) IS SOMETHING THAT YOU USE TO WRITE OR DRAW WITH. FIND SOMETHING ELSE THAT CAN BE USED TO DRAW WITH.

YES, THE (CRAYON) AND THE MAGIC MARKER ARE ALIKE BECAUSE YOU CAN USE THEM TO DRAW OR WRITE WITH. WATCH ME USE THE (MARKER) TO DRAW A PICTURE ON THE PAPER.

Verbal mediation: WHAT AM I DOING WITH THE MARKER? YES, I AM USING THIS (MARKER) JUST LIKE I USED THE (CRAYON). I AM USING THE (MARKER) TO MAKE LINES ON THE PAPER, . . . TO WRITE YOUR NAME, . . . TO DRAW WITH, . . . etc.
3. After finishing with the (magic marker), say: THIS IS SOMETHING THAT CAN BE USED TO DRAW AND WRITE WITH. FIND SOMETHING ELSE THAT CAN BE USED TO DRAW AND WRITE WITH.

YES, THE (MARKER) AND THE (PENCIL) ARE ALIKE BECAUSE YOU CAN USE THEM TO DRAW AND WRITE WITH. WATCH ME USE THE (PENCIL) TO DRAW WITH ON THIS PAPER.

Verbal mediation: WHAT AM I DOING WITH THE PENCIL? YES, I AM USING THIS (PENCIL) JUST LIKE I USED THE (MAGIC MARKER). I AM USING THE (PENCIL) TO MAKE LINES ON THE PAPER, . . . TO WRITE YOUR NAME, . . . TO DRAW WITH, . . . etc.

4. After finishing with the (pencil), say: THE (PENCIL) IS SOMETHING THAT CAN BE USED TO DRAW AND WRITE WITH. FIND SOMETHING ELSE THAT CAN BE USED TO DRAW AND WRITE WITH.

YES, THE (PENCIL) AND THE (CHALK) ARE ALIKE BECAUSE YOU CAN USE THEM TO DRAW AND WRITE WITH. WATCH ME USE THE (CHALK) TO DRAW WITH ON THIS PAPER.

Verbal mediation: WHAT AM I DOING WITH THE CHALK? I AM USING THIS (CHALK) JUST LIKE I USED THE (PENCIL). I AM USING THE (CHALK) TO MAKE LINES ON THE PAPER, . . . TO WRITE YOUR NAME, . . . TO DRAW WITH, . . . etc.

5. After finishing with the (chalk), say: THE (CHALK) IS SOMETHING THAT CAN BE USED TO DRAW AND WRITE WITH. FIND SOMETHING ELSE THAT CAN BE USED TO DRAW AND WRITE WITH.

YES, THE (CHALK) AND THE (PEN) ARE ALIKE BECAUSE YOU CAN USE THEM TO DRAW AND WRITE WITH. WATCH ME USE THE (PEN) TO DRAW WITH ON THIS PAPER.

Verbal mediation: WHAT AM I DOING WITH THE PEN? YES, I AM USING THIS (PEN) JUST LIKE I USED THE (CHALK). I AM USING THE (PEN) TO MAKE LINES ON THE PAPER, . . . TO WRITE YOUR NAME, . . . TO DRAW WITH, . . . etc.

Part III - Ending the Session

When E is finished with the last item, or at the end of 10 minutes, say: OUR GAME IS (ALMOST) OVER. IT'S TIME TO GO BACK TO YOUR ROOM NOW. I HAVE USED ALL THESE THINGS TO WRITE AND DRAW WITH. THE NEXT TIME THAT I COME, WE WILL PLAY THIS GAME, BUT WE WILL USE SOME DIFFERENT THINGS.
Planned Experience type II: E-Manipulate + Verbal Mediation

Session number: 2

Materials: Items to clean with

Procedure

Greeting: HELLO (__________). I WAS HERE AT YOUR SCHOOL BEFORE AND WE PLAYED A GAME TOGETHER. I BROUGHT THE GAME BACK, BUT THIS TIME I BROUGHT SOME NEW THINGS TO PLAY WITH.

TELL ME THE NAMES OF THE THINGS THAT I BROUGHT WHEN WE PLAYED THE GAME BEFORE.

YES. I BROUGHT THE PEN, AND PENCILS, AND CHALK. AND WHAT DID I DO WITH THEM? YOU ARE RIGHT. I WROTE WITH THEM AND DREW PICTURES WITH THEM. THE PENCIL AND PEN AND CHALK AND MARKER WERE WRITING THINGS.

Part I - Naming the Items to be used

I'M GOING TO START OUR GAME BY ASKING YOU TO TELL ME THE NAMES OF ALL THE THINGS THAT I SHOW YOU.

Show the S the first item and say: TELL ME WHAT THIS IS.

As the S names the items in the group, E comments "GOOD" or "OKAY". If S needs help naming the items, E may name them but only after S has made an attempt or indicates that S needs help. After all objects in the group are named, say: WE HAVE TALKED ABOUT THE NAMES OF ALL THESE THINGS.

Part II - Making Equivalence-Choices at the Functional Level

FOR THE REST OF THE GAME, YOU WILL WATCH ME PLAY WITH THE THINGS AND I WILL TALK WHILE I WORK.

1. Pick up the (paper towel). THIS PAPER TOWEL IS SOMETHING THAT YOU CAN USE. IT IS SOMETHING THAT YOU USE TO CLEAN THINGS WITH. WATCH ME USE THE TOWEL AND THIS SPRAY BOTTLE TO CLEAN THE . . .

Verbal mediation: TELL ME WHAT I AM DOING. YES, I AM USING THIS (PAPER TOWEL) TO CLEAN THE . . . WITH, . . . TO WIPE UP THE WATER, . . . TO WIPE UP THE DIRT, . . . etc.
2. When E is done, say: THE (PAPER TOWEL) IS SOMETHING USED TO CLEAN THINGS WITH. FIND SOMETHING ELSE THAT YOU CAN CLEAN THINGS WITH.

YES, THE (PAPER TOWEL) AND THE (SPONGE) ARE ALIKE BECAUSE YOU CAN USE THEM TO CLEAN THINGS WITH. WATCH ME WHILE I USE THE (SPONGE) TO CLEAN WITH.

Verbal mediation: WHAT AM I DOING WITH THE SPONGE? YES, I AM USING THIS (SPONGE) JUST LIKE I USED THE PAPER TOWEL. I AM USING THE (SPONGE) TO WIPE UP THE DIRT ON THE TABLE, . . .TO DRY UP THE WATER, . . .TO CLEAN THE TABLE, . . .etc.

3. When E is finished, say: THE (SPONGE) IS SOMETHING THAT YOU CAN USE TO CLEAN THINGS WITH. FIND SOMETHING ELSE THAT YOU CAN USE TO CLEAN THINGS WITH.

YES, THE (WASH CLOTH) AND THE (SPONGE) ARE ALIKE BECAUSE YOU CAN USE THEM TO CLEAN THINGS WITH. WATCH ME USE THE (WASH CLOTH) TO CLEAN THIS DOLL.

Verbal mediation: WHAT AM I DOING WITH THE WASH CLOTH? YES, I AM USING THE (WASH CLOTH) JUST LIKE I USED THE (SPONGE) AND THE (PAPER TOWEL). I AM USING THE (WASH CLOTH) TO CLEAN THE DOLL, . . .TO WIPE DIRT OFF THE DOLL, . . .I AM USING THE (WASH CLOTH) TO CLEAN THE DOLL'S FACE, . . .etc.

4. When E is finished, say: THE (WASH CLOTH) IS SOMETHING THAT YOU CAN USE TO CLEAN THINGS WITH. FIND SOMETHING ELSE THAT YOU CAN USE TO CLEAN THINGS WITH.

YES, THE (BROOM) AND THE (WASH CLOTH) ARE ALIKE BECAUSE YOU CAN USE THEM TO CLEAN THINGS WITH. WATCH ME WHILE I USE THE (BROOM) TO CLEAN THE . . .

Verbal mediation: WHAT AM I DOING WITH THE (BROOM)? YES, I AM USING THE (BROOM) JUST LIKE I USED THE (WASH CLOTH) AND THE (SPONGE). I AM USING THE (BROOM) TO CLEAN WITH. I AM SWEEPING THE FLOOR, . . .I AM SWEEPING THE TOP OF THE TABLE, . . .I AM USING THE (BROOM) TO CLEAN WITH.

Part III - Ending the Session

When E is done with the last item, or at the end of 10 minutes, say: OUR GAME IS (ALMOST) OVER. IT'S TIME TO GO BACK TO YOUR ROOM NOW. YOU HAVE WATCHED ME USE ALL THESE THINGS TO CLEAN WITH. THE NEXT TIME THAT I COME, WE WILL PLAY THIS SAME GAME, BUT WE WILL USE SOME DIFFERENT THINGS.
Planned Experience type II: E-Manipulate + Verbal Mediation

Session number: 3

Materials: Items to wear or dress the doll with

Procedure

Greeting: HELLO (________). I WAS HERE AT YOUR SCHOOL BEFORE AND WE PLAYED A GAME TOGETHER. I BROUGHT THE GAME BACK, BUT THIS TIME I BROUGHT SOME NEW THINGS TO PLAY WITH.

TELL ME THE NAMES OF SOME OF THE THINGS THAT I BROUGHT WHEN WE PLAYED THE GAME BEFORE.


Part I - Naming the Items to be Used

I'M GOING TO START OUR GAME BY ASKING YOU TO TELL ME THE NAMES OF ALL THE THINGS THAT I SHOW YOU.

Show S the first item and say: TELL ME WHAT THIS IS.

As S names the items in the group, E will comment "Good," or "okay." If S needs help naming the items, E may name them but only after S has made an attempt or indicates that S needs help.

After all objects in the group are named, say: WE HAVE TALKED ABOUT THE NAMES OF ALL THESE THINGS.

Part II - Making Equivalence-Choices at the Functional Level

FOR THE REST OF THE GAME, YOU WILL WATCH ME PLAY WITH THE THINGS AND I WILL TALK WHILE I WORK.

1. Pick up the (socks). THESE SOCKS ARE SOMETHING THAT YOU CAN WEAR. WATCH ME USE THE SOCKS TO DRESS THIS DOLL.

Verbal mediation: WHAT AM I DOING WITH THE SOCKS? YES, I AM USING THE (SOCKS) TO DRESS THE DOLL, . . . TO KEEP THE DOLL'S FEET WARM, . . . THE DOLL IS WEARING THE SOCKS.

2. After finishing with the (socks), say: THE (SOCKS) ARE SOMETHING THAT YOU CAN WEAR. FIND SOMETHING ELSE THAT YOU CAN WEAR.

YES, THE (SOCKS) AND THE (PANTS) ARE ALIKE BECAUSE YOU CAN WEAR THEM. WATCH ME USE THE (PANTS) TO DRESS THE DOLL.
Verbal mediation: WHAT AM I DOING WITH THE (PANTS)? I'M USING THE (PANTS) JUST LIKE I USED THE (SOCKS). I AM USING THE (PANTS) TO DRESS THE DOLL, . . . YOU WEAR PANTS, . . . YOU WEAR PANTS TO KEEP YOU WARM, . . . THE DOLL IS WEARING THE (PANTS).

3. After finishing with the (pants), say: THE (PANTS) ARE SOMETHING THAT YOU CAN WEAR. FIND SOMETHING ELSE THAT YOU CAN WEAR.

YES, THE (SHIRT) AND THE (PANTS) ARE ALIKE BECAUSE YOU CAN USE THEM TO WEAR. WATCH ME USE THE (SHIRT) TO DRESS THE DOLL.


4. After finishing with the (shirt), say: THE (SHIRT) IS SOMETHING THAT YOU CAN USE TO WEAR. FIND SOMETHING ELSE THAT YOU CAN USE TO WEAR.

YES, THE (HAT) AND THE (SHIRT) ARE ALIKE BECAUSE YOU CAN USE THEM TO WEAR. WATCH ME USE THE (HAT) TO DRESS THE DOLL.

Verbal mediation: WHAT AM I DOING WITH THE (HAT)? YES, I AM USING THE (HAT) JUST LIKE I USED THE (SHIRT). I AM USING THE (HAT) TO DRESS THE DOLL, . . . TO KEEP THE DOLL'S HEAD WARM, . . . THE DOLL IS WEARING THE (HAT).

Part III - Ending the Session

When E is finished with the last item, or at the end of 10 minutes, say: OUR GAME IS (ALMOST) OVER. IT'S TIME TO GO BACK TO YOUR ROOM NOW. YOU HAVE WATCHED ME USE ALL THESE THINGS TO DRESS THE DOLL WITH. THE NEXT TIME THAT I COME, WE WILL PLAY THIS SAME GAME, BUT WE WILL USE SOME DIFFERENT TOYS.
Planned Experience type II: E-Manipulate + Verbal Mediation

Session number 4

Materials: Items to write or draw with (the same items used in session 1)

Procedure

Greeting: HELLO (__________). I BROUGHT THE GAME BACK AGAIN TODAY AND TODAY WE'RE GOING TO PLAY WITH SOME THINGS THAT WE HAVE ALREADY PLAY WITH.

TELL ME SOME OF THE THINGS THAT I BROUGHT WHEN WE PLAYED THE GAME BEFORE.

YES. I BROUGHT PENCILS AND PENS. AND WHAT DID I DO WITH THEM?

YOU'RE RIGHT. I WROTE WITH THEM. THEY WERE WRITING THINGS. AND THEN I BROUGHT THE SPONGE, AND SOAP AND WASH CLOTH. WHAT DID I DO WITH THEM? YES. I CLEANED THINGS WITH THEM. THEY WERE WASHING THINGS. AND THEN, I BROUGHT THE DOLL AND CLOTHES. WHAT DID I DO WITH THE CLOTHES? YES. I PUT THE CLOTHES ON THE DOLL TO KEEP HER WARM. CLOTHES ARE THINGS TO WEAR.

TODAY, I BROUGHT BACK THE PENCIL AND PEN AND CHALK. TELL ME, CAN YOU USE THESE PENCILS, AND PENS, AND CHALK TO:

_____ EAT? (YOU ARE RIGHT, YOU CANNOT EAT PENS)
_____ CLEAN THE WALL OR FLOOR? (PENS ARE NOT CLEANING THINGS)
_____ PUT ON TO KEEP WARM? (YOU ARE RIGHT, PENS ARE NOT FOR WEARING.)

IF YOU CANNOT EAT THE PENS, OR CLEAN THINGS WITH THEM OR WEAR THEM, WHAT CAN YOU DO WITH THEM? RIGHT, YOU CAN USE THEM FOR WRITING.

Proceed with the rest of the session. The rest of this session is the same as for Planned Experience type II, session number 1, Parts I, II, III, pp.112-113.
Planned Experience type II: E-Manipulate + Verbal Mediation

Session number: 5

Materials: Items to wear or to dress with (the same items used in session 3)

Procedure

Greeting: HELLO (__________). I BROUGHT THE GAME BACK AGAIN TODAY AND TODAY WE'RE GOING TO PLAY WITH SOME THINGS THAT WE HAVE ALREADY PLAYED WITH.

TELL ME SOME OF THE THINGS THAT I BROUGHT WHEN WE PLAYED THE GAME BEFORE.

YES. I BROUGHT PENCILS AND PENS. AND WHAT DID I DO WITH THEM?

YOU ARE RIGHT. I WROTE WITH THEM. THEY WERE WRITING THINGS. AND THEN I BROUGHT THE SPONGE, AND SOAP AND WASH CLOTH. WHAT DID I DO WITH THEM? YES. I CLEANED THINGS WITH THEM. THEY WERE WASHING THINGS.

TODAY, I BROUGHT BACK THE CLOTHES, THE PANTS, AND HAT AND SOCKS. TELL ME CAN I USE THESE CLOTHES TO:

_______EAT? (YOU ARE RIGHT, YOU CANNOT EAT CLOTHES)
_______CLEAN THE WALL OR FLOOR? (THAT IS RIGHT. CLOTHES ARE NOT FOR CLEANING.)
_______MAKE MUSIC? (YOU ARE RIGHT. CLOTHES ARE NOT FOR MAKING MUSIC.)

IF YOU CANNOT EAT CLOTHES, OR CLEAN WITH THEM, OR MAKE MUSIC WITH THEM, THEN WHAT CAN YOU USE CLOTHES FOR? THAT IS RIGHT. CLOTHES ARE FOR WEARING TO KEEP YOU WARM.

Proceed with the rest of the session. The rest of this session is the same as for Planned Experience type II, session number 3 Parts I, and II, pp. 116-117.

WE ARE FINISHED WITH THE GAME. WE HAVE PLAYED THE GAME LOTS OF TIMES. NOT IT IS TIME TO LOOK AT THE PICTURES AGAIN.
Planned Experience type III: S-Manipulate

Sessions numbers: 1, 2, 3, 4, 5

Materials: See Appendix F for which materials to use during each of the sessions

The difference between this group's training and that of groups I and II is that this group does not receive verbal training from you the Experimenter.

Part I - Naming the Items to be Used

I'M GOING TO START OUR GAME BY ASKING YOU TO TELL ME THE NAMES OF ALL THE THINGS THAT I SHOW YOU.

Show the S the first item and say, TELL ME WHAT THIS IS. As S names the items in the group, E will comment "GOOD," or "OKAY." If S needs help naming the items, E may name them but only after S has made an attempt or indicates that S needs help.

After all objects in the group are named, say: WE HAVE TALKED ABOUT THE NAMES OF ALL THESE THINGS.

Part II - Directions After Items Have been Named

Introduce this section by saying: FOR THE REST OF THE GAME, YOU MAY PLAY WITH THESE THINGS. I AM GOING TO SIT OVER HERE WHILE YOU PLAY BECAUSE I HAVE SOME WORK TO DO.

No additional verbal guidance or interpretation of the child's activity is to be given. However, if S stops playing before the session is over, E should say something like:

YOU HAVE PLAYED WITH SOME OF THE THINGS BUT NOT WITH ALL OF THEM. YOU MAY PLAY WITH THE (_________) AND THE (_______) OR YOU MAY WORK SOME MORE WITH THE (______).

The intent of the above remarks to the child is to maintain interest in the activity, and not to give "functional" verbal guidance to the child.

Part III - Ending the Session

When S is done with the last item, or at the end of 10 minutes, say: OUR GAME IS (ALMOST) OVER. IT'S TIME TO GO BACK TO YOUR ROOM NOW. YOU HAVE PLAYED WITH ALL THESE THINGS. THE NEXT TIME THAT I COME, WE WILL PLAY THIS SAME GAME BUT WE WILL USE SOME DIFFERENT TOYS.

If this is the fifth and final session, say: WE ARE FINISHED PLAYING THE GAME. WE HAVE PLAYED THIS GAME LOTS OF TIMES. NOW IT IS TIME TO LOOK AT THE PICTURES AGAIN.
Planned Experience type IV: E-Manipulate

Sessions numbers: 1, 2, 3, 4, 5

Materials: See Appendix F for which materials to use in each of the sessions

No verbal training is given for this planned experience type.

Greeting: HELLO (S's name ________). I HAVE A GAME TO PLAY WITH YOU. LET'S SIT DOWN AT THIS TABLE TOGETHER (or LET'S SIT DOWN ON THIS RUG TOGETHER.)

Part I - Naming the Items to be Used

I'M GOING TO START OUR GAME BY ASKING YOU TO TELL ME THE NAMES OF ALL THE THINGS THAT I SHOW YOU.

Show the S the first item and say: TELL ME WHAT THIS IS. As S names the items in the group, E will comment "GOOD," or "OKAY." If S needs help naming the items, E may name them but only after S has made an attempt or indicates that S needs help. After all objects in the group are named, say: WE HAVE TALKED ABOUT THE NAMES OF ALL THESE THINGS.

Part II - Directions After Items Have Been Named

NOW, FOR THE REST OF THE GAME, YOU MAY WATCH ME WHILE I PLAY WITH THESE THINGS.

No additional verbal guidance or interpretation of the activity will be given. However, if it seems necessary, E might need to say the following to hold the child's attention

KEEP WATCHING or NOW I'M GOING TO PLAY WITH THE (______). Here, the intent is merely to maintain the child's interest and attention but not to give "functional" verbal guidance.

Part III - Ending the Session

When finished with the last item, say: OUR GAME IS (ALMOST) OVER. IT IS TIME TO GO BACK TO YOUR ROOM NOW. YOU HAVE WATCHED ME PLAY WITH ALL THESE THINGS. NEXT TIME, WE WILL PLAY THE SAME GAME BUT WE WILL USE DIFFERENT THINGS.

If this is the fifth and final session, say: WE ARE FINISHED PLAYING THE GAME. WE HAVE PLAYED THIS GAME LOTS OF TIMES. NOW IT IS TIME TO LOOK AT THE PICTURES AGAIN.
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