

University of Windsor

## Scholarship at UWindsor

---

Electronic Theses and Dissertations

Theses, Dissertations, and Major Papers

---

1973

### A pilot investigation of the training techniques designed to induce the acquisition of relational thought in preschool children.

Linda Anne. Wilmshurst  
*University of Windsor*

Follow this and additional works at: <https://scholar.uwindsor.ca/etd>

---

#### Recommended Citation

Wilmshurst, Linda Anne., "A pilot investigation of the training techniques designed to induce the acquisition of relational thought in preschool children." (1973). *Electronic Theses and Dissertations*. 703. <https://scholar.uwindsor.ca/etd/703>

This online database contains the full-text of PhD dissertations and Masters' theses of University of Windsor students from 1954 forward. These documents are made available for personal study and research purposes only, in accordance with the Canadian Copyright Act and the Creative Commons license—CC BY-NC-ND (Attribution, Non-Commercial, No Derivative Works). Under this license, works must always be attributed to the copyright holder (original author), cannot be used for any commercial purposes, and may not be altered. Any other use would require the permission of the copyright holder. Students may inquire about withdrawing their dissertation and/or thesis from this database. For additional inquiries, please contact the repository administrator via email ([scholarship@uwindsor.ca](mailto:scholarship@uwindsor.ca)) or by telephone at 519-253-3000ext. 3208.



A PILOT INVESTIGATION OF THE TRAINING TECHNIQUES  
DESIGNED TO INDUCE THE ACQUISITION  
OF RELATIONAL THOUGHT IN PRESCHOOL  
CHILDREN

by

Linda Anne Wilmshurst

A Thesis

Submitted in Partial Fulfillment

of the

Requirements for the Degree

Master of Arts

through the Department of Psychology

to the Faculty of Graduate Studies

University of Windsor

Windsor, Ontario

1973

© Linda Anne Wilmshurst 1973

487661

## ACKNOWLEDGEMENTS

The author would like to express her utmost appreciation to the chairman of her advisory committee, Dr. Ken Rubin without whose patience, inspiration and faith, the Thesis never would have been completed. Special Thanks are also extended to Drs. Miriam Bunt and Frank Schneider who served on the committee, for their contributions, suggestions and encouragement.

The author would also like to thank Richard Holmes for his co-operation and interest that made the proposed study possible. And of course without Pete's tolerance and Luke's sense of humour, nothing would be possible.

## Abstract

The present study was conducted to determine a) if training in relational concepts, such as left and right improved the Ss' abilities to perform on left-right relational tasks and b) if successful training of such relational concepts would improve the Ss' abilities to perform tasks of spatial perspective.

Twenty four-year-old preschool Ss were randomly assigned to two groups (Experimental and Control) such that the Experimental group received two weeks of training in relational concepts while the Control group received regular day care programming. The training session consisted of 10 carefully planned lessons based on cognitive conflict procedures which were instituted into the Nursery School Curricula within the Nursery setting. ✓

Results indicated significant mean differences between the Experimental and Control groups on post-tests for perspective and left-right relational judgments. Although the Experimental group revealed significantly superior performance on the Pretest for Perspective, additional analysis, within groups, revealed that significant improvements held for the Experimental group only.

It was concluded that due to treatment effects, the Experimental group revealed significant improvement on both the tests for relational Judgment and Spatial Relations. Therefore, the original hypothesis that successful training in relational concepts would improve the Ss' abilities to consider left-right

relations and to conceive perspectives from another point of view was confirmed for the 4-year-old Ss in the study.

The author discussed the results in the view of Flavell's theoretical hierarchy of role-taking abilities, revealing both the conflicting evidence of the present study and the implications for future social cognitive research.

TABLE OF CONTENTS

Section	Page
Acknowledgements.....	iii
Abstract.....	iv
List of Figures.....	vii
List of Tables.....	viii
Chapter I: Introduction.....	1
Chapter II: Method.....	7
Chapter III: Results.....	61
Chapter IV: Discussion.....	68
Footnotes.....	78
Bibliography.....	79
<b>Appendices:</b>	
A. Review of Literature.....	82
B. Figures.....	96
C. Raw Data.....	103
D. Vita Auctoris.....	112



## LIST OF FIGURES

Figure	Page
1a: Landscape and items positioned at 0°, 90° and 200°.....	97
1b: Landscape as it is viewed from the child's position at 0°.....	97
2 : Child is seated at 0°. The box has four pictures which face chairs at 0°, 90°, 180° and 270°.....	98
3. : Child is seated at 0°. The ball is rotated for 90°, 180° and 270°.....	99
4a: Doll is oriented to the <u>S</u> 's right. The doll is looking at the car.....	100
4b: The doll is looking at the bear. The bear is looking at the elephant. The elephant is looking at the child.....	100
5a: Difficulty scale for questions on Left-Right Pretest, Combined data.....	101
5b: Difficulty scale for questions on Left-right Post-test, Combined data.....	101
6a: Difficulty scale for questions on the Perspective Pretest, Combined data.....	102
6b: Difficulty scale for questions on the Perspective Post-test, Combined data.....	102
7 : Piaget's Tests for Left and Right.....	84

LIST OF TABLES

Table	Page
1 : Pre- and post-test means and standard deviations for the Experimental and Control groups.....	61
2 : A comparison of Experimental and Control group Pre- to Post test data.....	62
3 : Pre and post-test means and standard deviations for the Experimental and Control groups on Self- and Other-Oriented Perspective Questions.....	63
4 : A comparison of Experimental and Control group pre- to post-test data for Self- and Other-Oriented Perspective Questions.....	64
5 : Mean scores of individual questions for the Experimental, Control and Combined data.....	66, 67
6 : The Age of Onset for successful Left-Right Test Performance.....	85

## CHAPTER 1

### INTRODUCTION

The importance of understanding the logic of relations was emphasized by Piaget (1928) over half a decade ago:

...childish realism. i.e., the inability to grasp the relativity of notions or ideas is one of the principal obstacles to the development of childish reasoning. For this reasoning stands in the way of that gradual improvement in deductive power which would free the child from the immediate ready-made reality of the particular cases which have nothing to do with each other. (p. 96)

This "childish realism" i.e., egocentric thought, results in the young child's inability to conceive of a perspective other than his own, and consequently relational concepts such as 'to the left of' and 'to the right of' have little meaning for him outside of his own subjective frame of reference (Harris, 1972; Piaget, 1928; Piaget and Inhelder, 1956; Wapner and Cirillo, 1968). The young child at best can grasp topological inferences of left and right which assume only an understanding of directions along one plane (Piaget and Inhelder, 1956).

Past research has focused mainly on age changes in the transposition of left-right relations, from one perspective to another. The most important difficulties which hamper the child's understanding of such relational concepts as 'to the left of' and 'to the right of' can be summarized as follows:

- 1) The child's own body determines absolute right and absolute left initially, and a great amount of adaptation is

still necessary before the child realizes that there exists a right and left for everyone else. Later, objects themselves can be to the right or to the left of each other, even though their disposition in space is relative to us (Piaget, 1928).

2) The three stages in the evolution of right and left correspond to the process of gradual socialization of thought--egocentrism, socialization and complete objectivity. In the first stage, the child places himself at his own point of view; during the second (7-8 years) at the point of view of others; during the third (11-12 years) at a completely relational point of view, in which account is taken of objects in themselves (Elkind, 1961; Piaget, 1928). The understanding of left and right requires that the child be able to decenter his spatial imagination in a perspective system which entails relating the object to his own viewpoint as one of which he is fully conscious. To be conscious of one's own viewpoint, however, involves distinguishing it from other viewpoints and by the same token co-ordinating it with them (Piaget and Inhelder, 1956).

3) The young child seems to lack two conditions necessary for transposing left-right relations: i) he has not completely internalised the left-right distinction; ii) he does not co-ordinate his viewpoint with that of the model on the level of representation (Wagner and Cirillo, 1968).

4) Although the young child (5 years) can perform successfully on relational questions for 'up-down' and 'front-back', a

weak discrimination of 'left-right' results in an inability to perform relational judgments which are not only more difficult, but require a qualitatively different response. The difficulty in performing relational judgments of left and right, therefore, does not mean that the child is incapable of relational thought. It may only mean that his discrimination of left and right is not integrated to the extent that he can understand relational inferences pertaining to left and right (Harris, 1972 b)<sup>1</sup>.

Although many psychologists have cited the importance of understanding the notion of relativity, little attempt has been made to investigate the possibility of teaching or training young children to develop relational concepts (Karplus, 1963). In view of the available information concerning the development of the young child's understanding of relativity, the present study served as an investigatory attempt to induce the acquisition of the relational concepts, left and right. The training programme dealt with preschool children and was of an exploratory nature, such that the importance of the present study was in its hypotheses and implications for future research.

The childish realism or egocentric thought which results in the young child's inability to grasp the relativity of the concepts left and right, may be assumed to underlie the young child's inability to infer the spatial perspectives of other persons. The perspective of spatial relations has been emphasised (Piaget and Inhelder, 1956) in the child's understanding of relational concepts. For example, it has been suggested that

the child becomes better able to judge the visual perceptions of others when he has a grasp of relational concepts such as left and right (Flavell, in press; Piaget, 1963; Piaget and Inhelder, 1956). Therefore, in planning a training study of left-right relations, it is crucial to note whether or not the child's spatial perspectivism has improved.

Recent investigations suggest that elementary concepts of existence of perspectives (X is seen by Q)<sup>2</sup> and percept inference (the ability to suggest a particular Q's thoughts in a particular situation based on available cues) (Flavell, 1971), may be present as early as 2 or 3 years of age (Berke, 1971; Masangkay, McCluskey, Sims-Knight and Flavell, 1971). Also, contrary to earlier findings (Piaget and Inhelder, 1956), young children (3½- to 6½- year-olds) predicted the location of objects with relative ease when allowed to move to various positions (Shantz and Watson, 1971). In their analyses of percept attribution (Flavell, 1971), and spatial perspective (Shantz and Watson, 1971), the authors suggest levels of percept attribution and spatial perspective attainment delineating a hierarchical progression of difficulty. Such a stage theory analysis of abilities is in accordance with Piaget's (1928) and Piaget and Inhelder's (1956) discussion of stage (substage) acquisition of spatial perspective (See the Review of Literature, pp. 86 - 87 for further discussion).

Thus, (a) the earlier conception that preliminary understanding of relational terms is prerequisite to successful spatial role-taking, and (b) the recent findings that young

children are capable of elementary role-taking skills leads to the assumption that young, preschool children may be trained to improve upon existing spatial skills. The present study thus tested the hypothesis that successful training of relational concepts of left and right would improve the subjects' abilities to consider left-right relations and to construe perspectives from another point of view.

The training programme was designed to enhance cognitive development and induce change from the child's present egocentric level of cognition to a higher order level of decreasing egocentric thought. One of the most effective means of inducing change from one cognitive structure to another has as its basis Piaget's equilibration model of development (Kuhn, 1972). The equilibration model (Piaget, 1950) asserts that logical structure is not originally present in the child's thinking, but that it develops as a function of internal process, equilibration, which is to a large extent dependent on the activity and experiences of the child. According to Piaget (1952), assimilation and accommodation are the invariant and inseparable functions in the process of adaptation. The child's assimilation of new experiences into the pre-existing cognitive structure and the accommodation of the previous cognitive level in an attempt to integrate the new material results in a more stable equilibrium state at a higher level of differentiation. By inducing cognitive conflict, the experimenter attempts to disturb the present equilibrium state causing a state of disequilibrium which intrinsically motivates the child to resolve the conflict through cognitive reorganization. The process

terminates with the attainment of a higher order level of organization (Gruen, 1965; Karplus, 1963; Kuhn, 1972; Langer, 1967; Palmer, 1965; Palmer, 1968; Smedslund, 1961). According to Piaget (1928; 1950), the child's thought decreases in egocentrism when he interacts with peers whose conflicting points of view initiate a re-evaluation of his own. Flavell et al. (1968) also suggest that the child's peers provide the best natural socialization agent, allowing the child to think in less egocentric terms. Cognitive conflict has also been successfully induced through discrepant expectancies, where the child is confronted with a spatial perspective that has been rotated without his knowledge (Shantz and Watson, 1971).

In the present study, the experimenter attempted to induce cognitive conflict through training procedures designed to enhance group interaction and testing materials providing self-correcting (and consequently often discrepant) feedback. The major hypothesis may be stated as follows: successful training in relational concepts of left and right would improve the subjects' abilities to consider left-right relations and to conceive perspectives from another point of view (role-taking).



## METHOD

Subjects

The Ss were 20, 4 year old preschool children (9 females and 11 males) from a day care centre in Windsor. The Ss were randomly assigned to one of two groups: a) an experimental group which was trained for relational judgment and b) a control group which received no training. An additional four Ss who had been assigned to the experimental group prior to pre-testing, were eliminated from the study: one for withdrawal from the centre and three due to illness.

Stimulus Materials

All subjects were administered two tests prior to the treatment condition:

Pretest for Ability to Judge Perspective

The pretest for perspective consisted of six questions. The stimulus materials for each of the perspective questions consisted of:

Question 1 - four colored pictures (4"x5") of a car, dog, house and drum affixed to a cardboard box (1'x 1'). A replica of the above box (6"x6") with identical pictures drawn to scale (2"x2½") was provided for the S's use.

Question 2 - a ball (3" diameter) painted red on one side and white on the other

Question 3a- a doll (7") attached to a stand, a penny a black plastic hat (2" diameter) and a green bus (2").

- Question 3b- a pencil, a white plastic square (2") and a blue circle (2" diameter)
- Question 3c- a yellow rubber bear (4"x2"), a blue rubber elephant (4"x2")  
d
- Question 4 - a ball (3" diameter) half red and half blue  
5
- Question 6 - a cardboard circle (1' diameter) served as the base for a landscape constructed of paper mache. A school, bridge and tree were positioned at  $0^{\circ}$ ,  $90^{\circ}$  and at  $200^{\circ}$  respectively. The landscape was painted in green, brown and blue tones to further illustrate a three dimensional setting including a hill upon which the tree was placed, a pond over which the bridge was situated and a valley where the school house was placed. The house, tree and bridge were constructed out of pipe cleaners and colored paper such that various indicators (e.g., chimney) allowed for precise analysis of perspective. The three objects were fixed to the landscape. A duplicate landscape was provided for the S (parts fixed) to allow the S to match perspectives. (See Figure 1, Appendix B).

#### Pretest for Relational Judgment

The pretest for relational judgment consisted of six questions. The stimulus materials for each of the relational questions were as follows:

Question 4- a penny and a pencil

Question 5- a penny and a watch worn by the experimenter

Question 6- a pencil, a penny and a key.

### Training for Relational Judgment

The training of left and right consisted of 10 lessons, distributed over 7, 30 minute sessions. The stimulus materials required for each lesson were:

Lesson 1- the Language Master (Bell and Howell) was used by  
2  
3 the experimenter to introduce concepts such as same  
and different and to illustrate how these initial discriminations applied to the relational concepts of left and right. The Language Master is a sound recording machine, operable by either a child working independently or the instructor, which uses magnetic tape cards (8"x10½"). Sounds may be recorded and played back on cards, each of which is equipped with two channels of magnetic tape across the bottom. Space at the top of each card permitted the graphic portrayal of a concept and corresponding sound recording of the concept. Thus the child was able to see and hear concepts simultaneously. For example, two identical squares were drawn on one card such that the same half of each square was red and the remaining half, white. The corresponding statement recorded was: "The squares are the same." Ten cards were constructed for each of lessons 1, 2 and 3.

Lesson 4- a felt board (2'x3') that was self supporting  
5 and cutouts of a boy and girl (1'x4") which depicted a front or back view, as well as left and right profile, indicated separate relational viewpoints. Proportionately scaled cutouts of a dog, cat, bird, tree, house, ball, table, cup, plate, knife, fork and glass were also constructed of felt.

Lesson 6- four cutout puzzles. The puzzles were constructed  
7 by placing a cardboard overlay (2'x3') over top of the felt board. The puzzles depicted a boy and a girl, either facing or with their backs to the subjects. Cutouts of a left hand, left foot, right hand and right foot (labeled with the appropriate letters, L and R) were constructed of felt, such that they could be inserted into the proper frame of the puzzle.

Lesson 8- a five-finger puppet (a brown dog with two move-  
able arms and legs, 9"x5").

Lesson 10- two sets of five pictures each constructed of felt and the felt board used previously. The first set of pictures included (2 of each of) an apple, star, bird, house, dress. The second set was comprised of (2 of each of) a flower, ball, shovel, banana and boat. Each picture was approximately 6"x4" and duplicated pictures were identical. In addition, 7 (8"x10") cards were constructed to illustrate various person and object interrelationships.

## Procedure

The Ss were randomly assigned to one of two conditions: training and control. The Ss in the training condition were divided into 2 groups, resulting in E<sub>1</sub> which contained 5 Ss (3 females and 2 males) and E<sub>2</sub> which was comprised of 3 Ss (1 female and 2 males). Each subject was tested individually for the Pretest for Perspective and the Pretest for Left and Right prior to training.

### Schedule of Test Presentation

Each subject was administered the two pretests, such that both pretests were given within one week. One week after the presentation of the pretests, the Ss in the Training Group began the ten lessons. The Ss received four- 30 minute sessions the first week and three sessions the second week, also of 30 minute duration. The Control Group received their regular day care programming. One week after the completion of the training, all Ss were again administered the two posttests. Due to unforeseen circumstances, an additional post-post testing session was eliminated.

### Pretest for Perspective

Each child was tested individually in a small room. The pretest was divided into two conditions. The first condition required that the questions be answered in an order, such that all subject-relevant questions were given prior to object or other person for each section. For example, questions referring to what the subject himself saw were presented before questions

referring to how an observer would see the same object, or how an object appeared from a different perspective. The second condition provided questions relating to the subject, only after object or observer (other) referent questions were completed for that section. The Ss were randomly assigned to either condition 1 or condition 2, such that half the Ss in the Experimental and Control Groups were from either condition. Therefore, the pretests (posttests) were counterbalanced, while at the same time allowed for an analysis of possible carry-over effects of objectivity, if such effects in fact existed.

#### Condition 1

The E provided a brief warm up period by asking the child the following questions: "My name is...; what is your name? Do you like to play games? Games can be fun. Today we are going to play a game that I hope you will like."

The E seated the child ( $0^\circ$ ) at a table that had 4 chairs ( $0^\circ$ ,  $90^\circ$ ,  $180^\circ$ ,  $270^\circ$ ) (See Figure 2, Appendix B); "Would you please sit in this chair." "You see, there are three other chairs and they are empty."

"I am going to show you a box that has pictures on each side. This is a picture of a car (pointed to the car); this is a picture of a dog and this is a picture of a house. This is a picture of a drum. Can you name these pictures? (The E rotated the box, once again for the S, and pointed to each picture. The E corrected any mistakes). Now I am going to give you a little box just like the big one. See, here are the pictures of the dog, the car

the house and the drum. Your little box has the same pictures as the big box. The pictures of the dog, car, house and drum are on the same sides as the big box. Now I am going to place the big box on the table so that each picture is facing a chair. (The box was placed such that the picture of the drum was facing the child ( $0^\circ$ ), the dog was on the S's right hand side of the box ( $90^\circ$ ), the car was opposite the S ( $180^\circ$ ) and the house was on the side of the box that was the S's left hand side ( $270^\circ$ ). The Little box was placed directly in front of the S.)

Question 1:

- (a) Now can you tell me what big picture can you see? Do you see the dog, the car, the house or the drum? Show me the little picture that is just like the big picture you see.
- (b) If you were sitting here (E pointed to  $90^\circ$ ) what big picture would you see? Would you see the dog, the car, the house or the drum? Show me the little picture that is just like the big picture you would see.
- (c) If you were sitting here (E pointed to  $180^\circ$ ) what picture would you see? Would you see the dog, the car, the house or the drum? Show me the little picture that is just the same as the big picture.
- (d) If you were sitting here (E pointed to  $270^\circ$ ) what big picture would you see? Would you see the dog, the car, the house or the drum? Show me the little picture that is just the same as the big picture you would see.

The E removed the boxes and introduced the next stimulus.

"This is a ball. It is red on one side and white on the other. Show me the red side. (The E corrected any mistakes). Show me

the white side. What are the two colors? (The E corrected or affirmed the response.).

The E placed the ball in the middle of the table such that the child could see the colors hidden from view if so inclined. The red side was facing the child; the blue side was opposite (See Figure 3, Appendix B).

Question 2:

(a) Can you tell me the color of the ball that you can see?

What color is on your side?

(b) If you were sitting here, what color or colors would you see?

(90°)

(c) If you were sitting here what color or colors would you see?

(180°)

(d) If you were sitting here what color or colors would you see?

(270°)

The E removed the ball. "Now I am going to put the doll here. (The E placed the doll across from the S). Here are three things, a penny, a hat and a car. I will put the penny here (doll's extreme right), the hat here (in front of the doll and 4" from the penny) and the car here (extreme left, 4" from the hat)." The E oriented the doll slightly, but noticeably to the left (See Figure 4, Appendix B).

Question 3:

(a) Can you tell me what the doll is looking at? Is the doll looking at the penny, the hat or the car? (The E removed the three items and replaced them saying: "This is a



pencil, this is a square and this is a circle." The E oriented the doll slightly, but noticeably to the right.

The items were placed such that the pencil replaced the penny, the square replaced the hat and the circle replaced the car.).

(b) Can you tell me what the doll is looking at? Is it the pencil, the square or the circle? (The E removed the stimulus materials except for the doll and produced two new figures.) "This is a bear and this is an elephant." The E arranged the materials such that the doll was on the extreme left and her face was oriented towards the bear (right side of the child) which was in front of the doll. The bear was about 3" from the doll. The E placed the elephant 2" from the bear (on the child's right side) such that the bear was facing the elephant. The elephant was facing the child (See Figure 4b).

(c) Who is the elephant looking at?

(d) Who is the bear looking at?

The E removed all materials but the doll. The E presented a ball to the S saying; "Here is a ball. See, it is blue on one side and red on the other. See, here it is red and blue (The E pointed to both colors on one side). Now I will put the ball on the table." (The doll is at 90°).

Question 4:

(a) What color can you see? (blue)

(b) What color can the doll see? (red)

(c) Now I will turn the ball around ( $\frac{1}{2}$  full rotation).

What color do you see? (red)

(d) What color can the doll see? (blue)

"Now the doll will sit here (90°)." The E placed the doll at the chair to the child's right.

Question 5:

- (a) What color do you see? (red and blue)
- (b) What color does the doll see? (blue)

The E moved the doll to 270° such that the doll was situated on the child's left. "Now the doll is changing places..

- (c) What color do you see? (red and blue)
- (d) What color does the doll see? (red)

The E removed the ball. "Now I am going to put the doll back here (180°). Here is a model of a little village."

The E exposed the landscape to the child. "See, here is a little hill with a tree on it and here is a little pond with a bridge over it. Here is the school house."

Question 6:

- (a) Now you want to visit the doll and you are here. (E pointed to a spot in front of the school.) You want to visit the doll. What things would you pass on your way? Make a path with your finger as you tell me.
- (b) Now if the doll was going to visit you, how would she go and what would she see along the way? Tell me what she would see first, next and last.
- (c) Here is a village just like this (E pointed to the model) village. I would like you to make your village just like the other village so that the school, tree and bridge are in the same places. See the parts do not move, so you can turn your village to make it look just like this (model) one.

Try to have the house, bridge and tree on your landscape in the same places as they are on this (model) one. Now look at where you have put the house and tree and bridge. If you would like to change then to make them look more like this (model) scene you can. Tell me when you are finished.

(d) Now the doll is here ( $180^{\circ}$ ). Put the tree on your village so that it looks the same as the doll sees it on this village. Put the bridge and school in the places where the doll would see them. Turn your village so that the house and tree and bridge are where the doll would see them. Now look at where you have put the house and tree and bridge. That is how the doll sees the scene from here. If you would like to change them to make them look more like the scene that the doll sees you can. Tell me when you have finished. Remember, try to turn your village so that it looks just like the doll would see it from where she is standing.

(e) Now the doll is here ( $270^{\circ}$ )..(The E repeated the above instructions.)

(f) Now the doll is here ( $90^{\circ}$ )..(E repeated the instructions.)

(g) Now I am going to turn the scene a little (E rotated the scene  $\frac{1}{2}$  turn) and put the doll here ( $180^{\circ}$ ). (The E repeated the above instructions.)

(h) Now I will put the doll here ( $90^{\circ}$ ). (E repeated the above instructions.)

### Condition 2

The second condition proceeded exactly as the first condition with the exception being: Questions 1a, 2a, 3c, 4a, 4c, 5a, 5c and 6a were presented after Questions 1d, 2d, 3d, 4b, 4d, 5b, 5d, and 6b.

### Scoring of the Pretest (Posttest) for Perspective

The pretest (posttest) for perspective consisted of six questions. Each question was comprised of four parts (a,b,c,d) with the exception of the last question (question 6) which was subdivided into two parts, 6 a,b and 6 c,d,e,f, g,h. Question 6, therefore contained eight parts. Each part of each question when answered correctly provided a score of 1. Therefore, the total score obtainable for the Perspective test was 28.

### Pretest (Posttest) for Relational Judgment

The pretest for relational judgment was adapted from Piaget's six questions (1928) to judge the child's ability to distinguish left and right. The original questions from Piaget were included in the present test with the following exceptions: i) the addition of question 2 (adapted from Harris, 1972), and ii) the exclusion of Piaget's sixth question because it contained a memory factor.

The child was brought into the room and a brief warm up period (see Pretest for Perspective) was initiated. The child was seated and the E asked the following questions:

Condition 1

1. (a) Show me your right hand.  
(b) Show me your left hand.  
(c) Show me your right leg.  
(d) Show me your left leg.
2. The E stood beside the subject:  
(a) Show me my right hand.  
(b) Show me my left hand.  
(c) Show me my right leg.  
(d) Show me my left leg.
3. The E sat across from the subject:  
(a) Show me my right hand.  
(b) Show me my left hand.  
(c) Show me my right leg.  
(d) Show me my left leg.
4. A coin was placed on the table to the left of a pencil in relation to the child. The E then asked the child:  
(a) Is the penny on the left or right hand side?  
(b) Is the pencil on the left or right hand side?  
(The items were reversed.)  
(c) Is the penny on the left or right hand side?  
(d) Is the pencil on the left or right hand side?
5. The E was opposite the S (facing) and had a coin in her right hand and a watch on her left arm:  
(a) You see this penny. Is it in my right hand or my left hand?  
(b) You see this watch. Is it on my right or left arm?

(The E turned her back to the S, holding the coin in view.)

(c) You see this penny. Is it in my left or right hand?

(d) You see this watch. Is it on my left or right arm?

6. The child was opposite three objects in a row; a penny to the right, a pencil to the left and a key in the middle.

The E asked the subject:

~~(a)~~ Is the pencil to the left or to the right of the key?

(b) Is the key to the left or to the right of the penny?

(c) Is the penny to the left or the right of the pencil?

(d) Is the key to the left or to the right of the pencil?

(The E then asked the S to come to the opposite side of the table for the same stimulus array.)

(e) Is the pencil to the left or to the right of the key?

(f) Is the key to the left or to the right of the penny?

(g) Is the penny to the left or to the right of the key?

(h) Is the pencil to the left or the right of the penny?

### Condition 2

The questions in the second condition were the same as the first condition with the exception that the order of question presentation was altered. Question 1, parts a through d, were presented after question 4. The remaining order of questions was the same.

### Scoring of the Pretest (Posttest) for Relational Judgment

The pretest for relational judgment consisted of six questions. Each of the questions contained four parts (a-d), with the exception of question 6 which consisted of eight

parts (a-d; e-h). Each part of each question when answered correctly provided a score of 1. Therefore the total score obtainable for the pretest (posttest) for relational judgment was 28.

#### Training for Relational Judgment (Left and Right)

The Ss in the training group were subdivided into two subgroups: E<sub>1</sub> which consisted of 5 Ss (3 females, 2 males) and E<sub>2</sub> comprised of 3 Ss (1 female, 2 males). Half the training group received condition 1 pretests (posttests) and the remaining half (4 Ss) were provided with condition 2 pre and post tests. The subgroups, therefore, received pretests (posttests) for condition 1 such that E<sub>1</sub> contained three condition 1 Ss and E<sub>2</sub> contained one condition 1 subject. The remaining Ss received pre and posttests of the condition 2 type.

The training groups met four times the first week, and three sessions the following week. Each of the seven training sessions was of 30 minute duration and each subgroup (E<sub>1</sub> and E<sub>2</sub>) received the session the same time each day (E<sub>1</sub> participated in the session from 10- 10:30; E<sub>2</sub> received the session from 10:30- 11:00). Each session was comprised of two interrelated lessons, with the exception of sessions 1, 5 and 6 which contained one half hour lesson. Since the lessons were grouped in this fashion, a review period was not necessary at the onset of each new session. The same underlying concepts (left and right) were therefore presented with new materials each session, and each session served as its own review while at the same time advancing the progression of difficulty.

Throughout the training session, the E initiated questions in an attempt to guide, rather than instruct the Ss concerning solutions to various problems. The E provided correct answers when a new concept was introduced or when the Ss in their search for the correct solution deviated from the concept to the extent that other Ss became confused e.g., some of the Ss seemed more concerned with the buttons on the Language Master than the lesson per se and generated too many questions about the machine or refused to answer unless they could play with it. At all times, the E attempted to direct the Ss attention to the lesson proper and maintain this attention by asking the Ss to correct and point out the mistakes of the other Ss. When an S responded correctly, the E asked why the S gave that particular response in an attempt to clarify S's understanding of the concepts. If an S was incorrect, the E also asked why the S gave that response in an attempt to allow the other Ss to see the conflict. It was assumed that conflicting responses would initiate a better understanding of the concepts presented.

The Ss were provided with name tags at the initial meeting which were collected after the first session and eliminated after the second session. The E began the first session by introducing all the Ss to each other and introducing herself to the Ss. When the introduction was completed, the E said; "We are going to play some games together for a while. I would like you to give answers to as many questions as you can. Raise your hand if you know an answer and I will ask you. You may have to wait your turn if more than one hand is raised, so that everyone has a chance to play all the games. When you are not playing a game, please



watch what the other children do when they play. It will help you to play the game better when you know an answer. I would like you all to play as many games as you can."

### Session 1

#### Lesson #1 (Same and Different)

In order to teach the child such relational concepts as left and right, the E began the lessons with elementary discriminations of same and different. Starting with more global representations of same and different, the lessons progressed to include more finite discriminations specifically referring to same or different sides. Initially, discriminations pertaining to left and right were referred to as "this side" indicating the left and "that side" indicating the right.

"Now we are going to play our first game. I would like you to sit on the floor like this. (The E arranged the Ss such that they were in a semi-circle on the floor. This seating arrangement was adhered to for the remaining lessons, unless otherwise specified.) Is everyone comfortable? That's good." (The E waited until all the children were settled and relatively quiet and then brought out the stimulus materials.)

The E described the Language Master which was on a table (approx. 3') situated at the centre of the semi-circle about 3 feet from the Ss. "This is a machine that can talk. Watch what happens when I put the card into the machine. (The E inserted the first card for the lesson into the Language Master. The card depicted two squares. The squares (3"x3") were colored such that one half of each square was red and one half was blue.

A vertical line separated the two colors. The left half of each square was red and the right half was blue. The squares were separated by a 2" space.) The statement which the Language Master provided was: "The squares are...(pause)..the same." The initial card was stopped before the completion of the sentence only for a few seconds to insure that the Ss heard the sentence as an entity. The E then inserted the card again, this time allowing the full pause (allowing Ss an opportunity to respond) before the sentence was completed. "Let's listen to the machine again." For a second time, the initial part of the statement was heard: "The squares are..." at which time the E shut off the machine. The E waited for about five seconds and if the Ss did not respond simultaneously, the E said; "Can anyone tell me?" If there was no response, the E prompted the Ss by saying; "what can you tell me about these squares?" If a response was given, the E asked the remaining Ss if they agreed and why. If there was no response, or if there was a controversy among the Ss as to the correct answer, or if all responses had been given, the E said; "Let's find out." The machine was turned on and the remainder of the statement.. "the same" was heard by the Ss. The E re-inserted the same card once again and as she placed it into the machine said; "let's listen to what the machine says. If you know an answer raise your hand and I will ask each one of you in turn." The card was again presented to the Ss and the first part of the sentence was heard. The E waited for the Ss to raise their hands and proceeded to ask each S for his response. The E questioned the S as to why

he chose his answer and asked the remaining Ss if they agreed or disagreed and why. If the Ss provided the same answer to why the squares were the same, the E asked if there were any other ways that the squares were the same. The E repeated this procedure for all Ss who provided responses. After all responses had been given, the E said; "Let's find out." and the statement was completed. The E inserted the card one more time and played the sentence in its entirety.

After the fourth presentation of the card, the E initiated questions about the card to help the children understand what was the same about the squares. The E said; "what colours are the same?" If the Ss did not respond with both colours, then the E also said; "What other colours are the same? Why are they the same?" (After each question, the E waited for the Ss to answer spontaneously. If no answers were given, the E prompted saying; "Can anyone name the colors on the square? (E pointed to the red). What is this color? What is this color? (blue)". The E repeated for the second square. The E then pointed to the left side of the first square saying; "what can you tell me about this side of this square? What else can you tell me about this side? Can anyone tell me what the red sides are? Why are they the same? Does everyone agree? The E repeated the questions for blue. The E initiated questions to indicate that red was not the square but only part of the square, if such a response was given, The E repeated the card a final time before introducing the next card; "The squares are the..(pause) same."

"Now we will look at another card." The E revealed the

second card in the first series. The card displayed two identical dogs. The dogs were both brown with a red ribbon around their necks. The E placed the card into the Language Master saying; "Let's see what the machine can tell us about the dogs." The card advances slowly across the machine; "The dogs are..(pause) the same." The machine was stopped and the E waited for the Ss to respond. The E asked that each S raise his hand before he answered. The E asked each S for his response.

The E attended to the Ss' individual responses to estimate whether or not the Ss were beginning to grasp the concept of same. If the Ss deviated from the concept same, in their responses, the E said; "That is true, but what else can you tell me about the dogs."

In response to the partial statement initiated by the second card, the E again attempted to have the Ss respond, if they did not do so spontaneously, by saying; "Can you tell me?" If there were no responses or the responses were completed, the E said; "Let's find out." The card advanced to complete the statement. The same procedure was followed for all subsequent cards. Each card was repeated four times. The initial presentation served to introduce the concept. The second presentation gave the Ss an opportunity to respond to the partial statement while allowing them to hear the responses of other Ss. The third presentation served to further integrate the pictures on the card with the defining statement by requiring that the Ss substantiate their responses such that Ss stated why the response they had chosen was applicable. The third presentation also

provided an additional opportunity for Ss to hear conflicting responses and supporting statements, which were offered by other Ss. The fourth presentation of the card provided an opportunity to hear the statement in its entirety.

Following the fourth presentation of each card, the E initiated questions concerning the card. The questions were aimed at guiding the Ss to a better understanding of what elements on the card were the same. With the completion of the E initiated questions, the card was presented a final time, allowing only a slight pause (3 sec.) between parts of the sentence, to integrate the specific questions with the concept for the pictures in general.

Experimenter initiated questions for the second card were: "What color is this dog (left)? What color is that dog (right)? The colors of the dogs are the..(response) same. Why are the colors the same? What is this dog wearing? What is that dog wearing? The dogs are wearing ribbons that are..(response)..the same. Why are the ribbons the same? (look alike, same color) Why else are the ribbons the same? The dogs are..(response) the same. Why are the dogs the same? What else about the dogs is the same? Can you think of anything else that is the same about the dogs?" The E continued until the Ss established that the dogs were both the same because, they were brown, looked alike and were wearing red ribbons that were the same and looked alike. The E then placed the card into the machine for a final time and the sentence was heard; "The dogs are the ..same."

The E repeated the procedure for the next three cards:

two identical houses (yellow houses, with a red chimney on the right hand side with a door on the left side); two identical yellow stars; two identical cups with a red flower painted in the middle and handles turned to the right side. For each card the E presented it four times in the same procedure as previously stated. Following the fourth presentation, the E initiated similar questions to those mentioned previously. The final presentation of the card (fifth hearing) was the same.

The fifth card was presented in the same manner as the first card and depicted two squares, one red and one green. The card provided the statement; "The squares are different." (The terms not the same and different were used interchangeably to familiarize the Ss with both forms of the concept.) The procedure was the same as for the first card that introduced the concept same.

The sixth, seventh and eighth cards depicted: the two dogs used previously, one with a red ribbon and one with a yellow ribbon; two squares, one with the left side red and the right side of the other blue; two houses, the house on the left with a window and the house on the right with no window, and a chimney on the right side of the left house which was on the left side of the right house. The presentation of the cards (4 times) and the E initiated questions followed the same procedure as outlined above. The differences attributed to left side and right side were referred to at this stage as "this side" and "that side" respectively. For example, the questions concerning the dogs were presented in the following manner: "What

color is this dog (E pointed to the dog on the left)? "What color is the dog on that side? What can you tell me about the colors of both dogs? Why are they the same? What color is the ribbon on this dog? What color is the ribbon on that dog? What can you tell me about the ribbons the dogs are wearing? What else can you tell me about the ribbons that the dogs are wearing? What else can you tell me about the ribbons? Why are they not the same? Are the dogs the same? Why? Are the dogs different? Why? The dogs are...(response) not the same. Why?

The last two cards in the series were the most difficult, since they provided identical objects that had a difference in position of color etc. The ninth card displayed two squares, one with red on the left and green on the right and one with red on the left and blue on the right. An arrow pointed to the left side of each square. The card when inserted stated; "The colors on this side of the squares are the...(pause).. same. (The arrow indicated the left side of both squares.) The tenth card displayed the same pictures, but with no arrow. The card when inserted into the Language Master stated; "The squares are.. (pause) not the same." The final two cards were presented according to the procedure outlined above.

The E thanked the Ss at the end of the session and collected the name tags. At the end of each session, the E continued to tell the Ss that they all played the game very well and that she was looking forward to seeing them the next day.

## Session 2

Lesson #2 (Same and Different; Left and Right)

The E provided a brief warm up by saying; "Hello everyone. How are you today? Here are your name tags. I will put your name tags on." (The E placed the tags on each S.) If the Ss attempted to make conversation with the E, the E said; "I can't stay with you very long today, so let's start playing the games now." The E seated the Ss and said; "Is everyone ready? Then let's begin." (Throughout the lessons, the E always waited until the children were ready before beginning.)

"Remember the talking machine? Well, let's see what the machine has to say today." (The E exposed the first card.) "Let's see what the machine says about this card." The card had two circles on it. The circle on the left side was red and the circle on the right side was blue. There was an arrow pointing to the red circle. The card when inserted stated; "The red circle is on the..(pause) left hand side." The E followed the same procedure with the first card in this series as previously outlined in lesson #1, for the first card of every new concept. The E induced questions (as previously) followed the fourth presentation of the card, e.g., "The circle that is red is on the left hand side. The left circle is..red. The arrow is pointing to the circle on the..left hand side. The circle on the left hand side is..red."

The second card depicted a bird (left) and a dog (right). The bird was yellow and the dog was brown. An arrow pointed to the bird. The card stated; "The bird is on the..left hand side. The third card was the same as the first with the exception that



the arrow was pointing to the blue circle. The card stated; "The blue circle is on the..right hand side." The E followed the procedure for the introduction of a new concept.

The fourth card was the same as the second with the arrow pointing to the dog. When placed into the machine the card provided the statement; "The dog is on the..right hand side." The E followed the procedure outlined above.

The fifth, sixth and seventh cards indicated: a tree (left) and a house (right); a star (left) and an apple (right); a duck (left) and a pond (right). The cards provided the following statements about the pictures indicated above:

"The tree is on the..left hand side."; "The apple is on the..right hand side."; "The duck is on the..left hand side."

After playing the cards for the fourth time, the E initiated questions concerning the left and right objects on each card. For example, after the fifth card was heard for the fourth time, the E said; "The House is on the..right hand side. The picture that is on the left hand side is the..tree. The picture that is on the right hand side is..the house, etc."

The last three cards combined the concepts same and not same with left and right. The eighth card revealed a square that was red on one half and yellow on the other. When the E inserted the card into the machine, the following statement was heard; "The color red is on the..left hand side." As with previous cards, the E followed the same procedure, playing the card four times. The E induced questions attempted to

guide the Ss to incorporate the concepts of same and different with left and right. The E asked the following questions; "The left side of the square is red. The color yellow is on the right hand side. The colors on the square are different (not the same). Why are the colors different? Why is the left side of the square different from the right side?"

The ninth card displayed two squares, one square on the left side of the card and one square on the right side of the card. The left sides of both squares were red. The right side of the left square was blue. The card inserted into the machine stated; "The colors that are the same are on the left hand side." Since this was one of the more complex questions, the E initiated questions were more numerous than for the previous cards. It was also assumed that previous exposure to the square on the left (same square used in the eighth card) would aid in the transition to the more complex level of understanding. Before playing the card, the E described the card for the Ss. "Look at this card. See, on the card are two squares. Remember this square (the E pointed to the square on the left)? It was on the last card that you saw. Tell me what you can remember about this square. What color is on the right hand side? What color is on the left hand side?" The E inserted the card into the machine and the statement was heard by the Ss; "The colors that are the same are on the left hand side." After the fourth presentation of the card, the E initiated the following questions in an attempt to guide the Ss to an integration of the picture parts into meaningful relationships: "The square on

the right is..red and blue. The square on the left is yellow and red. The colors on the left side of both squares are..red and red. The colors on the right sides of both squares are..blue and yellow. The colors that are the same are..red and red. The colors that are different are..yellow and blue. The color blue is on the right hand side. The color red is on the left hand side. The right hand sides of both squares are..not the same. Why? The left hand sides of both squares are..the same. Why?

The tenth card revealed four circles, such that two blue circles were on the right side of the card and a red and green circle were on the left side of the card. The card when inserted into the machine stated; "The circles that are different are on the..left hand side." After the Ss heard the statement for the fourth time, the E initiated the following questions; "The circles on the left hand side are..red and green. The circles that are different are on..the left hand side. Why? The circles that are the same are on..the right hand side. Why are they the same? The colors of the circles on the right are blue. The red circle is on the..left hand side. The blue circle is on the..left hand side."

### Lesson #3 (People and body parts - left and right)

The Language Master also provided the basis for the third lesson. "Here is a new card. See, there is a picture of a boy on the card. The boy is sitting at a desk. His hand is up because he is asking the teacher a question. Let's put the card into the machine and see what the card says about

the boy." (The E inserted the card into the machine. The picture of the boy presented the boy such that his back was towards the Ss.) The card stated; "The hand that is up is the ..right hand." When the E played the card four times and asked the Ss a few questions, the second card in that series was introduced.

"Here is another card. See, it is a picture of the boy again. The boy has his hand up too (also back view). Let's see what the card has to say about the boy." The E played the card, following the procedure outlined previously and the card stated; "The hand that is up is the..left hand."

The third card depicted a baby holding a rattle in his left hand, the right hand was on the floor supporting him. Once again the baby was drawn such that his back was to the Ss. The card when inserted into the machine stated; "The hand holding the rattle is the..left hand." The fourth card had an illustration of a school guard holding a stop sign in his right hand. The school guard had his back to the Ss. The card provided the statement; "The hand holding the stop sign is the..right hand. The fifth card revealed a mother and a little girl. The mother and child had their backs to the Ss. The mother was holding the little girl's left hand with her right hand. The card when inserted stated; "The mother is holding the little girl's..left hand." Since the fifth card revealed a two person interaction, the sixth card also revealed the same picture with the little girl on the left and the mother on the right. The fifth card stated; "The little girl is

holding her mother's..left hand." The E initiated questions increased as the complexity of the illustrations on the cards increased. The E initiated questions for the fourth and fifth cards concerned both people (mother and girl) and attempted to reveal the implications of a side by side (back view) relationship.

The next three cards depicted one boy in three positions. The boy was holding a flag in his left hand. The first position depicted the boy with his back to the Ss, holding the flag in his left hand. The middle picture revealed a profile of the boy such that the hand holding the flag (left) was towards the back of the card, while the right hand was closest to the Ss. In addition to the flag in the left hand, all pictures also illustrated a book in the boy's right hand. The picture on the right showed the boy facing the Ss with the flag in his left hand. The boy was illustrated as walking along a continuous sidewalk, so that the sidewalk progressed through all three pictures and the boy's journey was seen to progress through all three pictures. The sidewalk turned to reveal a different direction in each picture. The E introduced the seventh, eighth and ninth cards at the same time. The E provided a replica of all three pictures and presented them at the same time on one piece of cardboard (8"x30") which she held in front of her and described to the Ss. "Here is a picture of a boy. All three pictures are of the same boy. The boy is walking to school with a flag in his hand. The path that the boy takes to school, first goes up here ( E outlined the path with her finger, for each

picture) then across like this, and then down like this, until he reaches the school which is here ( The E points to the school located at the bottom of the final segment).

The E placed the 7th card into the machine. "Here is a card that has a picture of the boy on it. See this picture shows the boy as he is walking up this path (pointed). See, this picture is the same as this part of the big picture. Let's see what the machine says about the boy." The card was inserted into the machine and stated; "The boy is carrying the flag in his.. left hand." The E completed the procedure for the 7th card for four repetitions of the statement. The E initiated questions were; "The boy's left hand is holding a..flag. The boy is holding the book in his..right hand. The hand that is up is the.. left hand. etc."

The E revealed the 8th picture which corresponded to the middle position on the large replica. "Here is the boy again; now he is walking along the path. This card has the same picture on it as this part of the boy's trip. Let's see what the machine says about the boy walking to school." The card was inserted into the machine. The statement that the card provided was; "The boy is carrying the book in his..right hand." After the fourth placement of the card, the E asked; "In his right hand, the boy is carrying..a book. In his left hand, the boy is carrying a .. flag. The boy is carrying the book in his..right hand. The boy is carrying the flag in his.. left hand."

The 9th card was provided in the same manner as the 7th

and 8th. The 9th card corresponded to the final segment of the replica, depicting the boy facing the Ss. When placed into the machine, the card stated; "The boy is carrying the book in his.. right hand." Once the card had been repeated four times, the E asked questions pertaining to the card as previously done.

The E then initiated questions referring to the large replica card which showed all three positions: "The boy carries the flag in his..left hand. The hand that carries the flag is the same in all pictures. why is the hand that carries the flag the same? The boy's left hand is always on his..left hand side. In the middle picture, the boy's hand that is up is his..left hand. In the last picture, the boy's left hand and your left hand are on..different sides. Why? In the first picture, the boy's left hand and your left hand are on the..same sides. Why? Come to the picture and stand the same way that the boy is standing (pointed to the first, back view). Raise your hand that would hold the flag, so that it will be the same hand as the picture shows. Is     standing the same as the boy in the picture? Why? Is the hand that is raised, the same hand as the boy's in the picture? Why? The hand that is raised is the..left hand. Is    's left hand on the same side as your left hand? Why? (Last 8 questions were directed at all Ss concerned with imitating the boy in the picture) The E repeated this procedure for each of the segments, such that an S modeled the boy's position for the remaining two segments and similar questions were asked concerning both the picture and the S.

The E then posed additional questions concerning the three

pictures to emphasize position-determined left and right relationships.

The tenth card illustrated a boy with his back to the Ss and a girl standing to the right of the boy with her front facing the Ss. The boy was holding an ice cream cone in his left hand. The girl was holding a doll in her right hand. The E inserted the card into the machine and described the picture for the Ss: "Here is a picture of a boy (pointed) and a girl (pointed). The boy is standing with his back to you. The girl is facing you. The boy has an ice cream cone in one hand. The girl has a doll in one hand. The card when inserted stated; "The girl is holding the doll in her..right hand." After the card had been played four times, the E switched to the second track of the tape: "Now let's see what the card says about the boy." The card stated: "The boy is holding an ice cream cone in his..left hand." After the fourth presentation of the second statement of card ten, the E initiated the following questions; "The doll is in the girl's..right hand. The ice cream cone is in the boy's..left hand. The boy and girl are standing..different. The boy's left hand is on your..left hand side. The boy's right hand is on your..right hand side. Why is the boy's right hand on the same side as your right hand? why is the boy's right hand on a different side than the girl's right hand? Why is your right hand on a different side than the girl's right hand? Why is the boy's right hand side different than the girl's right hand side. Show me the boy's right hand. Show me the girl's right hand. Show me the boy's left hand.



Show me the girl's left hand."

The E thanked the Ss for playing the game.

### Session 3

#### Lesson #4 (Objects to the left or right of persons)

The E welcomed the Ss and began the lesson as soon as the Ss were settled. "Today we are going to play a new game. See this big board (The E pointed to the felt board which was on a table directly in front of the Ss). It is called a felt board, because it is made out of a material called felt. I have some pictures made out of felt too. The pictures will stick on the board. Here is a picture of a boy standing with his back to you. Here is a picture of a boy facing you and here is a picture of a boy standing sideways. All three pictures are of the same boy. The boy is just standing different in each picture. Here are three pictures of the same girl. See, here she is standing with her back to you. Here she is standing sideways and here, she is facing you. (The E placed the pictures on the board as she described them. The E removed the pictures and replaced them with the new items that she revealed to the Ss.) Here is a dog and a cat. Here is a bird. This is a house. Here is a tree. Here are pictures of a ball and a table. I also have pictures of a cup, a plate, a fork, a knife and a glass." (The E removed all the stimulus items.)

"Now I will put the picture of the boy here. (The E placed the picture of the boy with his back to the Ss in the middle of the felt board.) Now I would like you to put some pictures on the board for me. Who would like to try? You

were first, so would you like to come to the board, please,

Here is a picture of a dog. Put the dog on the board so that it is on the same side as the boy's left hand. How many think that the dog is on the same side as the boy's left hand? Why? How many think that the dog is on the same side as the boy's left hand? Why? (If the majority of Ss were incorrect, the E asked more specific questions to direct the responses towards the more difficult concepts, e.g., "Show me the boy's left hand. Show me the side of the board that is the same as the boy's left side, etc.") At all times, if the Ss did not understand a relationship, the E reverted to asking questions about the individual parts, working up to the desired question. If however, the Ss were able to answer the questions, such that at least half the Ss revealed an understanding of what was involved, the E continued at the present level and increased the questions involved after each placement. This allowed those Ss who had not quite grasped the question an opportunity to have more exposure to the relationships involved. The E repeated the procedure for the next item and asked for another S to come to the board.

The next item was a picture of a bird. The E addressed the Ss saying; "Here is a picture of a bird. Who wants to come to the board? Good. I would like you to put the picture of the bird on the same side as the boy's right hand." The E asked the remaining Ss if they agreed or disagreed and why, as in the above procedure.

The E asked the following questions concerning the

three pictures on the board (dog, boy, bird): "The dog is on the..left hand side. The bird is on the..right hand side. The dog is on the boy's..left hand side. The bird is on the boy's..right hand side."

The E repeated the procedure for the picture of the cat which was placed on the "same side as the boy's right hand." The E initiated questions concerning all the pictures on the board and their relationship to the boy. The E continued the same procedure for the picture of the house which was placed on the "same side as the boy's left hand". The E initiated questions concerning all the items.

The E removed the pictures from the felt board and replaced the picture of the boy (back view) with a picture of a girl facing the Ss. The girl was placed in the centre of the board. The E asked the Ss to individually place pictures of the bird, tree, ball and dog on the felt board such that the bird and ball were on the "same side as the girl's left hand", and the tree and dog were on the "same side as the girl's right hand." The format was identical to that stated above. After each placement the E asked the other Ss if they agreed or disagreed and why. Questions pertaining to the items placed followed each individual placement and cumulatively included all relationships. The final questions concerning all four pictures were: "The bird and the ball are on..the girl's left hand side. Why? The tree and the dog are on the girl's right hand side. Why? The E then asked questions for each of the objects concerning their placement.

The E removed the pictures. "Here is a picture of a girl with her back to you. Who can place this picture on the left side of the board? Is the picture on the left side of the board? Why? Here is the picture of a boy facing you. Who can place the picture on the right side of the board? Is the picture on the right side of the board? Why?" The E initiated questions as follows: "The boy is on the..right hand side. The girl is on the..left hand side. Who can point to the boy's left hand? Is that the boy's left hand? Why? Who can point to the girl's left hand? Is that the girl's left hand? Why? etc."

The E removed the pictures. (The E **tried** to ask as many different Ss as possible to place the pictures.) "Here is a picture of a girl with her back to you. Who can place this picture on the left side of the board? Is the picture on the left side of the board? Why? Here is a picture of a boy facing you. Who can place the picture on the right side of the board? Is the picture on the right side of the board? Why?" (The E then asked Ss to point to the left and right hands of the pictured boy and girl with other Ss affirming or correcting if incorrect.) "Who would like to place the ball on the same side as the boy's right hand? Why?" The E repeated the procedure for placements of the dog which was on "the same side as the girl's right hand". Once the placements had been completed, the E asked the following questions: "The ball is on the same side as the girl's..right hand. The ball is on the same side as the boy's right hand. Why? The dog is on the same side as the boy's..right hand. The dog is on the same side as the girl's..

right hand. why?"

The E removed the stimulus materials and began the next lesson immediately.

Lesson #5 (Objects to the left or right of objects)

Since the concepts and underlying relationships were becoming increasingly more difficult, the initial part of the new lesson slowly integrated material previously learned with new material.

The E placed the picture of the boy with his back to the Ss on the felt board. "Here is a boy. He is standing with his back to you. Here is a dog. (The E placed the dog to the left of the boy.) The dog is standing beside the boy. The dog is on the boy's..left hand side. The boy's hand that is touching the dog is his..left hand. Here is a picture of a bird.

(The E placed the bird on the (boy's right) The bird is flying beside the boy. The bird is on the boy's..right hand side.

The bird and the dog are not..on the same side."

"Now we are going to put some more pictures on the board. Who can put the tree on the same side as the picture of the bird? (The E adjusted the pictures of the bird, dog and tree such that the tree was to the right of the bird.) The E removed the picture of the boy, and initiated the following questions: "The dog is to the left of the..bird. Why? What else is the dog to the left of? Why? The tree is to the right of the..dog. Why? What else is the tree to the right of? Why? On the left side of the bird there is a .. dog. On the right

side of the bird, there is a .. tree. What is to the left of the bird? Why? What is to the right of the bird? Why?"

Who can move the bird? I would like you to put the picture of the bird to the right of the tree. Is the bird to the right of the tree now? Why? Now, who can move the bird to the left of the dog? Is the bird to the left of the dog? Why?" The E initiated questions similar to those used previously concerning the final placement of pictures and their relationships to each other.

The E then removed the pictures and set up the felt board such that the girl had her back to the Ss and the boy was facing the Ss. There was a table between the pictures of the boy and girl. "Here is a picture of a boy and girl sitting at a table. They are going to eat their lunch. Here is a fork. Who would like to put the fork on the girl's right hand? Is the fork in the girl's right hand? Why? Who would like to put the knife in the girl's left hand? Is the knife in the girl's left hand?" (The E repeated the procedure until the cup was at the boy's left hand and the glass was at the boy's right hand.)

"Who would like to try next? Take the fork from the girl's right hand and put it in the boy's right hand." (After each placement, the E asked all the Ss if the placement was correct and why.) The remaining Ss were asked to take the knife from the girl's left hand and put it beside the boy's left hand; take the glass from the boy's right and put it at the girl's right and take the cup from the boy's left and put it beside

the girl's left hand."

Once all the placements had been made and corrected, the E initiated questions concerning the relationship of the objects to the person and objects to each other.

The E thanked the Ss and said that she was looking forward to seeing them soon.

#### Session 4

#### Lesson #6 (Puzzle of left and right)

The E welcomed the Ss and began the new lesson. "Here is a puzzle. See, it is a picture of a boy. The boy has his back to you. His hands and feet have been cut out so that they come off the puzzle. (The E removed the puzzle parts.) Here are the hands and feet. I will give you a hand or foot and tell you if it is the left or right one. When I tell you that you have the left foot, go to the puzzle and put the foot on the boy's left leg. If the foot fits, then you have chosen the correct side. You have to put the foot on the left leg. But if the foot does not fit where you have put it, you have chosen the wrong side. If I give you the right foot, it will only fit on the right side. Who would like to try the puzzle first?"

"Here is a hand. On the hand is a big letter R. The R stands for right. I would like you to put the hand on the boy's right arm. See, if it fits in the puzzle place you have chosen then you are correct." The E said; "Good, the puzzle fits. You have put the boy's right hand on correctly." If the choice was incorrect, the S was not able to fit the hand into the

puzzle space. The E said; "Does the puzzle fit? Can anyone show me where the puzzle part should go so that the boy's right hand is on correctly?" (The E asked the S in each case why the puzzle did or did not fit.)

The procedure was repeated for the next seven placements of the puzzle parts. After all four parts (left and right hand, left and right foot) had been placed on the puzzle correctly (the E had the part removed after each placement), the E repeated the procedure again giving the last Ss an opportunity to place the same puzzle parts as the first Ss.

The E then introduced a puzzle of a boy facing the Ss. "Here is a picture of a boy. It is a puzzle. The boy is facing you. There are spaces for his hands and feet. I will give you a part to put on the puzzle. If you put the part in the correct place, the puzzle piece will fit. If you have not picked the correct place, the puzzle piece will not fit."

The E repeated the above procedure for all four body parts through two completed puzzles. All Ss were given the opportunity to place one of the body parts on the second puzzle.

#### Lesson #7 (Puzzles - contrasting positions)

The E presented the new puzzle (18"x14") of a girl with her back to the Ss. "Here is a girl. She is standing with her back to you. Here is a picture of a boy. (The E placed the second small puzzle to the right of the first.) The boy is standing to the right of the girl. The boy is standing with his face to you. I will give you some parts to fit in



the girl puzzle and the boy puzzle. If the puzzle parts fit, you have chosen the correct place. If the parts do not fit you have chosen the wrong place. Who would like to try? (The E assigned one S to the left puzzle and one to the right puzzle, simultaneously.) I will give you both a hand with the letter R on it. That is the..right hand. The hands are both..blue. I would like you (S<sub>1</sub>) to put the girl's right hand on. I would like you (S<sub>2</sub>) to put the boy's right hand on. If the puzzle fits you have chosen the correct hand. Is the boy's right hand in the correct place? Why? Is the girl's right hand in the correct place? Why?"

After the placements had been made correctly, the E asked questions pertaining to the puzzle as far as it had been completed at each step. The E did not remove any puzzle parts. All questions were cumulative. Once all the corresponding parts were in place, the E asked questions pertaining to all puzzle parts. Since the right hands were blue, the left, red, the right feet, yellow and the left feet green, the E initiated questions such as; "The hands that are blue are the..right hands."

The E repeated the procedure with two exceptions. The Ss who previously placed parts on the puzzle of the girl, were asked to place parts for the boy puzzle, and the parts of the body were different colors. For example, the right hand for the boy was now blue while for the girl it was red. The left hand for the boy was red and for the girl was blue. The questions at the end of the placements, therefore were more extensive; "The boy's red hand is his..left hand. The girl's red

hand is her..right hand. The right hands are..red and blue, etc."

The E thanked the Ss.

### Session 5

#### Lesson 8 (Left and Right as relational concepts)

The E welcomed the Ss. The E sat at a low table such that she was facing the Ss who were sitting on the floor.

The E introduced the puppet to the Ss. (The voice of the puppet was also provided by the E.) The E was sitting at the table such that the puppet was sitting on top of the table with a dog house. The E's arm extended through the dog house such that the dog could be viewed just outside the doorway. "Here is someone I want you to meet. This is Silly. Silly is a puppy. Silly thinks he is the most important thing in the world."

Puppet (P): "I am so beautiful. I am so smart."

E: All right Silly, if you are so smart, then you can answer some questions for us. The boys and girls have been playing some games. They have been playing with left and right. Can you show me your right hand?

P: That is going to be easy. I am so smart. Let's see now. I can only pick one hand, they can't both be right can they?

E: No Silly. Now I know why they call you Silly. You have a left hand and a right hand. Can you show me your right hand?

P: Well, um, let's see now. Everyone has a left hand and a right hand. Then that means that everyone is just like

me.

E: I think it would be better, Silly, if you said that you were like everyone, rather than everyone was like you.

P: I am so smart. Everyone should be like me.

E: Well, Silly, you still haven't shown me your right hand. Do you know where your right hand is?

P: It's at the end of my arm..ha..ha..that was funny wasn't it? (Puppet looked at the E who gave him a very serious look.) Let me see now. I know. (Puppet raised his right hand.) Here it is. Here it is (waved it at the E). I am so smart.

E: Well what do you think? Is that Silly's right hand? Why? That was very good Silly. Now can you show me your left hand?

P: I have a left hand too? Let me think. I know. Here it is. Here it is. (Puppet waved his left hand at the E).

E: Who can tell me if Silly is correct? Is that Silly's left hand? Why?

P: See, I told you I was smart.

E: Well, Silly, so far so good. Now I am going to ask you to show me someone else's right hand. Who would like to come and let Silly find their right hand?

P: Oh, that is going to be as easy as pie.

E: Well, Silly. (The E turned to the Ss, and put her hand beside her mouth as if concealing the conversation from Silly.) Silly doesn't know it yet but he's in for a big surprise. This isn't as easy as it looks.

P: Dumdeedum..I am so smart. Here is my left hand (raised it) and here is my right hand (raised it). This is going to be easy.

E: All right Silly, you will have a chance to show how smart you are. \_\_\_(name) said he would like to play. I want you to tell me which hand is \_\_\_'s right hand. \_\_\_you stand here in front of Silly. I will cover Silly's eyes while you show everyone your right hand. Is that his right hand? Why? Now I will put something in your hand (E placed a piece of red felt in the Ss right hand). Close your hand tight. Close your left hand tight too. Now Silly, I will uncover your eyes. Now I want you to tell us, Silly, what hand is \_\_\_'s right hand."

P: Can I do it now? I know. I know.

E: Just a minute, Silly. First let me tell you what will happen if you are correct. If you pick the correct hand, when \_\_\_ opens up his hand you should see a piece of red felt.

P: Oh, red felt. Red felt. My favourite. I love red felt.

E: Wait a minute, Silly. If you are wrong, \_\_\_ will open his hand and nothing will be there.

P: Oh no.

E: All right Silly. Now, remember, show me \_\_\_'s right hand.

P: This is so easy. Let's see now. This is my left hand (raised it) and this is my right hand (lowered the left and raised the right). So then, \_\_\_'s right hand should be in the same place as my right hand. Here's \_\_\_'s right hand (grabbed it in both arms). I've got it. Open

it up and let me see the red felt. Let me see it.

E: Before \_\_\_ opens his hand that Silly chose, who can tell me if he chose the correct hand? Why? Q.K. now you can open your hands.

P: You tricked me. You ate it.

E: No Silly. \_\_\_\_\_ open up your right hand. See, there is the red felt. You made a mistake. You picked the left hand.

P: But I thought everyone's left and right were the same.

E: Well, that's true.

P: And I picked his hand that was on the same side as mine.

E: Who can tell Silly what is wrong with the way he chose \_\_\_'s right hand? How is \_\_\_ standing? What happens when someone is facing you? That's right. When someone is facing you, their right and left hands are on opposite sides.

P: You mean, when you're not looking, your left hand jumps over to the right side and your right hand jumps over to the left side?

E: No, Silly. Are you ever Silly. When you turn, your left and right hands turn with you. You will see what I mean. Who would like to try next? (The first S returned to his place on the floor.) Now, \_\_\_\_\_, I would like you to stand beside Silly. (S stood to the right) \_\_\_ is standing to the right of Silly. Now I want you to be facing the same way as Silly. I am going to put a piece of red felt in \_\_\_\_\_'s right hand. Now all you have to do is find her right hand and you will get the felt. Now close your eyes.

P: (to the Ss) Ha. She thinks she is going to trick me again.

Let's see. Last time I picked the opposite, or I should have picked the opposite but I picked the same. Now I will pick the opposite, since that was correct last time. I will get the felt.

(to the E) well, let's see. Here is my left hand (raised it) and here is my left hand. Now you think I am going to say it is this one (touched the S's right hand), but, I am smarter than you think. Since this is my right hand, \_\_\_'s right hand will be on the opposite side. This is the right hand (grabbed it) and I know where the felt is.

E: Before \_\_\_ opens the hand that Silly chose, can anyone tell me if Silly is correct or wrong. Did Silly choose \_\_\_'s right hand? Why? Let's find out.

P: Open your hand and let me see the felt. What happened?

E: Open your right hand and show Silly the felt.

P: I just don't understand.

E: Can anyone explain to Silly what happens when someone is standing beside you? Can anyone tell Silly where left and right are when someone is facing you? You see Silly, everyone has a left and right. Your left hand is called left, because it is on the left side of your body.

P: And right hands are called right because they are on the right side of your body.

E: Now when someone is standing beside you and you are both facing the same way, then you are standing the..same. And your left and right hands are the..same. (E waited for the

Ss to respond.) Now, you and \_\_\_ are standing...the same. Why? That's right because you are both facing the same way. You are both looking the same way. Now \_\_\_ raise your right hand. Now, Silly, you raise yours. See they are the same. Now, \_\_\_ slowly turn around with your right hand in the air. What happens? That's right. Her right hand turns with her. Now where will \_\_\_'s right hand be? Why? Where will \_\_\_'s left hand be? Why? \_\_\_'s right hand and your right hands will be on the..same side. Why? \_\_\_'s right and Silly's right hand will be on...different sides. Why?

P: Now I know. Now I know. When you are standing the same your hands are the same. And when you are standing different, left and right are different too.

E: Very good. One more chance Silly. Who would like to be next? \_\_\_, I would like you to stand behind Silly, so that you see his back. \_\_\_(S<sub>2</sub>) I would like you to stand in front of Silly so that he sees your back. Now, I will give each of you a piece of red felt for your right hands. Now, Silly, the piece of red felt is in each of the boys' right hands. First of all, will the right hands be the same? Will they be on the same side? Who can tell me? Why? O.K. Silly will their right hands be on the same side as yours? Who can tell Silly the answer? Why?

P: Let's see now. Are we standing the same? I'd day yes.

E: Why would you say yes?

P: We are standing the same because we are all looking the same way.

E: Good. Now, will your left side and right side be the same? Who can tell Silly? Why?

P: They will be the same. They will. (Silly took the felt.)

E: Now each of you will have a chance to try and fool Silly. When you come up to the front, stand either facing, or with your back to Silly and see if he can find your left or right hand. (Each S came to the front and the E asked Silly to chose the left or right hand. The E asked the remaining Ss if the choice was correct or incorrect. The S revealed the hand with the felt, if Silly was correct or without the felt, if incorrect. Silly just grabbed the felt, if correct or sulked if incorrect i.e., no dialogue with the puppet during this part of the lesson. Towards the end, Silly made all the correct answers.)

E: Well, that was very good, Silly. It looks like you really did learn a lot from the boys and girls.

P: I guess I wasn't as smart as I thought I was. But it was fun to learn about left and right. I enjoyed playing with the boys and girls.

E: Well, Silly, it's time to go. Say good-bye to the boys and girls.

P: Good-bye. (Silly went into the dog house.)

The E thanked the boys and girls for helping Silly.

## Session 6

### Lesson #9

The E welcomed the Ss and positioned them in a straight



line, such that all the Ss were facing the E. "Now I want you to stand like this (in a straight line). We are going to play a game today called Simon says. Now, I am going to face you and say things like; "Simon says put your hands on your head." I want you to do what Simon says. After I am Simon for a while, then I will let each of you be Simon for a while. If you don't do what Simon says, then you have to sit down. If you make a mistake, then you have to sit down until everyone has made a mistake and we will begin again."

"I will be Simon first. Simon says put your hands on your head. Simon says put your left hand in the air." The E asked all the Ss if everyone's left hand was up. "Now we will begin. That was just practice." The E called out directions, and asked for the Ss to watch that everyone was correct. After each instruction, the E said; "Is everyone doing what I asked? The E continued until all Ss were seated. Examples of some of the directions that were given are: "Simon says put your hands on your feet. Simon says put your hands in the air. Simon says put your left foot up, etc." The E discontinued asking questions when all the Ss were seated and at that time allowed each S to give four directions as Simon. Between each Ss turn at playing Simon, the E acted as Simon, continuing to increase in difficulty the directions she gave.

After each child had been given at least two opportunities to play Simon, the E stood with her back to the Ss and repeated the directions she had given previously for the front position.

The E thanked the Ss for playing and said that they all

made very good Simons. The E said that she was looking forward to seeing them at their next meeting.

### Session 7

#### Lesson #10 (Review)

The E welcomed the Ss and arranged them so that the Ss were seated in a semi-circle on the floor. The E brought out the felt board used previously.

Remember the felt board? We are going to put some pictures on the board like we did last time. Here is a picture of a ball. I will put the ball here (centre of the board). Now who would like to put the bird on the board? I would like you to put the picture of the bird to the left of the ball." After each placement, the E asked all the Ss if they agreed or disagreed with the placement and why. The E asked questions after each placement, such that the questions were cumulative in nature. The E repeated the procedure for the dog which was to be placed to the right of the ball.

When the three items had been properly placed and the appropriate questions asked, the E inserted the pictures of the boy and girl such that the boy was facing the Ss and the girl had her back to the Ss. The boy and girl were facing each other, with the stimulus items between. The E asked an S to pick the item that was to the left of the ball for the girl. The E asked another S to pick the item that was to the left of the ball for the boy. The E repeated this procedure (The E asked the Ss if they agreed or disagreed with each placement and why they felt the response was correct or

incorrect.) until each item had been named and its relationship to the boy and girl established.

The E removed the pictures and placed three new pictures on the board. The tree was situated at the top of the felt board. The house was placed in the middle and the cat, at the bottom of the board, such that the pictures were placed vertically, one underneath the other. The E then placed the right profile of the girl to the left of the items and the left profile of the boy to the right of the items. Each S was required to come to the board and point, naming the item required. For example, the first question was; "Come to the board and show me what the girl would see on her left (tree)." "Show me the picture the boy would see on his left (cat). Corrections were made as outlined previously. For example, if the S pointed to the cat instead of the tree when asked to point to "what the girl would see on her left", the E would ask the Ss ; "Who agrees with \_\_\_'s answer? How many think that the cat is on the left? Who thinks that the tree is on the left? Why is the tree on the left?, etc." Questions were initiated by the E after each placement.

After the questions were completed for all the items on the board, the E removed the stimulus items and placed two sets of pictures that were identical on the felt board. Two of each of the following: apple, star, bird, house, dress were placed on the board such that each set of items constituted a cross formation. On the first (left side) set, the apple was situated at the top, star in the middle, and bird

at the bottom. The house was on the left side (opposite the bird) with the dress on the right (opposite the house). The second set had the same formation with the exception that the house and the dress were reversed. The Ss were asked what was different about these pictures. The relationships of the other objects was also questioned.

The second set of pictures (two of each of a flower, ball, shovel, banana, boat) were also placed in the cross formation. One set (left) had the flower at the top and the shovel at the bottom of the vertical line, while the second set revealed the reverse (flower at the bottom and shovel at the top). The E followed the same procedure as above.

For each of the above formations, the E generated questions concerning the positional relation of the items to each other.

After the E had initiated all relevant questions, the stimulus materials and the felt board were replaced by the next items. The E introduced the new stimulus material (7 cards) saying; "Now I have some pictures to show you. (The E presented the cards in the same manner as noted in Lessons 1-3 with the exception being that the Language Master was not part of the lesson. Rather than have the machine play a recorded statement to correspond with the concept illustration, the E provided various statements concerning the pictures on each card. The statements were similar to those seen previously as E initiated questions in preceding lessons. For example, when the E exposed the

first card which had three items in a row horizontally (a dog on the left, a ball in the middle and a bone at the right), she did so by saying; "The ball is to the left of the.." and waited for the response "bone". Since the Ss were familiar with the questioning procedure, responses were given immediately and the partial statements were completed by the Ss. Additional E initiated statements for the first card were; "The dog is to the left of the..ball. The dog is also to the left of the..bone. The bone is to the right of the..ball. The bone is also to the right of the..dog. The ball is to the left of..the bone. The ball is to the right of the..dog. How can the ball be to the left of the dog and the right of the bone? Why are the dog and ball to the left of the bone? Why are the ball and the bone to the right of the dog?"

The E followed the above procedure initiating statements concerning all possible relations depicted on each card. Corrections were made for all statements in the same manner outlined previously (Ss were asked if they agreed or disagreed with the answers and why.). An additional six cards constituted the remainder of the lesson. The cards were presented in the following order, and revealed illustrations of: a girl with left profile and three vertical items- a doll, ice cream cone and bracelet; a boy, right profile and three vertical items, a car, dog and flag; a boy facing three horizontal items, car, dog and flag; a boy left profile facing three vertical items, a car dog and

flag; a boy with his back to the Ss, facing three horizontal pictures of a card, dog and flag.

Once all the cards had been presented and all possible statements made and corrected concerning the interrelationships illustrated on the cards, the lesson was complete.

The E then thanked the Ss very much for helping her play all the games so well. She also said that they wouldn't be playing anymore games together, but that she would come and see them all in a little while and play a game alone with them.

## RESULTS

The male and female data within the Experimental groups and within the Control group were combined, since  $t$  tests revealed nonsignificant effects of sex.

Pre- and post-test means and standard deviations for the Experimental and Control groups are presented in Table 1.

TABLE 1

Pre- and post-test means and standard deviations for the Experimental and Control groups

	Experimental (n=8)		Control (n=12)			
Pretest	$\bar{X}$	SD	$\bar{X}$	SD	df	t
Perspective	18.5	1.46	15.42	3.71	18	2.13*
Left and Right	10.0	5.17	10.58	7.19	18	n.s.
Post-test	$\bar{X}$	SD	$\bar{X}$	SD	df	t
Perspective	21.75	2.22	15.75	3.92	18	3.04**
Left and Right	15.62	5.81	10.66	6.71	18	2.94**

\*  $p < .05$

\*\*  $p < .01$

Statistical analyses ( $t$ -tests) revealed no significant pretest difference between the two groups on the left-right measure. However, results also revealed that the Experimental group performed significantly superior to the Control group on the Spatial Perspective pretest ( $t = 2.13$ ,  $df = 18$ ,  $p < .05$ ). In order to determine the extent of the experimental treatment effects, a comparison of pre- to post-test means within the groups was performed. The means for the Pre- and post-test comparisons within groups are presented in Table 2.

TABLE 2

A comparison of Experimental and Control group  
Pre- to Post- test data

Group	Pretest		Post-test		df	t
	$\bar{X}$	SD	$\bar{X}$	SD		
<u>Experimental</u>						
Perspective	18.5	1.46	21.75	2.22	7	3.86**
Left-Right	10.0	5.17	15.62	5.81	7	2.76*
<u>Control</u>						
Perspective	15.42	3.71	15.75	3.92	11	.53
Left-Right	10.58	7.19	10.66	6.71	11	.26

\*  $p < .05$ \*\*  $p < .01$



Since the pre- to post-test improvements for Perspective ( $t = 2.76$ ,  $df = 7$ ,  $p < .01$ ) and Left-Right Relations ( $t = 2.76$ ,  $df = 7$ ,  $p < .05$ ) were significant for the Experimental group only, it may be assumed that the treatment did have a significant effect. The Experimental group performed significantly superior to the Control group on the post-tests for Perspective ( $t = 3.04$ ,  $df = 18$ ,  $p < .01$ ) and Left-Right Relational Judgments ( $t = 2.94$ ,  $df = 18$ ,  $p < .01$ ).

In order to compare the  $S_a$ ' performance on questions referring to the  $S_a$ ' perspectives only (Questions 1a, 2a, 4a,c, 5a,c, 6a,c) and perspectives of another person (remaining questions) an analysis of pre- and post-test means was performed for both groups on the Perspective Test. The pre- and post-test means and standard deviations for both groups are presented in Table 3.

TABLE 3

Pre- and post-test means and standard deviations for the Experimental and Control groups on Self- and Other-oriented Perspective Questions

	Experimental (n=8)		Control (n=12)			
	$\bar{X}$	SD	$\bar{X}$	SD	df	t
Pretest						
Self-oriented	6.75	1.46	5.80	2.80	18	n.s.
Other-oriented	11.75	1.93	10.08	5.50	18	n.s.
Post-test						
Self-oriented	7.62	.48	6.00	1.67	18	3.11*
Other-oriented	14.00	4.50	9.75	9.52	18	3.24*

\* p .01

The results revealed that significant post-test differences existed between the Experimental and Control group means for Questions that were Self-oriented ( $t = 3.11$ ,  $df = 18$ ,  $p .01$ ) and for Questions referring to the Perspectives of Other Persons ( $t = 3.24$ ,  $df = 18$ ,  $p .01$ ). The Experimental group, therefore, performed significantly better on both phases of the Perspective post-test.

An analysis of pre- to post-test improvements within groups was performed to assess the effect of the experimental treatment for both orientations of the Perspective Questions. The means for the pre- and post-test comparisons within groups are presented in Table 4.

TABLE 4

A comparison of Experimental and Control group pre- to post-test data for Self- and Other-oriented Perspective Questions

Group	Pretest		Post-test		df	t
	$\bar{Y}$	SD	$\bar{Y}$	SD		
<u>Experimental</u>						
Self-Oriented	6.75	1.46	7.62	1.48	18	n.s.
Other-Oriented	11.75	1.93	14.00	4.50	18	2.50*
<u>Control</u>						
Self-Oriented	5.80	2.80	6.00	1.67	18	n.s.
Other-Oriented	10.08	5.50	9.75	9.52	18	n.s.

\*  $p .05$

The comparison of pre- and post-test means for the Experimental group revealed a significant improvement ( $t = 2.50$ ,  $df = 18$ ,  $p .05$ ) for Questions referring to the Perspectives of Other Persons. No significant improvement was found for the Experimental group on the Self-Oriented Questions or for the Control group for either orientation of the Perspective Questions.

An analysis between pre- and post-test data for individual questions revealed that the differences between the Experimental and Control groups on the pretests approached, but did not reach, significance for Question 1 on the Perspective task ( $t = 1.407$ ,  $df = 18$ ,  $p .20$ ) and for Question 1 for Left-Right Relations ( $t = 2.00$ ,  $df = 18$ ,  $p .10$ ). In both cases, the trends were in favour of the Experimental group. Remaining questions revealed no significant differences on pretest performance.

The analysis of post-test data revealed significantly better performance on the Perspective test for the Experimental group on Question 2 ( $t = 2.581$ ,  $df = 18$ ,  $p .02$ ) and 6 a, b ( $t = 2.312$ ,  $df = 18$ ,  $p .05$ ). Trends in the direction of significance were found for Questions 5 and 6 c-h (both  $p .20$ ). The analysis of Left and Right data also revealed significant improvement for the Experimental group on Questions 1 ( $t = 2.328$ ,  $df = 18$ ,  $p .05$ ), 4 ( $t = 2.396$ ,  $df = 18$ ,  $p .05$ ), 5 ( $t = 2.393$ ,  $df = 18$ ,  $p .05$ ), and 6 e-h ( $t = 2.057$ ,  $df = 18$ ,  $p .10$ ). A trend in the direction of significance was found for Question 6 a-d ( $p .20$ ). Individual pre- to post-test question comparisons on both variables for the Control group were all found to be nonsignificant. Since the Experimental group performed significantly better on the majority

of post-test questions for Perspective and Left-Right, it may be assumed that training in relational concepts improved left and right, as well as, perspective performance.

Since the ability to perform successfully on left-right relational tasks has been assumed to relate to successful performance on spatial perspectives tasks, a correlational analysis was performed. Pearson product-moment correlation coefficients revealed that performance on the two tasks was significantly related on the pretest for the Control group ( $r = .61$ ,  $df = 10$ ,  $p < .05$ ) but not for the Experimental group ( $r = -.09$ ). Post-test comparisons revealed that while the correlation for the Control group decreased slightly ( $r = -.55$ ,  $df = 10$ ,  $p < .10$ ), the correlation for the Experimental group was now significant ( $r = .78$ ,  $df = 6$ ,  $p < .02$ ).

From the analysis of individual questions, it is possible to derive a scale of difficulty for the questions, computed from the combined means revealed in Table 5.

TABLE 5

Mean scores of individual questions for the Experimental (Exp.), Control (Cont.) and Combined (Comb.) data

Question Number	Pretest			Post-test		
	Exp.	Cont.	Comb.	Exp.	Cont.	Comb.
Perspective: 1	3.25	2.66	2.95	4.0	2.81	3.45
2	2.37	1.41	1.89	3.0	1.58	2.29
3	3.13	3.16	3.14	4.0	3.08	3.54
4	3.75	3.58	3.66	3.87	3.41	3.64
5	2.87	2.98	2.57	3.12	2.58	2.85
6 a,b	1.37	.91	1.14	1.75	.91	1.44
6 c-h	1.37	1.00	1.18	2.37	1.41	1.89

Cont.

Con't.

Question Number	Pretest			Post-test		
	Exp.	Cont.	Comb.	Exp.	Cont.	Comb.
Left and Right: 1	3.75	2.41	3.08	4.0	2.58	3.29
2	1.00	1.81	1.40	1.0	1.91	1.45
3	.5	1.75	.90	1.0	1.66	1.33
4	2.25	1.81	2.03	3.5	1.75	2.62
5	.62	.91	.76	2.0	.66	1.33
6 a-d	1.25	1.08	1.16	2.25	1.25	1.75
6 e-h	.62	.75	.68	1.75	.66	1.20

The mean scores for the combined (Experimental and Control groups) data revealed that the progression of difficulty for the Perspective test was consistent from pre- to post-test with the order from least to most difficult being Questions: 4,3,1,5,2,6 c-h and 6 a,b. The Left-Right data was slightly less consistent with Questions ranging in difficulty on the pretest from 1,4,2,6 a-d,3,5, and 6 e-f, to post-test Questions 1,4,6 a-d,2,3 and 5, and 6 e-f.

Considering the effect of order of presentation of the questions on overall performance, it was revealed that S<sub>a</sub> in Condition 1 performed significantly superior to Condition 2 S<sub>a</sub> with respect to the post-test for Perspective ( $t = 2.22$ ,  $df = 18$ ,  $p .05$ ). All other comparisons yielded nonsignificant differences.

A comparison of the two Experimental groups, E<sub>1</sub> and E<sub>2</sub>, revealed that E<sub>2</sub> ( $n = 3$ ) performed significantly better than E<sub>1</sub> ( $n = 5$ ) on the post-test for Left and Right ( $t = 3.003$ ,  $df = 6$ ,  $p .05$ ). No other mean comparisons approached significance.

## CHAPTER IV

## DISCUSSION

The major purposes of the present study were to determine a) if training in relational concepts, such as left and right, improved preschool Ss' abilities to perform on left-right relational tasks and b) if successful training of such relational concepts would improve the Ss' abilities to perform tasks of spatial perspective. Therefore, the major questions posed concerned the possibility of training 4 year old children to improve their left-right knowledge and the further implication of the Ss transferring their acquired relational knowledge to a task involving spatial perspective.

#### I. Pretest to Post-test Comparisons:

Concerning the first purpose of the study, preliminary results indicated that the Experimental group's post-test performance on the left-right measure was significantly superior to that of the Control group. Moreover, further analysis revealed significant pre- to post-test improvement for the Experimental groups only. Therefore, it may be assumed that the significant improvement was due to the Experimental treatment, i.e., the training sessions.

Secondly, analysis of the data indicated that there was a significant difference between the Experimental and Control groups on the post-test for Perspective. However, since the Experimental group was significantly superior to the Control group on the pretest for perspective, additional analysis was necessary. The extended analysis of pre- to post-test data, within groups, revealed that significant improvements held only

for the Experimental group. Therefore, it may be assumed that the significant improvement for the Experimental group was due to the treatment.

In analyzing the results for the Experimental group improvement, it is essential to specify the possible treatment effects that could have accounted for the improvement. The overall framework of the lessons was based on the underlying assumption that cognitive conflict would aid the Ss in their ability to consider **opposing** viewpoints (in the responses of the other Ss) and alternative responses (discrepant feedback from self-correcting materials). Ss were encouraged, throughout the training sessions, to listen to the responses of the other Ss, and to agree or disagree with the response given. Explanations were also required of the Ss to substantiate their comments, i.e., "why do you agree; disagree?". The stimulus materials which were used in the lessons provided the Ss with feedback regarding their responses. For example, the puzzles used in Session 3, afforded the S the opportunity to see if the left or right hand (or foot) fit into the chosen puzzle place. If the part fit, the S knew immediately of his success. If the part did not fit, the S realized that his choice had been incorrect. Lesson 8 also provided an opportunity for all Ss in the Experimental group to observe the conflicting situations the Puppet encountered. It would seem that the use of cognitive conflict procedures and the lengthy training session (2 weeks) accounted for the Ss' increased ability to perform left-right relations.

These procedures of a) cognitive conflict and b) lengthy

training period (1 week) were employed previously to elicit successful acquisition of conservation of number (Gruen, 1965; Smedslund, 1961). Therefore, the present study mirrors previous training studies, extending these successful procedures to the area of relational thought. However, the present investigation is distinct from previous studies in one important aspect. Previous training studies concerned with the Piagetian concept of conservation have, for the most part, concentrated on the individual child in an artificial laboratory setting. In the present study, carefully designed lesson plans were instituted into the Nursery school curricula and the project was conducted within the typical nursery day -- a factor of utmost educational relevance.

## II. Individual Item Difficulties:

### i) Left-Right Relations:

Now, concerning the scalability of item difficulty for each individual, left-right question, the combined data (both groups) revealed a definite progression of mean success scores (See Figures 5a and 5b, Appendix B). In general, the rate of progression is similar to the previous findings of Piaget (1928) and Elkind (1961). As with these earlier studies, knowledge of one's own left and right seemed to be the easiest item. Knowledge of left and right as positions occupied by objects (Question 4, present study; Question 3 in Piaget, 1928) seemed to directly follow the preceding stage. The items of third greatest difficulty included those in which Ss were asked to transpose left and right for a model facing the S and for objects held by that



model (Questions 3 and 5, present study; Questions 2 and 4 in Piaget's study).

The major discrepancy in the findings of the present study as compared to the earlier, classical studies involves the final question, Question 6. Although Piaget found that the knowledge of left and right for 3 objects was the most difficult, the present study revealed that Questions 6 a-d were fourth (third on the posttest) most difficult of the seven questions. Questions 6 e-f, on the other hand were found to be the most difficult of all. However, the present author believes that extrinsic, rather than intrinsic, task relevant variables led to this finding. First, I believe that Question 6 a-d was less difficult than either Questions 3 or 5 because the former question merely reflected a simple extension of the knowledge required for Question 4, i.e., the knowledge that objects can occupy positions of left and right (Question 4 = 2 objects; Question 6 a-d = 3 objects). The more difficult questions, 3 and 5, on the other hand, required transpositional knowledge as outlined above. This is in disagreement with Piaget's statements that two object relational discrimination precedes transposition and three object relational discrimination respectively.

Secondly, in order for one to explain why Questions 6 e-f were more difficult than Questions 6 a-d (although both are 3 object discrimination tasks) one would have to rely on anecdotal evidence. From such evidence, it appeared as if the Questions 6 e-f elicited a greater number of "disinterested" types of responses, quicker responses, or "I don't know"

behaviours. This may have been the result of the repetitious nature of these latter questions, thereby leading to fatigue, confusion, and/or "get it over with" behaviours emitted by the Ss. Thus, the present author strongly believes that the data do not truly reflect the order of item difficulty. Instead, items 6 e-f (or 3 object, left-right relations) should probably precede transpositional items such as Questions 3 and 5.

## II. Effect of Question Orientation:

Considering the effect of Question orientation (Self vs. Other) on the Ss' pre and post-test abilities to judge spatial perspective, results revealed that while no significant pretest differences were found between the Experimental and Control groups, the Experimental group performed significantly superior to the Control group on post-test questions referring both to the perspective of the subject (Self-Oriented Questions) and that of other persons (Other-Oriented Questions). In order to determine the effect of the experimental treatment on the Ss' improvement, a within-groups analysis revealed that the Experimental group performed significantly better on questions referring to the perspectives of other persons. All other within-group comparisons were nonsignificant. These results thus lend further credence to the conclusion that training in left-right relations aided the Ss in their abilities to judge the perspectives of other persons.

## III. Spatial Perspectives:

In considering the individual questions on the Perspective pre- and post-test for the combined data, a scale of difficulty

can also be established (See Figures 6a and 6b, Appendix B). Although the best analysis of the individual scores would entail a comparison of the present research with existing evidence, little research is available to form such a comparative continuum. However, the present data suggest that an internal comparison would be valuable.

When comparing Question 4 (easiest for Ss) with Question 2 (5th most difficult out of seven), it may be suggested that it is easier for the S to determine what an observer (the doll) saw at the present time, than to determine what he, himself, would see at some future time (implied) and from some future position. The second Question seemed to entail two further transpositions (as compared with Question 4, requiring only that the S realize that the O's viewpoint was different) of thought: a) he had to displace himself to occupy a position (he had to become O); b) he had to do it at some future time; c) he had to realize that a change of position for himself resulted in a change in his own viewpoint (perspective). The ease with which the Ss answered Question 3 in part, is supported by evidence that some 3-year-olds are able to respond to implied perspective questions, i.e., "What does the doll see?" (Masangkay, McCluskey, Sims-Knight and Flavell, 1971). The questions of most difficulty (6 c-h, 6 a,b, respectively) were also of most difficulty for earlier studies of 3 object perspective (Flavell, 1968; Piaget and Inhelder, 1956) since the 3 objects entail dimensions of depth, left and right, and their reorientation to a model. In a discussion of the emergence of perspective-

taking ability in young children (See Appendix A), Piaget and Inhelder (1956) proposed that perspective or projection for successive positions of a single object, whether seen by the child or an imaginary observer, precedes perspective of a group of objects as envisaged by an observer (O) from different positions, or alternatively by a number of observers. The data in the present study, for Questions 6 a,b, 6 c-h, agree with earlier findings.

Finally, upon considering the present empirical evidence in the light of Flavell's (1971) recent theoretical framework (See Appendix A), a conflict arises. Flavell believes Level 1, the capacity for symbolically representing certain visual acts and attributing them to others, as well as the self, precedes Level 2 which implies that S is aware of an S-O difference. The present study would suggest that the opposite is true, i.e., the S realizes an S-O difference before he is able to symbolically transpose the information. This proposition is further supported by examining the Ss' overall performance on the Pretest Questions 3, 1, and 5. (See Figure 6a, Appendix B) which posed increasing difficulty for the Ss and which were intermediary to Questions 4 and 2 on the difficulty scale. Comparing Questions 3 and 1, the same features hold as in the above comparison. Question 3 which implies an analysis in the present (e.g., "What is the doll looking at?") is contrasted with Question 1 which requires that the S make a future transposition for himself ("What picture would you see?"). It seems from the present study, that contrary to Flavell's interpretations that Level 1

precedes Level 2, that it is more difficult for an S to project himself into a future position, than to determine what an observer (O) views at the present time.

#### IV. Effects of Group Size and of Question Order Presentation:

In addition to the major findings concerning Ss' overall performance on the left-right and perspective tests prior to and after training, there were a number of other noteworthy results. First, the degree of improvement in relational and spatial judgments was a function of the number of Ss in the training group; secondly, the order of question presentation on the Perspective posttest revealed overall significant differences.

Concerning the first result, the Experimental group (E<sub>2</sub>), comprised of 3 subjects, performed significantly better than the Experimental group (E<sub>1</sub>) with 5 subjects on the posttest for Left and Right. Perhaps a more direct student-teacher interaction and opportunity for greater involvement afforded each S in E<sub>2</sub> were contributing factors. It is also suggested that the smaller n (E<sub>2</sub>) resulted in more intense interest and heightened attention, witnessed by fewer outbursts, and distracted behaviour (e.g., throwing of stimulus materials, shoving and pushing other Ss, Ss competing for E's attention) in a smaller group. However, lack of available data for IQ, socioeconomic status or personality profiles, in addition to the relatively small sample (n = 8), results in speculation, only, at this point, as to the contributing factors.

Concerning the significantly superior performance of Ss in Condition I (as compared with Ss in Condition 2), it can only be speculated that the Ss in Condition I were better able to make

distinctions based on stating subject-relevant effects, prior to observer-relevant. Another explanation may be that Ss in Condition 2 were at a disadvantage, since they were required to extract O-relevant material prior to considering their own viewpoints. Why this occurred only on the posttest may be attributed, perhaps, to the S's growing conscious awareness of his own perspective throughout the training session. Additional testing in this area is essential, however, before these speculations are validated.

#### V. Criticism and Suggestions for Future Research:

In the present investigation, it appeared as if the puzzles provided the most interest and challenge for the children, whereas the Language Master contributed most to the disinterest of the Ss. Perhaps, this may have been due to the fact that the Language Master lesson plans dealt with rather simple concepts that the children may have already known (e.g., "same" vs. "different"). Moreover, disinterest may have resulted because only the teacher was allowed to operate the machine. The group design of the present study necessitated teacher operation of the machine, thereby avoiding obvious problems (e.g., Ss pushing all the buttons; pushing cards through too quickly). Thus, if used in future studies, it is suggested that the Ss be allowed to operate the machine on their own, guided, but not instructed, by the teacher. It should also be noted that the Puppet which was manipulated only by the E provided humor and increased S participation in trying to outwit 'Silly'. The consensus here is that the Puppet lesson was successful and that puppets could be used more frequently in the future.

In considering the future implications of the present research, the possibilities are infinite. The fact that 4-year-olds can be successfully trained to acquire left-right relations and transfer that knowledge to a task of spatial perspective, suggests that with the proper procedures and length of training, young children can be and are interested in learning new concepts. The implications that arise from the Ss' abilities to take the spatial perspective of another person, at such an early age, suggest possibly that egocentric behaviour can be restricted on a social plane. If young children are able to acquire the knowledge that other people have different feelings, as well as, perspectives, the benefits of providing young children with an awareness of social concern, empathy and consideration for fellow children (i.e., sharing, and helping behaviours) is overwhelming.

## Footnotes

<sup>1</sup> Harris argues that Piaget's six tests to determine the child's stage of relational thought are in fact discontinuous. He poses a two stage analysis of discrimination and relativity to account for the lag in left-right discrimination as compared with other spatial concepts (up-down, front-back). For further analysis of the discrepancies between Harris' and Piaget's positions, refer to the Review of Literature.

<sup>2</sup> Flavell's initial delineation of skills involved in making inferences (existence, need, inference, application) (1971) and his partitioning of role taking into five components (existence, need, prediction, maintenance, application) (Flavell et al., 1968).



Bibliography

79

- Baldwin, A. L. Three Theories of Child Development. New York: Wiley, 1969.
- Berlyne, D. Structure and Direction in Thinking. New York: Wiley, 1965.
- Borke, H. "Interpersonal perception of young children". Developmental Psychology, 1971, 5, 263-269.
- Bruner, J. s. "The course of cognitive growth." American Psychologist, 1964, 19, 1-15.
- Cooper, R., and J. Flavell. "Cognitive correlates of children's role-taking behaviour." Merrill-Palmer Quarterly, in press.
- Elkind, D. "The child's conception of right and left." Journal of Genetic Psychology, 1961, 99, 269-276.
- Elkind, D. Children and Adolescents: Interpretive Essays on Jean Piaget. New York: Oxford University Press, 1970.
- Feigenbaum, K. "A pilot investigation of the effects of training techniques designed to accelerate children's acquisition of conservation of discontinuous quantity." The Journal of Genetic Psychology, 1971, 119, 13-23.
- Flavell, J. H. The Developmental Psychology of Jean Piaget. Princeton, New Jersey: D Van Nostrand, 1963.
- Flavell, J. H. "Role-taking and communication skills in children." Young Children, 1966, 21, 3, 164-177.
- Flavell, J. H., P. T. Botkin, C. L. Fry, J. W. Wright and P. E. Jarvis. The Development of Role-taking and Communication Skills in Children. New York: Wiley, 1968.
- Flavell, J. H. "The development of inferences about others." Paper presented at the Interdisciplinary Conference on our Knowledge of Person Perception and Interpersonal Behaviour. New York, 1971.
- Gruen, G. E. "Experiences affecting the development of number conservation in children." Child Development, 1965, 36, 4, 963-979.
- Harris, L. J. "The role of front-back features in children's "front", "back" and "beside" placements of objects." Merrill-Palmer Quarterly, 1972, 18, 2, 259-271.
- Harris, L. J. "Discrimination of left and right and the development of the logic of relations." Merrill-Palmer Quarterly, 18, 4, 308-320.

- Karplus, R. "The science curriculum improvement study--report to the Piaget conference." Journal of Research in Science Teaching, 1964, 2, 236-240.
- Karplus, R. "Meet Mr. O". Science and Children, 1963, 1, 19-24, cited in D. Rubadeau and I. Athey (eds.) Educational Implications of Piaget's Theory. Massachusetts: Ginn-Blaisdell Co., 1970.
- Karplus, R. "Relativity and Motion." Science Curriculum Improvement Study, University of California (mimeographed), 1963.
- Kuhn, D. "Mechanisms of change in the development of cognitive structures." Child Development, 1972, 43, 833-844.
- Langer, J. "Disequilibrium as a source of development." In P. Mussen, J. Langer, M. Covington (eds.), Trends and Issues in Developmental Psychology. New York: Holt, Rinehart and Winston, 1969, 22-37.
- Masangkay, Z., K. McCluskey, J. Sims-Knight, and J. Flavell. "The early development of inferences about the visual perceptions of others." University of Minnesota (mimeographed), 1971.
- Palmer, E. "Accelerating the child's cognitive attainments through the inducement of cognitive conflict: an interpretation of the Piagetian position." Journal of Science Education, 1965, 3, 318-325.
- Palmer, E. "The equilibration process: some implications for instructional research and practice." Paper presented at the American Educational Research Association Meeting, 1968. In D. Rubadeau and I. Athey (eds.), Educational Implications of Piaget's Theory. Massachusetts: Ginn-Blaisdell Co., 1970.
- Peterson, C., F. Danner, J. Flavell. "Developmental changes in children's response to three indications of communicative failure." Child Development, in press.
- Piaget, J. The Child's Conception of the World. New York: Harcourt and Brace, 1926.
- Piaget, J. Judgment and Reasoning in the Child. New Jersey: Littlefield, Adams & Co., 1928.
- Piaget, J. The Psychology of Intelligence. New York: Harcourt and Brace, 1950.
- Piaget, J. Play, Dreams and Imitations in Children. New York: W.W. Norton and Company Inc., 1951.
- Piaget, J. The Origins of Intelligence in Children. New York: International Universities Press Inc., 1952.
- Piaget, J. "Development and Learning." Journal of Research in Science Teaching, 1964, 2, 176-186.

- Piaget, J. and B. Inhelder. The Child's Conception of Space. London: Routledge and Kegan Paul, 1950.
- Piaget, J. and B. Inhelder. The Growth of Logical Thinking from Childhood to Adolescence. New York: Basic Books, 1956.
- Shantz, C. and J. Watson. "Spatial abilities and spatial egocentrism in the young child." Child Development, 1971, 42, 171-181.
- Sigel, I. and F. Hooper (eds). Logical Thinking in Children. New York: Holt, Rinehart and Winston, Inc., 1968.
- Sigel, I., A. Roeper, and F. Hooper. "A training procedure for acquisition of Piaget's conservation of quantity: a pilot study and its replication." British Journal of Educational Psychology, 1966, 36, 301-311.
- Smedslund, J. "The acquisition of conservation of substance and weight in children: II External reinforcement of conservation of weight and of operations of addition and subtraction." Scand. Journal of Psychology, 1961, 2, 71-84. (a)
- Smedslund, J. "The acquisition of conservation of substance and weight in children V. Practice in conflict situations with out external reinforcement." Scand. Journal of Psychology, 1961, 2, 156-160. (b)
- Turiel, E. "An experimental test of the sequentiality of developmental stages in the child's moral judgments." Journal of Personality and Social Psychology, 1966, 3, 611-618.
- Wapner, S., L. Cirillo. "Imitation of a model's hand movements: age changes in transposition of left-right relations." Child Development, 1968, 39, 875-886.

APPENDIX A  
Review of Literature

---

## Review

The Review of Literature is intended to supplement the Introductory presentation of research relevant to the present study. The purpose of the review will be to expand and clarify important issues and methodological implications for research concerning perspective and relational judgments in young children.

Piaget's (1928) initial investigations of the child's ability to understand such relational concepts as left and right was based on a series of six tests (six, multipart questions). The questions (See Figure 7, p. 84) were designed to tap the child's ability to pass through three successive stages of relational thought. The results, which are revealed in Table 6, p. 85, were based on the following criteria: i) all parts of a question had to be answered successfully before a test was considered passed; ii) a test was considered successfully passed when at least 75% of the SS in that age group answered it correctly.

By seven years of age (See Table 6, p. 85), the child could attribute left and right as positions occupied by objects (subject-referent) i.e., the S had knowledge that two objects could occupy two positions - the penny to the left and the pencil to the right. The majority of eight year olds could identify these relations for a model facing the S and for objects held by that model, thereby successfully transposing left and right to the S's mirror image. The last two questions (See Questions 5 and 6, Figure 7, p. 84) required that the S not only distinguish

Piaget's Tests for Left and Right\*

---

- Question 1: Show me your right hand. Your left. Show me your right leg. Now your left.
- Question 2: Show me my right hand. Now my left. Show me my right leg, now my left.  
(During these questions, the E must sit opposite the child.)
- Question 3: (A coin is placed on the table to the left of a pencil in relation to the child.)  
Is the pencil to the right or to the left? And the penny?
- Question 4: (The child is opposite the E who has a coin in his right hand and a bracelet on his left arm.)  
You see this penny. Have I got it in my right hand or my left? And the bracelet?
- Question 5: (The child is opposite three objects in a row: a pencil to the left, a key in the middle, and a coin to the right.)  
Is the pencil to the left or to the right of the key? And of the penny? Is the Key to the left or to the right of the penny? And of the pencil? Is the penny to the left or the right of the pencil? And of the key? (Six answers in all)
- Question 6: (The same questions as before with three objects in a row opposite the child, a key to the left, a piece of paper in the middle and a pencil to the right. But the objects are only shown for half a minute and are then covered over with a copy book. The answers are recorded. The child is told: Now listen, I am going to show you 3 things only for a tiny moment. You must look very carefully and then afterwards tell me by heart how the things are arranged)  
The E repeats the six questions for Question 5 substituting new items.

Figure 7. \*Jean Piaget. Judgment and Reasoning in the Child. pp. 98-99.

TABLE 6

The Age of onset for Successful Left-Right Test Performance

Age of Onset (years)	Tests Passed
4	0
5	1
6	1
7	1 and 3
8	1, 2, 3 and 4
9	1, 2, 3 and 4
10	1, 2, 3 and 4
11	1, 2, 3, 4, and 5
12	1-6

left and right for a three object array, but entailed the understanding that the key which was in the middle could be both to the right of the pencil and to the left of the coin. Questions 5 and 6 were identical, however, an additional requirement of question 6 was that the S symbolically represent the images, hidden from view, while he answered the questions of relation. It was not until 12, then, that the S was able to perform mental relational operations.

Elkind (1961) replicated the Piaget study utilizing the same methodology and revealed similar results. Testing 5-11 year old children (30 at each age level), Elkind found that results could be viewed as distinguishing three progressive levels of relational thought: a) child is capable of identifying his own left and right (7-8 years); b) child can identify left and right for a model facing him and for objects held by the model (8-10 years); c) child is able to view left and right as pure relations and not as inherent properties of objects, i.e., the child is aware that viewpoints are position-determined and that left and right for people and objects are relations dependent upon the defining criteria (10-12 years).

**Harris (1972<sub>ab</sub>)** argued against the supposed continuity of Piaget's test questions. Although the tests were considered age specific by Piaget, Harris proposed that the questions were in fact not continuous, but were discontinuous, in that they were tapping two qualitatively different thought processes. Harris offered a two-stage model of the logic of relations and considered discrimination of relational concepts as distinct from



relational thought. Although relational concepts by necessity entail successful discrimination, relational questions refer only to more than two items. Consequently, only the last two tests of Piaget's original study (Questions 5 and 6) would be considered as relational in this context. Discrimination refers only to the direction involved (topological, in Piaget and Inhelder, 1950).

Since Harris' method deleted the mirroring factor (by having the model sit beside the child rather than facing him) his argument may be justified, but, only in relation to his own modification. Transposing concepts of left and right does necessitate an understanding that the concepts are relative to the position of the model with respect to the child's own viewpoint. Harris' suggestion that factors other than egocentrism may account for the relational difficulties is ambiguous, since such discrepancies of viewpoint were eliminated from his study.

Harris (1972 a) also found, in his analysis of front-back placement, that "when the self-referent condition (E told S to place the test object in front of, beside or behind, himself) followed the object-referent condition (E told S to place one member of the test object pair in front of, beside, or behind, the object), the child was more likely to treat himself as another object in relation to the object which he was asked to place, rather than to treat himself as a user of the object" (p. 269; brackets my own).

Other methodological considerations relevant to the study of relational thought have been suggested by Wapner and Cirrilo (1968). Although Wapner and Cirrilo suggested that pretraining as to the

demands of the task may more adequately tap the capacity to coordinate perspectives, they warned against the possibility that repeated demonstrations, before testing, may result in pseudo-transposition (e.g., the subject may follow the rule of doing the opposite of the model).

Since the understanding of left and right implies that the S can relate an object to his own viewpoint and that he must be consciously aware of his own viewpoint (Piaget and Inhelder, 1956), a further implication is that the S must be aware of position-determined viewpoints or perspectives. The analysis of spatial perspective by Piaget and Inhelder (1956) required that Ss (n = 100, 4-11 years) view a scale model of three mountains from various perspectives other than their own. Piaget and Inhelder (1956) found that when Ss were asked to select photographs that depicted the view that the doll would see from where the doll was standing (different from the position the S occupied and consequently a different perspective) age-dependent results emerged. Children in Stage 11 (4-7 years) revealed an inability to distinguish between different viewpoints. Although children in the earlier years of this stage (Substage 11<sub>A</sub>) all chose pictures depicting their own point of view, older Ss (Substage 11<sub>B</sub>, 6 years) revealed some attempts at discrimination, selecting a number of different pictures for the same position of the doll. The authors felt that this behaviour was typical of childish egocentrism, since the young child was unable to decentre his thoughts regarding the viewpoint of an observer. The older Ss (Substage 11<sub>B</sub>) revealed indications of the emerging trans-

ition to socialized thought (7-8 years). 7

In their discussion of the emergence of spatial perspective and the waning of egocentrism, Shantz and Watson (1971) revealed that if the preschool child (3½-6½ years) was allowed to physically move around a model landscape, the prediction of object locations was significantly better than if he simply watched a doll move to various positions. Hence, results were not age-dependent. Shantz and Watson (1971) concluded that between 3½ and 6½ years, it appeared that the majority of children had a well-established ability to predict the location of objects when they themselves had moved prior to the questioning. Also Shantz and Watson revealed that the frequency of error was largely dependent on two categories of response: i) the S chose the perspective that he saw; ii) the S chose the "impossible perspective" i.e., the perspective that differed most from his own. Such findings seem to re-iterate the transitional stage implied by Piaget and Inhelder (1956) for Substage 11B Ss. Shantz and Watson (1971) speculated that in addition to the viewpoint of the other embedded in the object array and the representation of movement as crucial factors in the prolonging of spatial egocentrism that "other abilities, perhaps other spatial concepts, [were] necessary for the waning of egocentrism" (p. 180).

Flavell's present research on role-taking abilities in young children (Cooper and Flavell, in press; Flavell, 1966; Flavell, 1971; Flavell et. al., 1968) reveals interesting implications for research concerning relational concepts. Role-taking ability, "the ability to take into account the perspectives of others"

(Cooper and Flavell, in press) is an integral element in Flavell's delineation of a relatively new area of developmental psychology-social cognition. Social cognition refers to the development of inferences about others. Examples in the area include the child's perception of his social environment (e.g., moral judgment) as well as, adult 'person perception' (e.g., observations or inferences about intentions, attitudes, emotions, etc.) of a psychological nature and interpersonal relationships (e.g., love, power, etc.) (Flavell, 1971). Social interaction is the principal factor i.e., role-taking, liberating the child from his egocentric illusions, forcing the child to re-examine his own perceptions and concepts in the light of other viewpoints, and in so doing, gradually rids himself of cognitive egocentrism (Flavell, 1963).

Flavell (1971) and Shantz and Watson (1971) provide similar systematic analyses of percept attribution (Flavell) and spatial perspective (Shantz and Watson). The four levels of percept attribution and four stages of spatial perspective attainment suggest a hierarchical progression of ability. Flavell's (1971) four levels of inference may be outlined as follows:

Level 0, the knowledge of X's physical presence, i.e., S knows that perspective exists such that the same objects look different from different positions; Level 1, S is aware that Q sees an object Y, i.e., the attribution of perspective to another person; Level 2, S is able to distinguish an S-Q difference embedded in an S-Q similarity, i.e., S is aware that he and an observer can view the same object differently (from

different perspectives) and Level 3, S has an ability to reproduce a spatial arrangement of three objects from the perspective of another person, from various positions.

Although the import of relational thought has been speculated, little research has been conducted (with the exception of the above mentioned studies) to empirically determine the extent of relational thought that can be acquired through training procedures for the very young, or how training in such relational thought would aid in the child's ability to perform other tasks (e.g., the ability to conceive the perspective of another person) that require the child to decentre his thoughts.

Concerning the acquisition of such relational concepts, it has been determined, however that: i) relativity of left and right pertaining to actual objects emerges far more slowly than other person (Piaget, 1928); ii) perspective for successive positions of a single object, whether seen by the child or other observer, will precede perspective of a group of objects as perceived by the observer from different positions or alternately by a number of observers (Piaget and Inhelder, 1956).

Numerous research has been oriented towards studies of conservation ability (for review, see Sigel and Hooper, 1968) and to a lesser extent of moral judgment (Turiel, 1966) and of class inclusion (Kuhn, 1972). Therefore, in considering a training study in a relatively uncharted area, methodological considerations can be derived from the training studies performed in the more researched areas.

Conservation studies require the young child to recognize

that "certain properties (quantity, number, length, etc.) remain invariant (are conserved) in the face of certain transformations (displacing objects or object parts in space, sectioning an object into pieces, changing its shape, etc.) (Flavell, 1963, p. 245). The child's inability to conserve is in part attributed to his perceptual dominance (egocentric thought centred on one predominant dimension) or the inability to apply 'concepts of relationship' that are dependent upon the defining attributes (or cues) available to the child (Bruner, 1964). The fact that the child must determine if row A has more or less chips than row B, assumes the child's ability to: i) discriminate between the concepts of more and less; ii) distinguish that these terms are relative to the defining situation. Therefore, one could suggest initial training in relativity as a precursor to studies of conservation. Gruen's (1965) success with verbal pretraining (the discrimination of "number of objects" and "length of array") when used in conjunction with a conflict producing procedure, in the acceleration of conservation of number, and the inclusion of multiplicative relations as a prerequisite and necessary condition (Sigel, Koeper and Hooper, 1966) in a training programme to induce conservation, are examples of such initial discrimination training.

Although the training study conducted by Sigel, Koeper and Hooper (1966) considered multiple relationality as a prerequisite operation to performing conservation tasks, the study also assumed classification skills to precede relational judgments. However, Piaget (1928, 133) believed that it is the in-

ability to understand a relation and underlying reciprocity which stands in the way of the generalization necessary for the formation of classes. It is the juxtaposition of thought rather than relation which lacks the necessity and reciprocity which constitute an essential character of logical thought -- its reversibility.

A recent pilot investigation of training techniques for the acquisition of conservation provides important methodological considerations for any training study. The improvement of the control group in tests of conservation (Feigenbaum, 1971), as well as, role-taking tasks, could only be hypothesized due to the methodology of the training study. Since the author could not determine the extent to which the control group improvement was a result of the natural progress of the subjects during the training study or carry-over effects of the pretest, the suggestion of a pretest - test - training - post-test design was postulated. Also multiple-condition training effects were difficult to ascertain as compared with its single-condition presentation. Therefore, a further suggestion that multiple-training groups be equated with their single-condition counterpart for equal exposure was made.

The importance of Logico-mathematical (LM) thought (learning about the properties and relations which belong not to things, but to our action upon things. concepts such as 'right' and 'left'; Elkind, 1970, 87) has been emphasized in cognitive development (Elkind, 1970; Flavell, 1963; Piaget, 1928, 1952; Piaget and Inhelder, 1956). However, as Elkind (1970, 92) has pointed out:

"The teacher assumes that the child knows such categories as 'same' and 'different' and such spatial relations as 'right' and 'left' and 'top' and 'bottom'. She uses words like 'more' and 'less' as well as, 'because' without thinking to explain them. These LM contents, however, are not innate and must themselves be learned." Piaget (1964) also refers to this assimilation at nothing other than a verbal level and similar expressions are found in Maier's (1969, 127) discussion of relational concepts when he states that the child at the intuitive level of thought increasingly employs appropriate language (words such as left and right) without fully comprehending its meaning.

Karplus (1963) has incorporated the concepts of relativity and motion in a programme designed as a science curriculum improvement study for elementary school children. Karplus (1963 a) utilized a technique incorporating a stick figure, Mr. O, or several Mr. O's. Mr. O viewed all relations (top-bottom, left-right) from one egocentric perspective, regardless of spatial orientation or organization of materials. Therefore, through cognitive conflict, being faced with the contradiction between the different Mr. O's and between Mr. O and himself, the child is assumed to become aware of the relativity of positions and movements, i.e., to become gradually decentered in his dealings with physical systems (Palmer, 1968).

Karplus (1964), in evaluating Mr. O, the concept of relativity, states: "Teaching relativity in the elementary school, therefore does not imply an acceleration of learning that is accomplished more slowly now; it implies a qualitative change."



- Concepts of relativity, such as the relations of objects to one another are among the first concepts introduced at the primary, kindergarten level, in order to orient the young child to think in scientific and relational terms.

APPENDIX B  
FIGURES

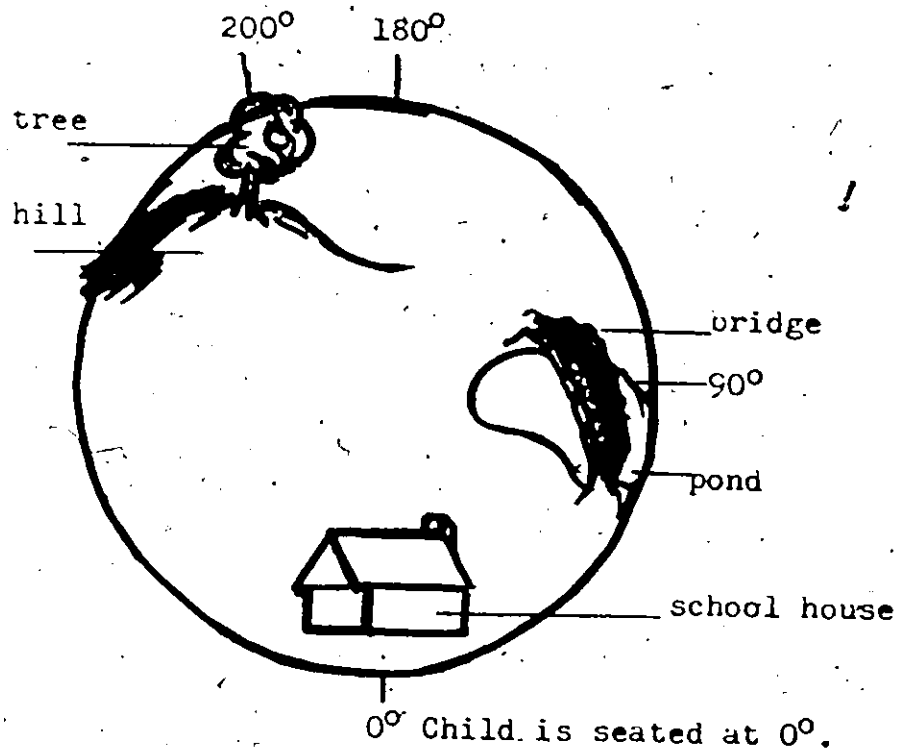


Figure 1. Landscape and items positioned at  $0^\circ$ ,  $90^\circ$  and  $200^\circ$ .

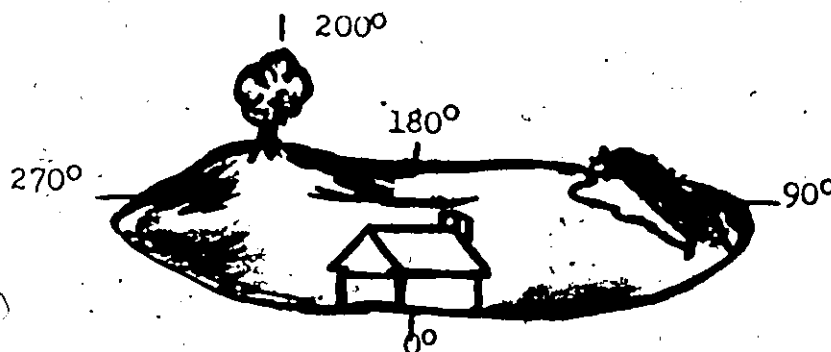


Figure 1b. Landscape as it is viewed from the child's position at  $0^\circ$ . The doll takes positions at  $90^\circ$ ,  $180^\circ$  and  $270^\circ$ .

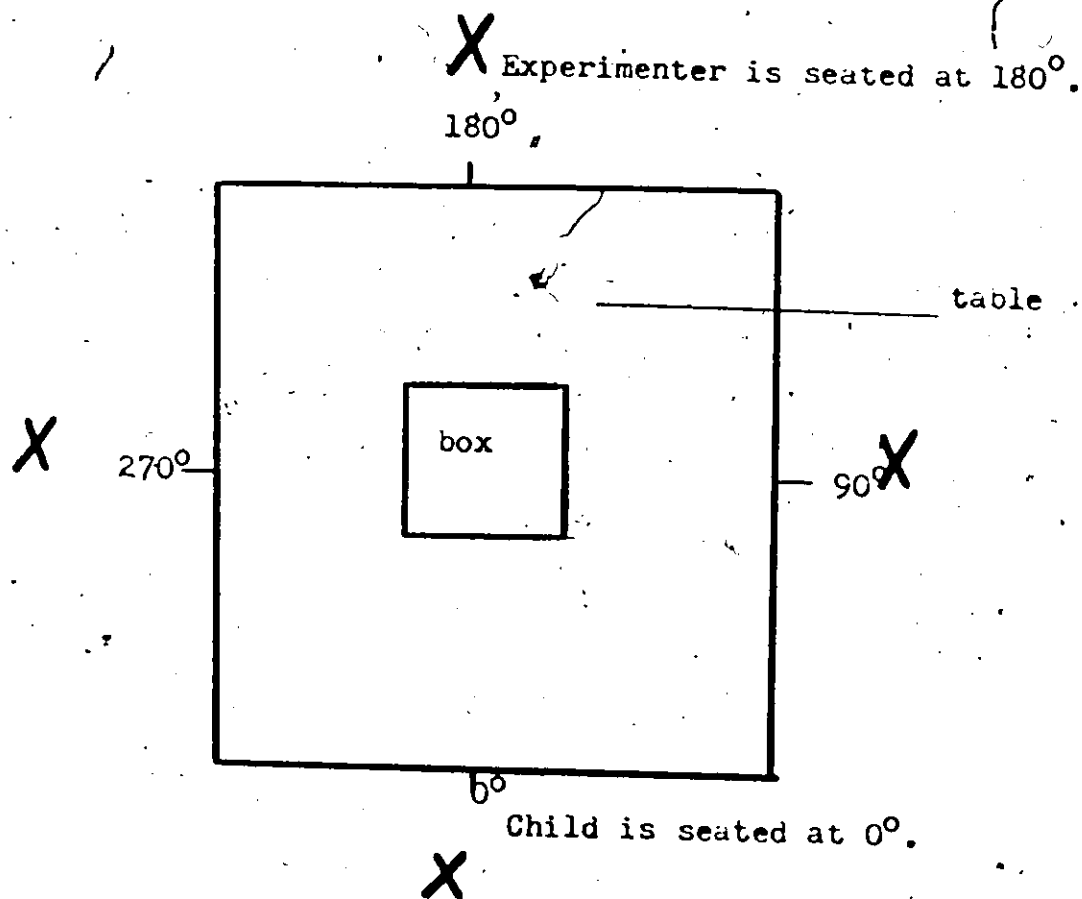


Figure 2. Child is seated at  $0^{\circ}$ . The box has four pictures which face the chairs (X) at  $0^{\circ}$ ,  $90^{\circ}$ ,  $180^{\circ}$  and  $270^{\circ}$ .

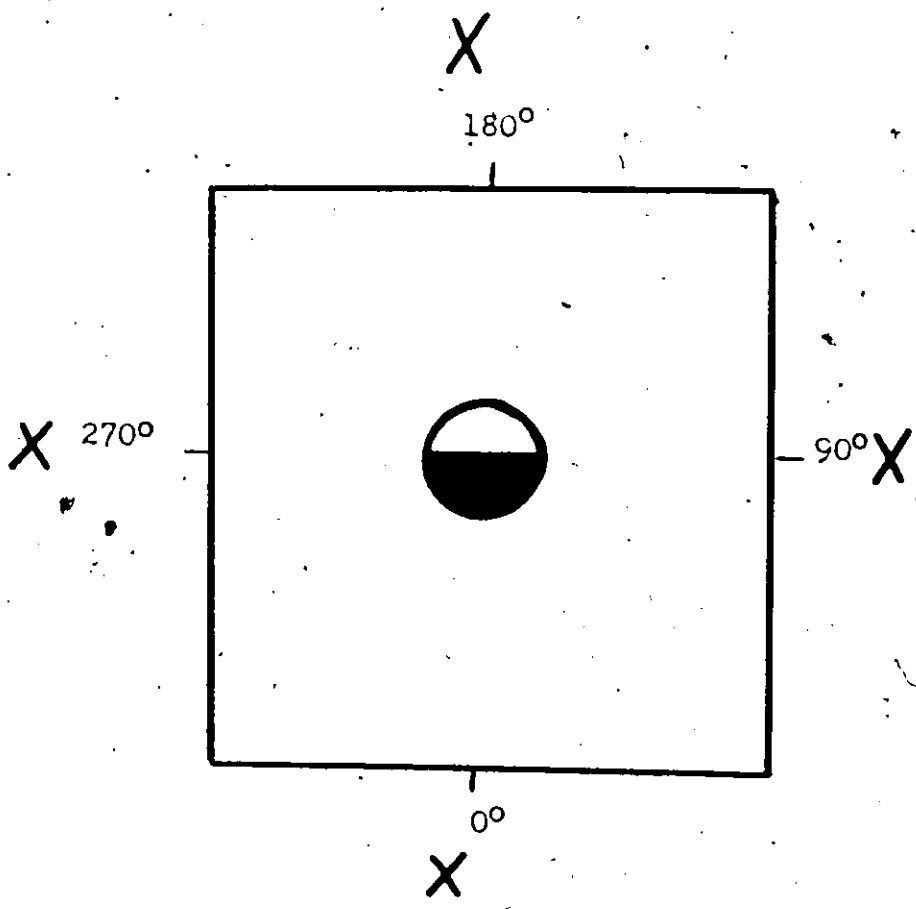


Figure 3. Child is seated at 0°. The ball is rotated for 90°, 180° and 270°.

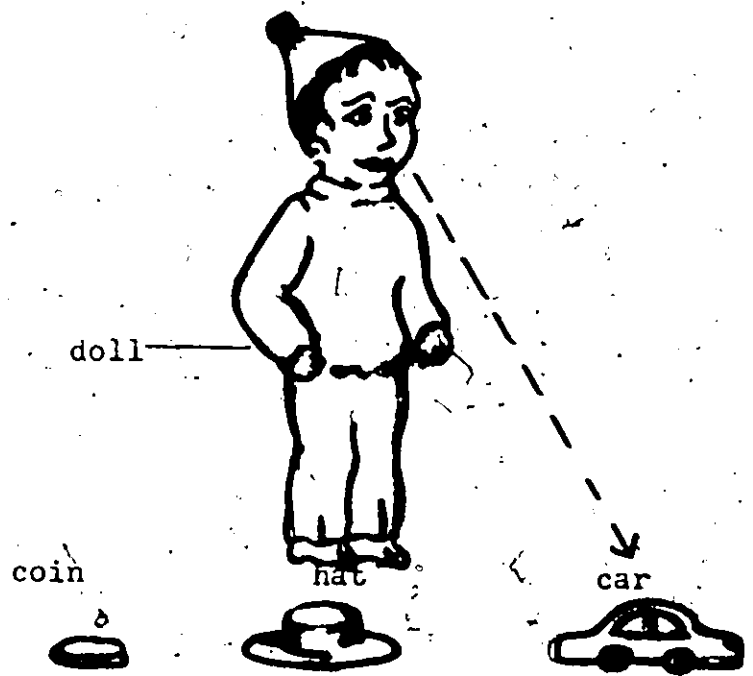


Figure 4. Doll is oriented to the S's right. The doll is looking at the car.

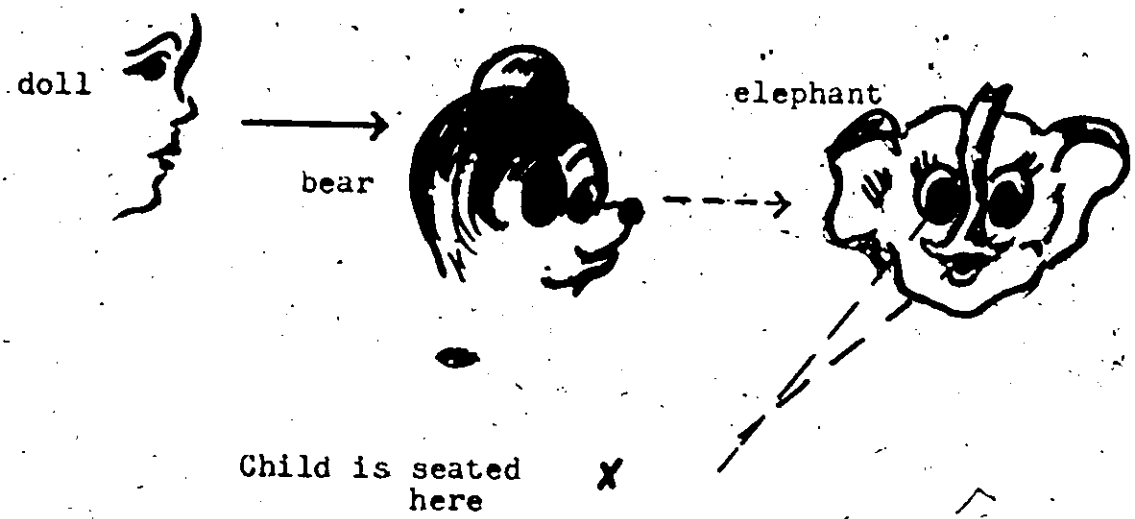


Figure 4b. The doll is looking at the bear. The bear is looking at the elephant. The elephant is looking at the child.

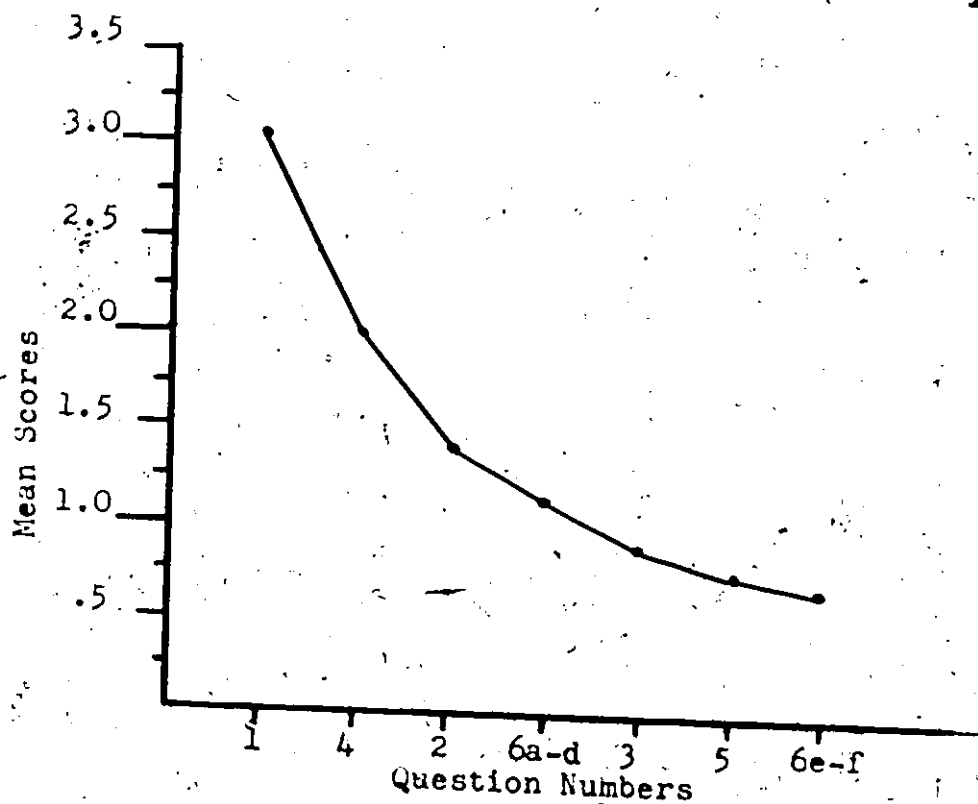


Figure 5a. Difficulty scale for questions on Left-Right Pretest, Combined data.

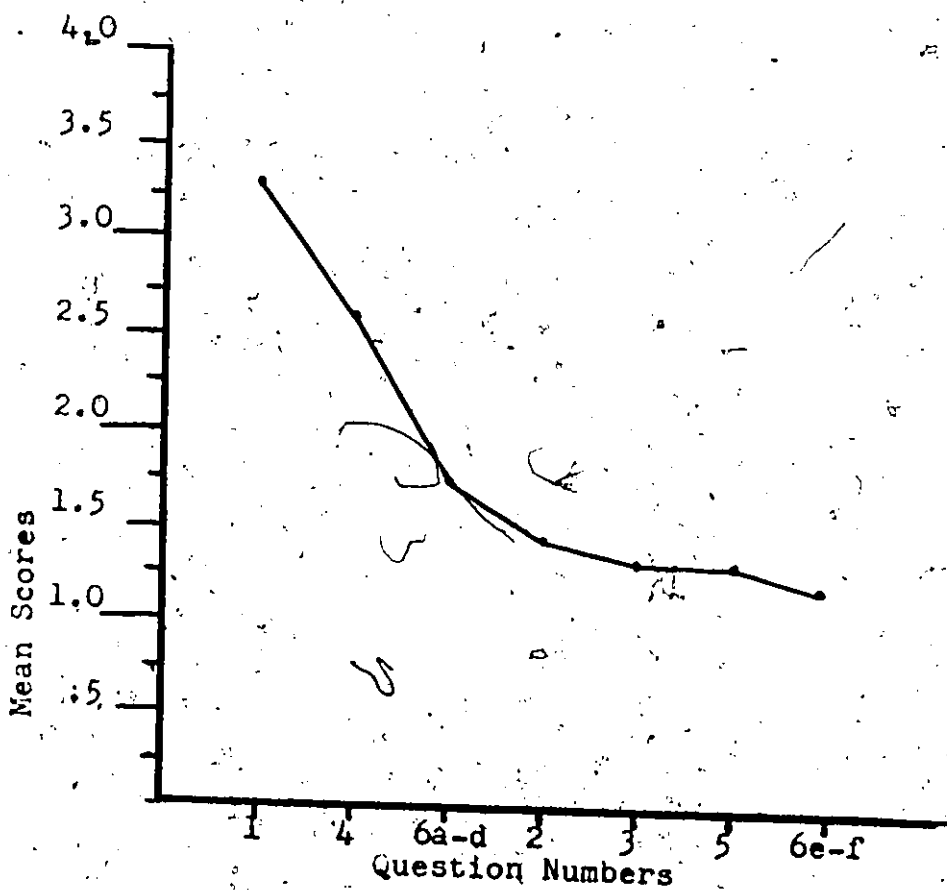


Figure 5b. Difficulty scale for questions on the Left-Right Post-test, Combined data.

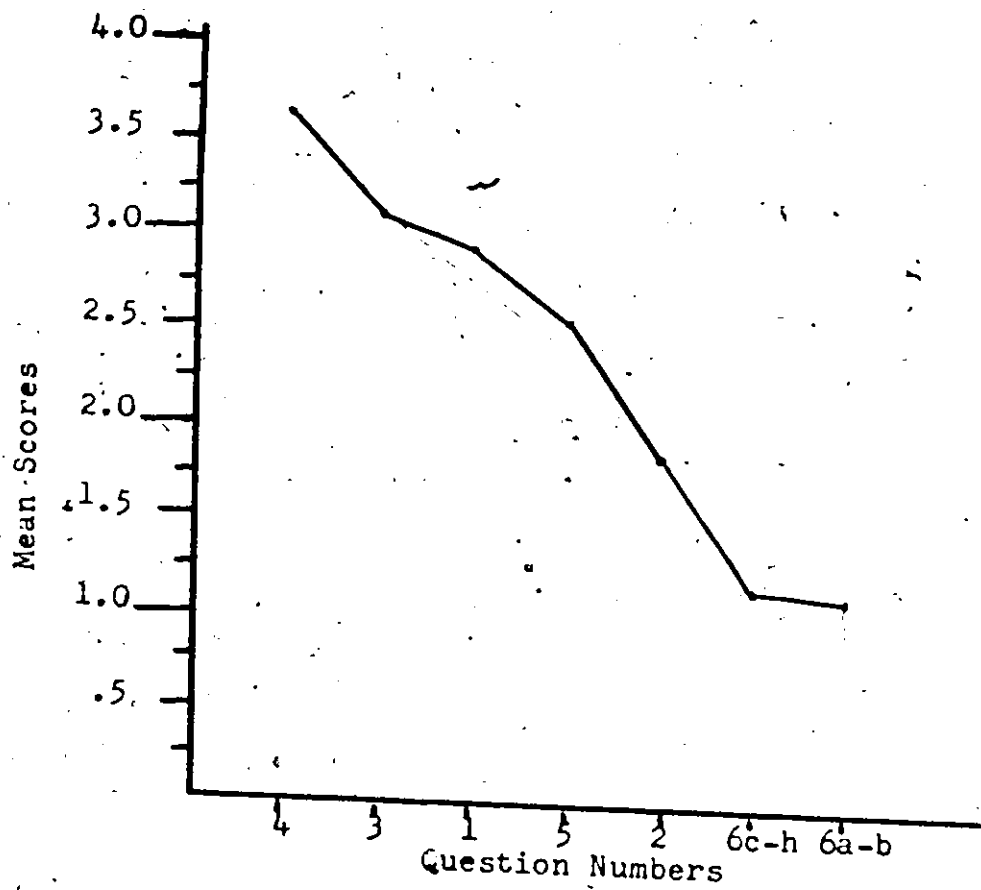


Figure 6a. Difficulty scale for questions on the Perspective Pretest, Combined data.

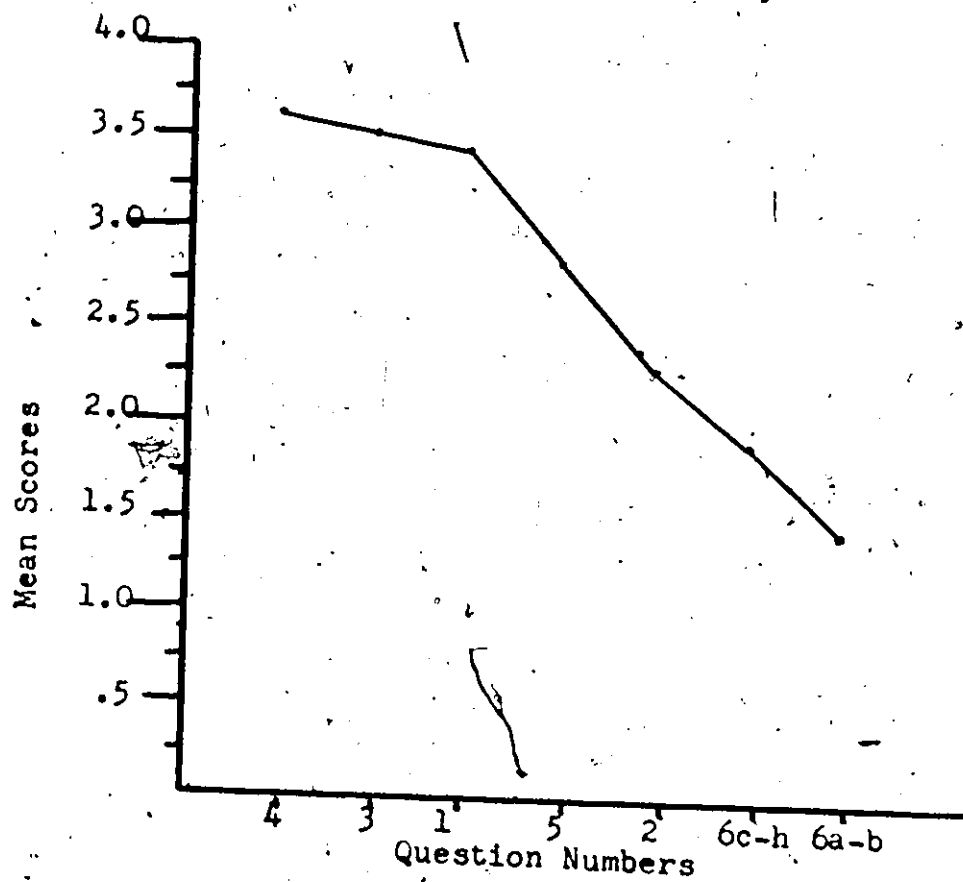


Figure 6b. Difficulty scale for questions on the Perspective Post-test, Combined data.



APPENDIX C

Raw Data

RAW DATA 1

Pretest for Perspective

Experimental Group

Subject Number	Question Numbers					6a-b	6c-h	Total Correct
	1	2	3	4	5			
1	2	2	3	4	4	2	2	18
2	4	4	4	4	2	1	1	20
3	4	2	3	4	4	1	1	19
4	3	2	4	4	2	1	1	17
5	2	2	4	2	1	2	3	16
6	4	2	3	4	3	2	1	19
7	3	4	4	4	4	1	1	21
8	4	1	4	4	3	1	1	18

RAW DATA 2

Pretest for Perspective

Control Group

Subject Number	Question Numbers					6a-b	6c-h	Total Correct
	1	2	3	4	5			
1	2	2	4	4	4	2	3	21
2	3	2	3	4	4	0	0	17
3	4	1	3	2	1	2	0	13
4	3	3	3	4	4	0	0	17
5	2	1	4	1	0	1	0	9
6	4	2	4	4	3	2	1	20
7	2	0	2	4	3	0	3	13
8	4	0	4	4	4	2	2	20
9	1	2	4	4	2	2	2	17
10	2	2	3	4	2	0	1	15
11	3	0	3	4	2	0	0	12
12	2	2	1	4	2	0	0	11

RAW DATA 3

Post-test for Perspective

Experimental Group

Subject Number	Question Numbers					Total Correct
	1	2	3	4	5	
1	4	2	4	4	2	24
2	4	4	4	2	2	19
3	4	4	4	4	2	24
4	4	3	4	2	0	18
5	4	2	4	3	1	20
6	4	2	4	4	2	23
7	4	4	4	4	2	23
8	4	3	4	4	2	23

Post-test for Perspective

Control Group

Subject Number	Question Numbers						Total Correct
	1	2	3	4	5	6a-b 6c-h	
1	3	4	4	4	4	4	25
2	3	2	3	4	3	1	16
3	4	1	3	2	2	0	13
4	3	4	3	4	4	0	18
5	2	1	3	1	0	0	8
6	4	1	4	4	3	2	18
7	1	0	3	4	4	0	15
8	4	0	3	4	3	2	18
9	1	2	4	3	2	1	15
10	3	2	3	3	2	1	16
11	3	0	3	4	2	0	12
12	3	2	1	4	2	2	15

RAW DATA 5

Pretest for Left-Right Relations

Experimental Group

Subject Number	Question Numbers						Total Correct	
	1	2	3	4	5	6a-d 6e-f		
1	4	0	4	4	2	2	4	20
2	4	0	0	4	0	1	0	9
3	4	4	0	3	0	1	0	12
4	2	0	0	0	0	0	0	2
5	4	0	0	1	1	0	0	6
6	4	0	0	3	2	3	0	12
7	4	0	0	0	0	2	0	6
8	4	4	0	3	0	1	1	13

RAW DATA 6

Pretest for Left-Right Relations

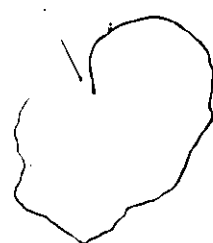
Control Group

Subject Number	Question Numbers						Total Correct
	1	2	3	4	5	6a-d 6e-f	
1	4	4	0	4	2	2	18
2	4	4	4	4	1	4	24
3	0	0	0	0	0	0	0
4	4	0	0	4	0	2	10
5	2	2	0	3	0	1	8
6	4	0	4	3	2	2	18
7	1	4	4	2	2	1	14
8	0	4	4	2	2	0	13
9	4	4	1	0	2	1	12
10	2	0	0	0	0	0	2
11	0	0	0	0	0	0	0
12	4	0	4	0	0	0	8

Post-test for Left-Right Relations

Experimental Group

Subject Number	Question Numbers						Total Correct	
	1	2	3	4	5	6a-d 6e-f		
1	4	0	0	4	2	3	4	18
2	4	0	2	4	2	2	1	15
3	4	0	0	4	2	4	2	16
4	4	0	0	0	0	0	0	4
5	4	0	0	4	0	2	0	10
6	4	0	0	4	4	3	3	18
7	4	4	4	4	3	3	2	24
8	4	4	2	4	3	1	2	20





RAW DATA 8

Post-test for Left-Right Relations

Control, Group

Subject Number	Question Numbers						Total Correct
	1	2	3	4	5	6a-d 6e-f	
1	4	4	0	4	2	2	18
2	4	4	4	4	0	3	23
3	0	0	0	0	0	0	0
4	4	0	0	4	0	0	10
5	2	2	0	3	0	1	8
6	4	1	4	3	2	1	18
7	1	4	4	2	0	0	14
8	1	4	4	1	1	1	12
9	4	4	0	0	2	0	11
10	3	0	0	1	1	0	5
11	0	0	0	0	0	0	0
12	4	0	4	1	0	0	9

## VITA AUCTORIS

- 1948 Born in Sault Ste. Marie, Ontario to Jean and Wes Werbowy.
- 1962-67 Attended Sir James Dunn C & V S in Sault Ste. Marie.
- 1970 Graduated with a four year degree in English from the University of Windsor, Windsor, Ontario.
- 1971 Was married to Peter M. Wilmshurst.
- 1972 Graduated with an Honours B.A. in Psychology from the University of Windsor.
- 1972 Luke was born and I enrolled in graduate school.