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THE EFFECTS OF MODELING, INSTRUCTIONAL PROMPTS, AND SENSORY
MODALITY ON YOUNG CHILDREN'S ELABORATION

City University of New York

Ph.D. 1986

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THE EFFECTS OF MODELING, INSTRUCTIONAL PROMPTS, AND
SENSORY MODALITY ON YOUNG CHILDREN'S ELABORATION

by

Jeannine Rocha

A dissertation submitted to the Graduate Faculty in
Educational Psychology in partial fulfillment of the
requirements for the degree of Doctor of Philosophy,
The City University of New York.

1986

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This manuscript has been read and accepted for the Graduate Faculty in Educational Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

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Abstract

THE EFFECTS OF MODELING, INSTRUCTIONAL PROMPTS, AND SENSORY
MODALITY ON YOUNG CHILDREN'S ELABORATION

by

Jeannine Rocha

Advisor: Professor Barry Zimmerman

An experiment was conducted on three aspects (type, form, and developmental trends) of young children's use of elaboration strategies on paired-associate tasks and to explore the efficacy of modeling in presenting these strategies to preschool children and in training them to use these strategies more effectively. During all three phases of the study, children's toys were used as paired-associate stimuli and a recognition assessment procedure was employed. Children at two age levels, 4-year-olds and 8-year-olds, served as subjects.

In Phase 1, 112 4-year-old children were assigned to one of 4 treatment groups: a model's visually-presented elaborations, a model's verbally-presented elaborations, a model's combined visually- and verbally-presented elaborations, and a control group. Forty 8-year-old children were assigned to a control group. The data from this phase indicated that modeling was effective in presenting elaboration strategies to the preschool children. Further, all forms of these modeled elaborations were successful.

Phases 2 and 3 examined the effectiveness of Phase 1 training via

modeling in enhancing 4-year-old children's use of elaboration strategies on subsequent learning tasks within a typological framework. At the imposed level, children were instructed to manipulate toys (motoric-productions). At the prompted induced level, children were instructed to use imaginal, verbal, or both imaginal and verbal forms of elaboration strategies. At the unprompted induced level, children received control instructions. The procedures employed during Phases 2 and 3 were identical. Phase 2 was administered immediately after Phase 1 training and Phase 3 was administered after a one-week delayed-time interval.

Results from these phases found that the same overall pattern of children's performances obtained during Phase 2 was also obtained during Phase 3. Additionally, modeling was found to be effective in enhancing the performance of the trained children relative to that of the untrained 4- and 8-year-old children at the prompted induced level during Phases 2 and 3 and at the unprompted induced level during Phase 3.

The results from the experiment indicate that preschool children can use elaboration strategies to enhance their paired-associate learning efficiency. However, it is important to both train and to prompt them to use elaborations. Further, modeling is an effective and durable training strategy.

Acknowledgements

I would like to express my gratitude to my mentor, Barry Zimmerman, for his painstaking dedication of both his time and assistance in the development and completion of this project. He has greatly helped me to develop research skills during my graduate training. Appreciation is extended to Shirley Feldman and David Rindskopff who served as members of my dissertation committee for their cooperation and support over the long time period necessitated by such an undertaking. Especially valued were the conceptual clarifications that they offered. I would like to thank Alan Gross and Harold Ladas for their participation as outside readers. Alan was able very early in my graduate studies to reawaken in me an interest in statistics for which I shall always be indebted. Deep appreciation is felt for the members of my committee who also served as my primary teachers for all they have done to further my educational development.

A special thanks is extended to Sister Ann Ganley, Director of Curriculum and Testing of the Archdiocese of New York, Mary Anne Sullivan, Director of the William Woodward, Jr. Nursery School, Mitten Wainwright, Director of the Park Avenue Christian Day School, Judith Keisman, Director of the Park Avenue Methodist Nursery School, James Hayes, Principal of The Epiphany School, Ellen Goldsmith, Director of the International Preschool at 86th Street, Valerie Kennedy, Director of the International Preschool at 74th Street, Sister Noreen Nolan, Principal of Our Lady of Good Counsel, Alane

McCahey, Assistant Director of Youth and Family Services of the YMCA, Sister Mary DeSales, Principal of St. Gregory the Great, and William Hanousek, Pastor, and Sandy Mast, Director of the Bethany Memorial Reformed Church Afterschool Program for allowing me to come into their schools and to work with the children who participated in this study. I also would like to thank all of the teachers and staff of these schools who helped to make this research both easier to carry out and a pleasant experience for me.

Finally, I would like to acknowledge the love and support of my husband, Rene, and my son, Rene.

DEDICATION

To the memory of my brother, Joe

For all that he took ... and ... For all that he gave.

He lived not for naught for at least one life he touched.

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Chapter 1

Statement of the Problem

Children's generation and use of mediational strategies (see Appendix A for a glossary of technical terms) to acquire knowledge of the world is of importance to educational psychologists. Mediational strategies may be conceptualized as planned cognitive activities that learners use to solve complex or abstract learning tasks (Flavell, 1970). The goal of such processes is to transform the complex or abstract information into forms that make the information more comprehensible or easier to learn (Davidson & Klich, 1984).

Elaboration is the most frequently studied form of mediational strategy in paired-associate memory tasks (Pressley, Heisel, McCormick, & Nakamura, 1982). Elaboration consists of generating an event that can serve as a common referent for the members of an association (Rohwer, 1973). An event contains the objects to be associated and some relation that integrally involves these objects.

Research that has typically investigated the effects of elaboration strategies on young children's learning has generally focused on the use of visual-imaginal, verbal, or combined visual-imaginal and verbal elaborations (Pressley, 1977). Elaboration strategies may be either directly incorporated into learning materials such as experimentally-provided pictures, sentences, and demonstrations, or they may be generated by the learner in forms such as images or phrases and sentences (Levin,

(1976). Visual-imaginal elaboration provides a visual context for the items to be associated such as a model's presentations of meaningful manipulations between the items. Verbal elaboration embeds items in a meaningful phrase or sentence. Combined visual-imaginal and verbal elaboration does both. Elaboration strategies that are externally provided to the learner in the form of learning materials are called imposed elaboration strategies (Levin, 1976). Imposed strategies may also occur when a learner directly motorically manipulates the learning materials (Levin, 1976), or when he or she is exposed to the strategies via modeling procedures (Zimmerman & Rocha, 1984, 1986). Elaboration strategies that are generated by the learner to meet task demands or by experimental instructions are termed induced elaboration strategies (Levin, 1976).

A number of controversies have arisen in the research literature concerning the effectiveness of various forms of elaborations at different age levels (Dilley and Paivio, 1968; Jones, 1973; Kemler & Juszyk, 1975; Levin, 1976; Levin, Davidson, Wolff & Citron, 1973; Montague, 1970; Pressley, 1977; Reese, 1970a; and Rohwer, 1970). Several researchers claim that verbal elaborations are more effective at an earlier age than visual-imaginal elaborations (Reese, 1970a; Rohwer, 1970; and Milgram, 1967). Other researchers (Dilley and Paivio, 1968; Jones, 1973; and Montague, 1970) claimed opposite effects or no differences between the effectiveness of visual-imaginal and verbal elaborations. A further problem concerns the relative effectiveness of combined visual-imaginal and verbal elaborations in comparison to either type alone. Several researchers

(Holyoak, Hogeterp, & Yuille, 1972; Jones, 1973; Perlmutter & Myers, 1975; and Rohwer, Kee, & Guy, 1975) have found that combined elaborations were more effective than either visual-imaginal or verbal elaborations alone. However, Levin, Davidson, Wolff, & Citron (1973) found that instructions to generate either type of elaboration alone was as effective as instructions to generate both. Zimmerman and Rocha (1986) reported a similar finding in a study examining the effectiveness of modeling procedures in enhancing young children's paired-associate performance. They found that the addition of a verbal elaboration strategy to a visual- imaginal strategy improved the children's performance no more than the visual-imaginal elaboration strategy alone. However, these authors suspected a ceiling effect in their study. Children receiving the visual-imaginal elaborations and those receiving the combined visual-imaginal and verbal elaborations correctly matched almost all of the toy pairs on the assessment test. They conducted a second experiment (Zimmerman & Rocha, 1984) in which the number of toy pairs were greatly increased. They found that both modeling visual-imaginal elaborations and modeling verbal elaborations increased the children's paired-associate performance. However, they did not compare modeled combined visual-imaginal and verbal elaborations to either visual-imaginal or verbal elaborations alone. Clearly, more work is needed to better understand the role of elaboration strategies in young children's learning.

It appears that many of these reportedly conflicting findings may be resolved by providing a more detailed analysis of the nature of

elaboration strategies used by young children. Differences in the effectiveness of the various sensory modality forms of elaborations (visual-imaginal, verbal, and combined visual-imaginal and verbal) may be due to the level of elaboration analysis (i.e., types of posttraining instructions). The ability to generate and utilize an elaboration strategy spontaneously according to task demands is considered to be a more cognitively stringent task than is the ability to generate and utilize such a strategy upon instruction (Montague, 1970). Furthermore, generating and utilizing an elaboration strategy upon instruction is considered to be more cognitively demanding than using an elaboration strategy that is provided externally (Levin, 1976).

The age of transition in children's ability to use mediational strategies at these levels has been found to vary with several factors. These factors include the particular type of mediator studied as well as the particular task conditions such as the learning stimuli used, the testing procedures employed, and the experimental instructions administered (Flavell, 1970). The development of any mediational strategy typically consists of age-dependent increases in children's ability to use it in appropriate task situations. Young children should, therefore, benefit from imposed elaboration strategies at an earlier age than they should from induced elaboration strategies.

The literature on the development of visual-imaginal elaboration strategies has been based largely on Piaget's cognitive stage theory. He has posited that children in the concrete operational stage of

intellectual development can benefit from instructions to generate such elaborations. However, it has been theorized that children in the preoperational stage of development are unable to benefit from such instructions (Levin, 1976; and Pressley, 1977). As a result of these hypotheses, a number of researchers have compared the performances of five-year-old children (preoperational) with those of 8-year-old children (concrete operational).

The literature on verbal elaboration strategies is largely based on the work of Luria and Vygotsky (McCabe, 1973; McCabe, Levin, & Wolff, 1974; and Montague, 1970). Verbal elaboration research has indicated that children of ages four to five do not benefit generally from instructions to generate verbal elaborations, whereas children seven and older do. However, McCabe (1973) and McCabe, Levin, & Wolff (1974) have reported some success in instructing 4-year-olds to generate verbal elaborations.

This study compares the performances of 4-year-old children and 8-year-old children in their use of elaboration strategies at different levels of analysis. The interrelationships are investigated between the different categories of elaboration strategies (imposed by external presentation, imposed by children's direct motoric manipulation of the learning materials, imposed through modeling procedures, induced through experimental instructions, and induced spontaneously by task demands) in a paired-associate learning task. Comparisons among visual-imaginal, verbal, and combined visual-imaginal and verbal elaboration

strategies will be made at each of these levels of analysis. Such research should clarify issues concerning the types of learning from which young children may be expected to benefit. Also information concerning the relative effectiveness of the different sensory modality types of elaboration strategies should shed more light on the development of such strategies.

Of particular interest in this proposal is the issue of whether young children can be trained precociously via modeling to generate elaboration strategies. This investigation is important because it will help to identify instructional methods that optimize young children's learning and memory. The emphasis of this research is not only on the importance of cognitive processes to learning, but also on techniques that can be used to increase children's achievement. Previously, training studies have been devoted to children's learning of visual-imaginal elaboration strategies. Only one training study has been devoted to verbal elaboration training. Furthermore, no training studies have been found that dealt with combined visual-imaginal and verbal elaboration strategies.

In a review article, Pressley (1977) suggested that although Levin and his associates have delineated some conditions which prompt young children to use visual-imaginal strategies, more research is needed to identify other techniques which do so as well. Modeling techniques based on Bandura's (1977) social learning theory have been found to be particularly effective in enhancing young children's learning (Zimmerman, 1974, 1977; and Zimmerman & Rocha, 1984, 1986). The attractiveness of these procedures lies in their naturalness to

young children. Much everyday learning occurs through these procedures. Additionally, modeling techniques can be used with groups of children without requiring direct physical participation by children.

Basically, Levin and his associates used procedures in which young children were prompted to use visual-imaginal elaborations by manipulating learning materials (toy pairs). Levin (1976) termed this level of elaboration analysis "imposed". He inferred that children on recognition tests of the toy pairs reproduced imaginal elaborations that they had previously experienced visually when they manipulated the toys. In order for the imaginal elaborations to be termed "induced" according to Levin, the children had to generate novel elaborations during subsequent learning. Levin's imposed learning technique involved manipulating toy pairs, and it enhanced paired-associate performance by the children. Levin and his associates derived this method of prompting young children to use visual-imaginal elaborations from the Piagetian rationale that visual imagery emerges from children's overt external actions or outcomes. Therefore, imaginal representations which children cannot produce internally at one stage of cognitive development can be produced through the direct motoric manipulation (Levin, 1976).

A series of training studies were conducted to determine whether concurrent motoric manipulation of toy pairs was a necessary factor for children to use visual-imaginal elaborations on paired-associate tasks (Danner and Taylor, 1973; Varley, Levin, Severson, & Wolff,

1974; and Yuille and Catchpole, 1973, 1974). It was found that various forms of motoric activity (manipulating object pairs, drawing pictures of objects pairs interacting, and etc.) by the children greatly enhanced their performance on the test items. Visual-imaginal elaborations generated by children on the test items can be termed "induced" because the children had not previously witnessed any elaborations between the same object pairs during the test trials. These training studies may be criticized on several points. They typically failed to include delayed posttests or transfer tests to assess the stability and generalizability of the training effects. Additionally, they all tended to confound visual-imaginal elaborations with verbal elaborations during the training procedures. Thus, a clear analysis of the contribution of either type of elaboration alone in training young children to use such strategies is obviated. Further, it appears that different instructional prompts were given to trained and untrained children on the learning tasks following training in all of these studies. Also, these training studies confounded child-produced elaborations with adult-produced elaborations during the training. Therefore, questions concerning the necessity for direct participation by children during training cannot be answered. The present research is designed to provide information concerning these issues.

The importance of direct motoric manipulation of object pairs in prompting children to use visual-imaginal elaborations was addressed by another series of studies. Research by Wolff, Levin, & Longobardi

(1972) had indicated that five-year-old children who watched an adult experimenter manipulate toy pairs performed as well on an immediate assessment test as those who manipulated the toys themselves. Additionally, a study by Brody, Mattson, & Zuckerwise (1978) found that five-year-old children who watched an adult manipulate toy pairs performed better than a group of five-year-old children who manipulated the toy pairs themselves. Further, findings from a study by Bender & Levin (1976) indicated that kindergarten children performed equally well whether they actually manipulated toy pairs or whether they merely planned ways in which they could manipulate toy pairs.

Other research by Wolff, Levin, & Longobardi (1974) and Borkowski, Levers, & Gruenenfelder (1976) indicated that direct manipulation on the part of the child may be necessary for any long term learning effects, however, in the study by Borkowski, et. al., (1976), child participation and adult participation in the active learning condition were confounded. The conclusions that direct manipulation on the part of the child was necessary for long term learning were challenged by Zimmerman & Rocha (1986). These researchers found that five-year-old children who watched other children of the same age manipulate toy pairs performed as well as the child manipulators both on an immediate assessment test and on a 24 hour delayed test. Clearly, further research is needed to determine more precisely the conditions under which five-year-old children can be prompted to generate induced visual-imaginal elaboration strategies. Only one study, the Borkowski, et. al.

(1976) study previously cited, was found in the literature which attempted to train young children to use verbal elaborations. This study can be criticized on the same grounds as other training studies attempting to prompt young children to use visual-imaginal elaborations. Both visual-imaginal elaborations and verbal elaborations were used during the training. No studies have been reported that have attempted to train young children to use both combined visual-imaginal and verbal elaborations. It is of interest to determine the effectiveness of a training procedure in prompting young children to generate both verbal elaborations and combined visual-imaginal and verbal elaborations on a paired-associate task. The effectiveness of such training should be compared to the effectiveness of similar training in prompting young children to generate induced visual-imaginal elaborations on the same task.

The role of instructional prompts to use elaboration strategies on a paired-associate task was also addressed in the present study. Interpretational difficulties frequently occur in training studies (Pressley, Heisel, McCormick, & Nakamura, 1982) when children fail to use a strategy to which they have been exposed. It is often unclear whether they cannot execute the strategy at all or whether they may be able to generate the strategy under another set of instructions.

There is research that indicates children as young as four can be successfully instructed to generate verbal elaborations on a paired-associate task (Levin, McCabe, and Bender, 1975; McCabe, 1973; and McCabe, Levin, & Wolff, 1974). However, the same age children have been found unable to benefit from instructions to generate

induced visual-imaginal elaborations on similar tasks (Levin, 1976; Pressley, 1977; Wolff & Levin, 1972; Wolff, Levin, & Longobardi, 1972; and Wolff, Levin, & Longobardi, 1974). No research has been reported that has addressed the question of whether this age group of children could be successfully instructed to generate combined visual-imaginal and verbal elaborations on a paired-associate task. It is of instructional interest to ascertain whether the learning of young children who were told to generate combined visual-imaginal and verbal elaborations would be better, worse, or equivalent to that of children instructed to generate only visual-imaginal elaborations or verbal elaborations alone.

After training, the effects of varying levels of prompts are of interest (i.e., control prompts, instructions to use elaborations, and instructions to manipulate toy pairs). Findings concerning trained 4-year-old children are compared to the performance of untrained 4-year-old youngsters under corresponding prompting conditions. In addition, the performances of these groups of children are compared to the performances of untrained 8-year-old children. Untrained 8-year-old children are included in this analysis in order to provide another index of the effectiveness of training because they are reportedly adept at employing elaboration strategies (Levin, 1976; and Pressley, 1977) due to their development. The effect of prompting instructions provides critical information concerning age differences in children's use of elaboration strategies.

Information concerning the generalizability and stability of the effectiveness of training is desirable because young children may rarely transfer such strategies even though they can execute them. To provide this information, a transfer test of the effects of training was conducted after a one week delay interval. Relatively few delayed posttests and transfer tests have been reported in the elaboration strategy literature. Elaboration strategy maintenance and generalization is important because it provides insights about dimensions of strategy knowledge that are critical for learning to occur (Pressley, Borkowski, & O'Sullivan, 1984).

Chapter 2

Review of the Literature

Performance due to elaboration strategies has been found to vary with such factors as age, sensory modality form, and level of prompting. Sensory modality forms of these strategies that have been frequently studied are visual-imaginal, verbal, and combined visual-imaginal and verbal elaborations (Jones, 1973; Rohwer, 1973). Prompting conditions for these strategies have been broadly classified into imposed and induced levels (Levin, 1976). Elaboration strategies may be imposed by incorporating them into learning materials (Rohwer, 1973); by children's direct motoric manipulation of learning materials (Levin, 1976); or via modeling (Zimmerman and Rocha, 1984, 1986). Elaboration strategies may be induced spontaneously by task demands (Montague, 1970 and Rohwer, 1972) or through experimental instructions (Levin, 1976). A review of the influence of these factors on young children's ability to generate and utilize elaboration strategies will be presented below.

The Development of Elaboration Strategies

Visual-Imaginal Elaboration Strategies. Research on the use of visual-imaginal elaboration strategies by young children has been extensively conducted by Levin and his associates. For reviews of this research see Levin (1976) and Pressley (1977). This research has been largely based on Piaget's theory of the development of mental imagery.

Piaget and Inhelder (1971) postulated that children in the preoperational stage of cognitive development (2 years to 8 years of age) do not generate and utilize dynamic visual imagery. Dynamic imagery consists of internal representations of changes in spatial positions or in the shapes of externally presented materials. Preoperational children are unable to perform the necessary imaginal manipulations such as rotations and transformations because they lack the mental operations to perform such tasks. Consequently, imagery in this stage of cognitive development is limited to reproductive and static copies of sensorially presented information. Images are reproductive in that children can only represent events that they have already experienced. Piaget theorized that preoperational children's images are static because the child is incapable of manipulating them through his or her own mental actions.

However, according to Piagetian theory, a child's imagery becomes dynamic and anticipatory with the emergence of concrete operational thought around 7 to 8 years of age. The child has then developed the necessary mental operations to transform her or his images. Through such mental transformations, the child can create images of things that he or she has never before experienced. This capacity enables the child to use imagery to anticipate as yet unperformed actions. This development greatly enhances the child's problem solving ability.

According to Piaget and Inhelder (1971), an image emerges from a child's overt external imitation of external actions or outcomes. With development, the child's overt imitation becomes abbreviated and

internalized. Therefore, an image is an abbreviated, covert residual of the child's external imitations.

Verbal Elaboration Strategies. Much research on the effectiveness of verbal elaboration strategies has been based on the work of the Russian psychologists Vygotsky (1962) and Luria (1960, 1961a, 1961b). Vygotsky and Luria postulated that children learn to regulate purposeful behavior through their own speech. Initially, children use speech for communicatory and expressive functions. Through social relations, children's mental activity is prompted by external verbal instructions of adults. From such interactions, children begin to guide their actions through their overt speech. At first, children's learned speech is unabbreviated and full. However, as actions are mastered, speech becomes more abbreviated and contracted. Furthermore, it begins to precede the children's activity instead of merely accompanying it. Around 7 years of age, children's speech goes underground. They begin to perform tasks in silence.

Kendler (1964) developed a verbal mediational theory based on Vygotsky's and Luria's formulations on the development of internal speech in young children. Kendler postulated three stages in the development of verbal mediators. Initially, children's production of overt verbal mediators exert little or no influence on her or his learning performance. Reese (1962) termed such an inability of verbal mediators to influence learning as a "mediational deficiency". In the second stage of verbal mediation, children's overt verbalizations enhance performance. However, children cannot

effectively perform the tasks in the absence of overt verbal mediators. Finally in the third stage, children develop the ability to generate his or her own verbal representations in the absence of overt verbal supports.

Flavell (1970) extended the stage theory of verbal mediational theory by postulating age ranges for the different levels of mediational ability. Additionally, he made a theoretical distinction between mediation deficiencies and production deficiencies. A mediation deficiency exists when the child cannot benefit from externally-provided mediators. A production deficiency exists when the child is unable to generate and utilize mediators upon instruction. Children younger than 5 years of age typically display both mediational and production deficiencies. However, children from 5 to 7 years old typically display production deficiencies.

Montague (1970) applied the theory of mediational development to the study of visual-imaginal and verbal elaborations. She also extended the theory by drawing a distinction between children's ability to generate and utilize mediators upon instruction and their ability to spontaneously generate and utilize mediators according to task demands. Although children around 7 to 8 years of age are able to improve their learning by generating and utilizing mediators upon instruction, they typically do not spontaneously generate and utilize mediators in appropriate task situations until a much later age.

Rohwer (1972), in agreement with Montague, also suggested that children benefit from instructions to generate and utilize

visual-imaginal and verbal elaborations at a much earlier age than they spontaneously generate and utilize them without instructions.

Comparisons of Visual-Imaginal and Verbal Elaboration Strategies.

Levin's and his associates' work on visual-imaginal elaboration strategies is grounded in Piagetian theory (Levin, 1976). Piaget (1962) views visual imagery and verbal production as manifestations of one common symbolic function. Both language and imagery are assumed to be determined by the child's mental operations. Both undergo change with the emergence of concrete operational thought. The child's ability to generate images and language are assumed to be reflective of and subordinate to Piagetian mental actions or operations. Piaget (1962) suggests that language during the preoperational period of development is basically imitated and reproduced without being consolidated to any degree.

Montague (1970), like Piaget (1962), assumes that both visual-imaginal and verbal elaboration strategies follow a similar developmental course. Other theorists, Bruner (1964, 1966) and Montessori (1964), postulate that children's modes of internal representation of information initially develops from enactive motoric manipulation of objects, then through symbolic forms of images, and finally to predominantly abstract forms of internal representations such as linguistic and mathematical signs. Early forms of representation are supplanted by later forms of internal representation. Bruner (1966) stated that children from the ages of 4 through 12 years old mainly use imagery to represent information at

the lower end of this period. They come to more heavily rely on verbal forms of representation as they reach the end of this period.

Contrary to Bruner (1966) and Montessori (1964), other researchers have claimed that the capacity of young children to derive optimal benefit from verbal modes of representation develops earlier than their ability to benefit from imaginal modes of representation (Reese, 1970a; and Rohwer 1970). Reese (1970a) suggests that young children fail to process visually depicted information. They merely enumerate isolated elements of the presentation without grasping the relationships between elements. Therefore, the children's internal representation of the depicted information is incomplete. However, verbal elaborations are more facilitative because the salient elements as well as the relationships between the elements are all explicitly named and thus encoded by the children. Rohwer (1970) stated that language is a coherent and well organized system, but that imagery is a more ad hoc system. He assumed that a capacity for the utilization of organized systems is easier to acquire and thus develops earlier than less organized systems.

Reese (1970a) and Rohwer (1970) performed a series of paired-associate studies to show the relatively greater effectiveness of verbal elaborations over visual-imaginal elaborations. These studies used cued verbal recall assessment procedures. The elaborations were also incorporated into learning materials rather than by being generated by the children. Dilley and Paivio (1968) and Paivio (1970) challenged Reese's and Rohwer's interpretation and suggested

that these findings may have been due to symbolic decoding problems experienced by the young children. They stressed that a stimulus transformation requiring decoding pictorial stimuli into a verbal response was a more difficult task than coding a verbal stimulus into a verbal response.

Jones (1973) also criticized the design of studies reporting a superiority of verbal to visual-imaginal elaborations on young children's learning. She claimed these studies used minimally detailed pictorial materials such as black and white photographs and line drawings. Young children were unable to supply needed details to such materials. Further, these studies did not include adequate pretraining to ensure that the children understood the task demands before task parameters were manipulated. Jones (1973) and Perlmutter and Myers (1975) found support for Dilley and Paivio's (1968) and Paivio's (1970) decoding hypotheses. Additionally, they found that it was just as difficult to decode a visual response from a verbal stimulus as it was to decode a verbal response from a visual stimulus.

In contrast to these studies based on cued verbal recall, a series of studies requiring merely a yes or no indication of recognition of previously presented stimuli indicated that visually presented items were recognized better than were verbal items (Corsini, Jacobus, & Leonard, 1969; Cramer, 1976; and Perlmutter & Myers, 1975). These research findings call into question claims made by Reese (1970a) and Rohwer (1970) that verbal elaborations are

better facilitators of learning for young children than are visual-imaginal elaborations.

Combined Visual-Imaginal and Verbal Elaboration Strategies.

Research by several investigators has indicated that visual-imaginal and verbal modes of representation although often overlapping in the information that they convey, also represent qualitatively different dimensions of the information (Kolers, 1983; Kosslyn, 1980, 1981; Kosslyn & Pomerantz, 1977; Paivio, 1971, 1977, & 1978; Palmer, 1975; Salomon, 1979; and Shepard, 1975). Because different modalities represent qualitatively different aspects of the information, the combined representations should facilitate learning more than either alone (Paivio, 1971, 1977, & 1978).

In support of this prediction, research studies conducted by Holyoak, Hogeterp, & Yuille (1972), Jones, (1973), Perlmutter & Myers (1975) and Rohwer, Kee, & Guy (1975) have found that combined visual-imaginal and verbal elaborations offered maximal effectiveness in comparison to either visual-imaginal elaboration or verbal elaboration. However, a study conducted by Levin, Davidson, Wolff, & Citron (1973) found that instructions to young children to generate and utilize both visual-imaginal and verbal elaborations were no more effective than instructions to generate and utilize either type of elaboration alone. Similarly, Zimmerman and Rocha (1986) in a study investigating the effects of the modeling in enhancing young children's paired-associate learning efficiency by prompting them to use elaboration strategies, found that adding a verbal elaboration strategy to a visual-imaginal one did little to improve performance.

These authors, however, suspected the operation of a ceiling effect that may have obscured the effects of the additional strategy.

In summary, several different positions have been presented concerning the combined effectiveness of visual-imaginal and verbal elaborations in young children's learning. Further research is needed to clarify some of these issues.

Categorical Levels of Elaboration Strategies

Imposed and Induced Elaboration Strategies. Many of the conflicting research findings reported above may be resolved by providing a more detailed analysis of the level of elaboration strategy. Elaboration learning can occur by incorporating elaborations into learning materials or by instructing children to generate elaboration strategies (Rohwer, 1970). Also, children may spontaneously generate elaborations to help them deal with task demands (Montague, 1970). Levin (1976) working extensively with visual-imaginal elaboration strategies made a theoretical distinction between imposed and induced elaboration strategies. Levin reasoned that when children manipulate paired-associate objects by making them interact together, they form a visual image of this interaction. On assessment tests, they retrieve this visual-imaginal representation. Since they have not created a novel interaction between object pairs mentally, the elaboration is imposed. Zimmerman and Rocha (1984, 1986) also found that elaborations could be presented to children via modeling. According to Levin (1976), induced elaboration strategies are strategies which the learner generates either when instructed to do so or spontaneously due to task demands.

The ability to generate elaboration strategies oneself is considered to be more cognitively demanding and to occur later during development than the ability to use externally provided strategies (Levin, 1976). In turn, the ability to generate elaboration strategies spontaneously in accordance with task demands is considered to be significantly more difficult and to occur later developmentally than the ability to generate these strategies when instructed (Montague, 1970, and Rohwer, 1972).

Imposed Elaborations Incorporated into Presentational Materials.

A number of studies have been conducted on the effects of elaborations incorporated into materials used in paired-associate learning tasks with young children (Begg and Anderson, 1976; Holyoak, Hogeterp, and Yuille, 1972; Milgram, 1967; Reese, 1965 & 1970b; Rohwer, 1970; Rohwer & Ammon, 1971; Rohwer, Ammon, & Levin, 1971; and Rohwer, Kee, and Guy, 1975). Generally, the materials used in these studies have consisted of picture pairs, word pairs, integrated pictorial scenes which contained the picture pairs, and sentences or phrases which contained the word pairs. It has been found that materials presented in an interactive context, such as an integrated pictorial scene or sentence embedding the terms to be associated in a meaningful relationship, greatly facilitated learning. This learning was superior to learning that occurred when elements were presented as isolated units of information.

It has been found that the effectness of visual-imaginal versus verbal elaborations in learning materials depended on the assessment techniques (Dilley & Paivio, 1968; Jones, 1973; Paivio, 1970; and

Perlmutter & Myers, 1975). An additional series of studies indicated that the effectiveness of both visually- and verbally-presented materials facilitated paired-associate learning more than either mode of presentation alone (Holyoak, Hogeterp, & Yuille, 1972; Jones, 1973; Rohwer, Kee, & Guy, 1975; and Perlmutter & Myers, 1975).

Induced Elaboration Strategies Generated Spontaneously by Task Demands. Research indicating that children younger than 7 to 8 years of age do not typically spontaneously generate and utilize visual-imaginal elaboration strategies has been largely based on Piagetian theory (Levin, 1976). According to the Genevian school of cognitive development (Inhelder, 1970; and Piaget & Inhelder, 1971), children younger than 7 to 8 years of age cannot generate dynamic imagery to facilitate learning. They found that preoperational children were unable to adequately reproduce or anticipate manipulations by gestural imitations, drawings, or verbal reports that required transformations in position or shape.

Research conducted by Bray, Justice, Ferguson, & Simon (1977); Jensen & Rohwer (1965); Montague (1970); and Rohwer (1972) indicated that children younger than 7 do not spontaneously use verbal elaborations to facilitate learning. Typically, 5-year-old children produced labels of picture pairs connected by the conjunction "and" when they were asked to generate sentences (Jensen and Rohwer, 1965).

Induced Elaboration Strategies Generated in Response to Experimental Instruction. Studies conducted by Levin, Davidson, Wolff, & Citron (1973) indicated that children younger than 8 years old do not benefit from instructions to generate visual-imaginal

elaborations on paired-associate tasks. These findings supported the Piagetian position that preoperational children cannot generate and utilize dynamic imagery. A number of other studies (Kendler, 1964; Kendler and Kendler, 1962; Levin, McCabe, & Bender, 1975; McCabe, 1973; and McCabe, Levin, & Wolff, 1974) found that young children could be effectively instructed to use verbal mediators to enhance their learning. Kendler (1964) and Kendler and Kendler (1962) used simple discrimination tasks to demonstrate the effectiveness of a verbal labelling strategy in emphasizing the relevant and irrelevant dimensions of the tasks. Kemler and Jusczyk (1975) and Montague (1970) reported similar findings about the effectiveness of verbal elaboration strategies in enhancing the paired-associate performance of 6- and 7-year-old children. Levin, McCabe, & Bender (1975); McCabe (1973); and McCabe, Levin, & Wolff (1974) found that 4-year-old children could be effectively instructed to generate and utilize verbal elaboration strategies in the form of sentences to enhance paired-associate performance. These findings indicate that children from 4- to 7-years-old can effectively utilize instructions to generate verbal elaboration strategies to enhance paired-associate performance.

Studies conducted by Levin, Davidson, Wolff, & Citron (1973); Kemler and Jusczyk (1975); and Montague (1970) have examined the effectiveness of instructing young children to generate and utilize verbal elaborations as contrasted to visual-imaginal elaborations. Both groups of researchers found that 6- and 7-year-old children benefited equally from instructions to generate and utilize

visual-imaginal and verbal elaborations compared to a control group of children who received nonmediational instructions to remember object pairs. Levin, Davidson, Wolff, & Citron (1973) found that instructions to generate and utilize both visual-imaginal and verbal elaborations were no more effective than instructions to generate and utilize either type of elaboration alone. Contrary to the findings reported by Levin, et.al. (1973), Montague (1970) found that verbal elaborations were more effective in enhancing the learning of 7-year-old ghetto children than were visual-imaginal elaborations.

In summary, when comparing studies on verbal elaborations strategies reported by McCabe (1973); McCabe, Levin, & Wolff (1974); and Montague (1970) and studies on visual-imaginal elaboration strategies reported by Montague (1970), Wolff and Levin (1972), Wolff, et. al. (1972, 1974), it seems that children respond to instructions to generate and utilize verbal elaboration strategies at an earlier age than they respond to instructions to generate and utilize visual-imaginal elaboration strategies.

Imposed Visual-Imaginal Elaboration Strategies Produced by Children's Motoric Manipulation of Learning Materials. Levin and his associates hypothesized that preoperational children could be prompted to use visual-imaginal elaboration strategies to enhance learning on paired-associate tasks by motorically manipulating the items to be paired (Levin, 1976; Wolff and Levin, 1972; Wolff, Levin, & Longobardi, 1972, 1974). According to Piaget and Inhelder (1971), imagery is the cognitive residual of external imitative acts. Consequently, Wolff and his colleagues postulated that dynamic

imagery in the form of visual-imaginal elaboration strategies which can be internally generated and utilized without the support of overt activity at one developmental level must be accompanied by overt activity at an earlier developmental level in order for the child to be able to benefit from it. Wolff and Levin (1972); and Wolff, Levin, & Longobardi, (1972, 1974) predicted that 5-year-old preoperational children would benefit from instructions to generate and utilize imaginal elaboration strategies only if they were allowed to concurrently manipulate paired-associate toy items by making the toys in each pair interact together. Their results appeared to support their hypothesis.

Danner and Taylor (1973) and Varley, Levin, Severson, & Wolff (1974) questioned whether concurrent manipulation on the part of the child was necessary for him or her to generate visual-imaginal strategies on paired-associate tasks. These researchers used training sessions prior to the learning tasks in order to investigate this question. Danner and Taylor (1973) instructed children during training to draw pictures relating objects to be associated. They also instructed the children to verbally describe an interaction between the objects. During the learning tasks, the children were instructed to think of a picture of each set of objects doing something together. They found that the training improved the performance of 6-year-old children compared to a no practice control group.

Varley, Levin, Severson, and Wolff (1974) compared the effectiveness of motoric playing and drawing in enhancing the

performance of 5- and 6-year old children. In a training session prior to the learning task, the children were instructed to make the toys "play" together. Another group of children during training was instructed to draw the toys playing together. The 5-year-old children significantly improved their learning if they either played with the toys or drew pictures of the toys interacting during the training session. Both forms of motoric activity were found to be equally effective. However, no differences in the performance of any of the groups was found for the 6-year-old children. These researchers concluded that children between the ages of 6 and 7 become increasingly adept at generating and utilizing dynamic representations in the form of visual-imaginal elaborations even when there is no concurrent motor involvement or prior training.

Taken together, the findings of Danner and Taylor (1973) and Varley, Levin, Severson, and Wolff (1974) indicate that concurrent motoric manipulation is not necessary for preoperational children to generate and utilize visual-imaginal elaboration strategies. Children could be trained to use such visual-imaginal elaboration strategies through motoric manipulation prior to the learning task.

Wolff and Levin (1972) and Wolff, Levin, and Longobardi (1974) questioned whether tactual manipulation or visual feedback from the manipulation was the specific factor that enhanced the children's performance. They conducted experiments in which they varied the visual and tactual components of the motor manipulations. They concluded that the tactual manipulation was more important than the visual feedback in enhancing learning. However, contrary to these

findings, Levin, McCabe, and Bender (1975) found that 4-year-old children benefited only when they directly manipulated toy pairs when they visually observed the interactions.

These findings have raised questions concerning the need for motoric manipulation to induce young children to generate and utilize visual-imaginal elaboration strategies. Whereas, Wolff and Levin (1972) had expected to find that children who manipulated toys themselves would perform better than children who observed an adult experimenter manipulate the toys, they actually found no significant differences. They reasoned that this finding was due to the nature of the interactions produced by the children. Perhaps, the children could not always generate an interaction for some of the toy pairs. However, in the experimenter manipulation condition a high quality intereraction was given for every pair. They suggested that further research should be conducted to investigate this finding using yoked pairs of children. One child in each pair would serve as the performer and the other as the observer.

Wolff, Levin, & Longobardi (1974) predicted that children who manipulated toy pairs would outperform children who observed the manipulation of toy pairs. No difference in the performance of child models and child observers was detected on an immediate posttest. However, on a 24 hour delayed posttest, child models outperformed child observers. Wolff, Levin, and Longobardi (1974) concluded that motoric manipulation was necessary for induced imagery in the form of visual-imaginal elaboration strategies to remain effective for any period of time.

Brody, Mattson, and Zuckerwise (1978) conducted an experiment to clarify whether self-generated interactions were necessary for preoperational children to generate and utilize interactive images in the form of visual-imaginal elaboration strategies. They found that children who observed an adult experimenter manipulate toy pairs performed better than children who manipulated the toy pairs themselves on an immediate posttest. However, the Brody, et. al. (1974) study provided no delayed posttest similar to that employed in the Wolff, et. al. (1974) study. Consequently, no conclusions about the stability of learning without the support of motoric manipulation could be drawn from this experiment.

Borkowski, Levers, and Gruenfelder (1976) reported similar findings to those of Wolff, Levin, and Longobardi (1974) with 3- and 4-year-old children. Children in the observational learning group listened to the experimenter verbally describe prepositional relationships between object pairs. Then they watched the experimenter perform manipulations between each object pair in the manner that he had verbally described. The active learning group of children listened to the experimenter verbally describe relationships between object pairs, and they manipulated the objects according to these verbal descriptions. Borkowski, Levers, and Gruenfelder (1976) found that the observational and active learning groups of children performed equally well on immediate posttests. However, on a transfer task given two weeks after training, the active learning group performed better than the observational learning group of

children. They concluded that manipulation of the object pairs during learning was necessary for long term effects.

Additional studies conducted by Bender and Levin (1976) and Yuille and Catchpole (1973) cast further doubt as to the necessity of motoric manipulation in prompting preoperational children to generate and utilize visual elaboration strategies. Bender and Levin (1976) found that kindergarten children benefited equally well from instructions to motorically manipulate toy pairs, to plan interactions and then manipulate toy pairs, and to plan interactions between toy pairs that they could perform later. All of these instructions produced significantly better performance than instructions to imagine a picture in their heads of the toys playing together. Yuille and Catchpole (1973) found that manipulation of object pairs and picture pairs produced no better learning than nonmanipulation for 5- and 8-year-old children. However, presenting the objects or picture pairs in an interactive context did produce significantly better learning. These researchers criticized the findings of Wolff and Levin (1972) and Wolff, Levin, and Longobardi (1972) for confounding motor manipulation with interactive context. Only children in these studies who played with the toys experienced the toys in an interaction.

Taken as a whole, this body of research findings indicates that motoric manipulation is not necessary on the part of the preoperational children for them to effectively generate and utilize visual-imaginal elaboration strategies on paired-associate tasks. Such findings appear to contradict the findings of Wolff and Levin

(1972) and Wolff, Levin, and Longobardi (1974) who concluded the opposite effects of motoric manipulation in prompting preoperational children to utilize visual-imaginal elaboration strategies on similar tasks.

Imposed Elaboration Strategies Presented to Children Via Modeling. Zimmerman and Rocha (1986) further investigated the facilitative effects of learning from visual-imaginal elaboration strategies that had been previously attributed to motoric manipulation. These researchers postulated that the quality of the information presented to the learner through such interactions was more important than the actual physical contact with the objects to be paired. Young children have been found to have difficulty in understanding experimental procedures and instructions (Bray, Justice, Ferguson, & Simon, 1977; Jones, 1973; and Siegel, McCabe, Brand, & Matthews, 1978). Modeling procedures have been found to be particularly effective in enhancing the learning performance of young children on many cognitive tasks (Rosenthal, Alford, & Rasp, 1972; Rosenthal and Zimmerman, 1972; Zimmerman, 1972, 1974; Zimmerman and Jaffe, 1977; and Zimmerman and Kleefeld, (1977).

According to social learning theory (Bandura, 1977), internal representations in the form of symbolic codes (images, verbal descriptions, propositions, etc.) play an important role in conveying information about the world to the individual. People's ability to manipulate symbols has greatly expanded their ability to learn from their environment by allowing them to encode the actions of others (models). Further, this ability to manipulate symbols allows them to

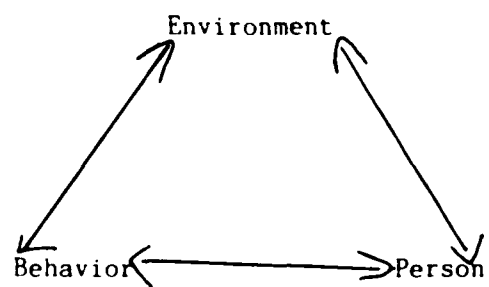
retain information that they acquire as well as to anticipate future events. Man is viewed as a continuously active being who lives in a complex and dynamic world. Knowledge about the world is actively constructed by individuals as they interact with their environment.

Bandura (1977) presents a tripartite formulation termed reciprocal determinism to represent the individual's interaction with the environment (see Figure 1). In this schematization, person variables (P), behavioral variables (B), and environmental variables (E) exert continuously dynamic and mutually interdependent influences on one another. Changes in any one of the variables are seen to impact on the other 2 variables. The behavior variable represents all overt observable manifestations made by the person. The person variable includes the components of the internal state of the person such as values, beliefs, attitudes, emotions and motivations. The environmental variable represents both the physical and social world with which the individual interacts. Bandura has outlined four components of the modeling process that he derives from the reciprocal determinism paradigm. These components are also perceived as being interactive and mutually interdependent. They include attentional, retentional, motoric reproductive, and motivational processes.

Since the social learning theorists view the world as continuously active and dynamic, it is assumed that children's symbolic encoding will never at any age be limited to static representations of reality. Age-related changes in a child's awareness and use of elaboration strategies is accepted by social

Figure 1

Reciprocal Determinism Model



learning theorists (eg. Mischel and Mischel, 1983); however, claims that young children are unable to learn to use such strategies because of qualitative stage assumptions have been widely disputed (Bandura, 1977; Rosenthal and Zimmerman, 1974; and Zimmerman and Rosenthal, 1978).

Contrary to the findings of Borkowski, Levers, & Gruenenfelder (1976); Wolff and Levin (1972); and Wolff, Levin & Longobardi (1974); a prediction was made by Zimmerman and Rocha (1986) that children watching meaningful interactions between paired items would learn as effectively as children who actually manipulated the items. Further, the effectiveness of learning was predicted to be durable over a 24 hour delayed period as well as generalizable to a new set of materials. Zimmerman and Rocha used similar procedures as those employed by Wolff, Levin, & Longobardi (1974). Same sex pairs of 5-year-old children served as subjects. One child in each pair was randomly designated as the model, and the other child was designated as the observer.

Three levels of informational quality about the toy pairs were varied. In the low information condition, the child model physically manipulated the toys in each pair separately but did not allow them to interact. In the intermediate condition, the model was instructed to manipulate the toy pairs by making them play together. The model both manipulated the toy pairs and also verbally described the interactions in the high information condition. The child observers were instructed to attend to the behaviors of the child models across all three informational levels.

On both an immediate posttest and a 24 hour delayed posttest, child observers performed as well as child models in all three information conditions. However, the performance of the children in the intermediate and high information conditions did not differ significantly from each other. The findings of Zimmerman and Rocha (1986) indicated that children can be prompted to generate and utilize visual elaboration strategies by observing the actions of others. Modeling procedures were found to be effective learning techniques for these children. Zimmerman and Rocha concluded that direct motoric manipulation on the part of the child is not necessary for the effective utilization of visual-imaginal elaborations.

However, research conducted by Corsini (1972) and Daehler (1976) instructing young children to place different kinds and colors of objects into different kinds and colors of receptacles found verbal instructions as effective as modeling. Corsini (1969) found verbal instructions more effective than modeling alone. It seems likely that the children may not have comprehended all of the relevant dimensions of the task (color, as well as kind of object and receptacle) from the actions of the model. They were just instructed to watch and do what the model does.

Corsini (1972) and Daehler (1972) found that children who both listened to the verbal instructions as well as watched the actions of the adult model performed better than children who only heard the instructions or those who only watched the model. However, Corsini (1969) found that verbal instructions and the combined modeled enactment of the instruction plus the verbal instructions were

equally effective. Both were more facilitative than the modeled enactment alone. Further research is needed to investigate the effectiveness of verbal instructions as contrasted with modeling procedures.

The Effects of Motoric Manipulation on Young Children's Use of Verbal Elaboration Strategies. McCabe (1973) and McCabe, Levin, & Wolff (1974) conducted studies examining the effects of concurrent motor manipulation in enhancing the effectiveness of young children's use of verbal elaboration strategies on paired-associate tasks. They predicted that the same facilitative effects of motoric manipulation on visual-imaginal elaboration strategies reported by Wolff and Levin (1972), and Wolff, et. al. (1972, 1974) would be obtained using verbal elaboration strategies. They based their hypotheses on Piaget's (1962) statement that imagery and language production were realizations of a common underlying process. McCabe and her associates assumed that both language and imagery would therefore follow a similar developmental path.

Levin, McCabe, and Bender (1975) and McCabe, Levin, and Wolff (1974) found that children who motorically manipulated toys performed better than children who generated and utilized verbal elaboration strategies. This finding was similar to the findings reported by Wolff and his associates that children who manipulated toys performed better than those who were instructed to generate and utilize visual elaboration strategies. However, McCabe (1973) and McCabe, Levin, and Wolff (1974) investigating the effectiveness of verbal elaboration strategies combined with motoric manipulations found that

allowing 4-year-old children to manipulate toys as they generated verbal elaborations produced no better learning than instructing them to use verbal elaborations alone. These investigators concluded that these findings contradicted the notion that language production and imagery production follow a similar developmental path. Language production is not improved by accompanying motor activity while imagery is.

In a study conducted by Zimmerman and Rocha (1986), the combined effects of motoric manipulation and verbal elaboration strategies were found to be no more facilitative to young children's learning than motoric manipulation alone. Children who motorically manipulated toys as well as those who observed such manipulations performed as well as children who manipulated the toys and verbally described the toys or those who observed such interactions. The McCabe (1973) and the Levin, McCabe, and Bender (1975) studies had not addressed questions concerning the relative effectiveness of combined motoric manipulation and verbal elaboration strategies versus motoric manipulation alone. The Zimmerman and Rocha (1986) study did not directly compare instructions to generate verbal elaboration strategies to those to manipulate the toys. The finding by Zimmerman and Rocha (1986) that the addition of a verbal elaboration strategy to motoric manipulation did not enhance learning performance was thought by these researchers to be due to the operation of a ceiling effect in the experiment. Only 12 pairs of toys had been used during the learning tasks. Children in conditions where toys were manipulated averaged 9.94 of 12 correct matches.

Children in those conditions where the toys were both manipulated and verbally described averaged 10.69 of 12 correct matches.

A second study (Zimmerman and Rocha, 1984) was conducted with 5-year-old children to investigate the possible ceiling effect. The number of toy pairs on this task was greatly increased. Direct motoric manipulation by the children was not employed in this experiment since observational learning had been found to be just as effective in the Zimmerman and Rocha (1986) study. An adult model motorically manipulated each pair of toys by making them play together or else merely presented the toy pairs side by side in a noninteractive manner to the children.

The toy pairs were presented verbally to the children in one of 4 ways. No verbalizations were given by the experimenter to one group of children. The experimenter labeled the toys in each pair for another group of children. For a third group of children, the experimenter presented peer verbal elaborations of toy interactions for each toy pair. The statements had been generated by a group of children of the same age prior to the experiment. The fourth group of children listened to adult verbal elaborations (created by the experimenters prior to the experiment for each toy pair interaction).

The results indicated that visual elaborations produced greater learning than did static visual presentations. These findings replicated those found by Zimmerman and Rocha (1986). Further, adult verbal elaborations produced greater learning than the peer verbal elaborations. Both of these types of verbal elaborations produced greater learning than verbal labels or no verbalizations. Thus,

verbal elaboration strategies imposed via modeling were found to be successful in improving the children's learning. These results were similar to those reported by McCabe, Levin, and Wolff (1974) who found verbal elaborations more effective than nonmediated control instructions. The results were also similar to McCabe's (1973) finding that verbal elaborations were more facilitative than was a covert labelling strategy. No comparison was made in this experiment between the effectiveness of visual-imaginal elaborations and verbal elaborations.

Training Children to Transfer Use of Elaboration Strategies

Several studies have used procedures for prompting children from 4- to 7-years-old to generate and utilize elaboration strategies in paired-associate tasks. Danner and Taylor (1973) and Varley, Levin, Severson, & Wolff, (1974) studies used manipulation training procedures (play or draw) to prompt preoperational children to induce imaginal elaboration strategies. These researchers found that the procedures they used were effective on a transfer task immediately after training. However, these studies included no delayed posttests to assess the stability of the training effects.

Although no training studies using only verbal elaboration strategies were found, several studies (Borkowski, Levers, & Gruenenfelder, 1976; Danner and Taylor, 1973; and Yuille and Catchpole, 1973, 1974) used training procedures that combined visual-imaginal and verbal elaboration strategies to enhance young children's paired-associate performance. Borkowski, et. al. (1976) described their methodology as "a verbal prepositional mediational

procedure", whereas Yuille and Catchpole (1973, 1974) called their paradigm "an imaginal training procedure".

In the Yuille and Catchpole (1973, 1974) studies, children generated verbal elaborations of possible interactions between object pairs during training. The experimenter then manipulated the objects according to the descriptions by the learner. If the children were unable to verbally elaborate, the experimenter provided his own descriptions of the toy manipulations.

In the Borkowski, Levers, and Gruenfelder (1976) experiment, the children listened to the experimenter verbally produce prepositional elaborations relating object pairs. Children in the observational learning condition then watched the experimenter manipulate the objects in a manner to correspond to the verbal elaborations. Children in the active learning condition, however, then manipulated the objects themselves in a manner to correspond with the verbal elaborations.

Both of these training procedures were found to be effective during delayed posttests and transfer tests (Borkowski, Levers, & Gruenfelder, 1976 and Yuille and Catchpole, 1974). The delayed posttest in the Borkowski, et. al. (1976) study consisted of a transfer test given 2 weeks after the last training session. The delayed posttest and transfer test in the Yuille and Catchpole (1974) study was given 1 week after the learning task.

In all of these studies, Borkowski, et. al. (1974) and Yuille and Catchpole (1973, 1974) visual-imaginal and verbal elaboration strategies were combined during training. It is difficult to

ascertain from these procedures what the effectiveness of visual-imaginal elaboration strategies were in comparison to verbal elaboration strategies. Further, the combined effectiveness of visual-imaginal and verbal elaboration strategies during training and subsequent learning in comparison of either type of training alone is unclear. Did the children in these studies generate and utilize visual-imaginal or verbal elaboration strategies or did they generate both in enhancing their performance?

In addition, Yuille and Catchpole (1973, 1974) and Borkowski, et. al. (1976) combined verbal elaborations or motoric manipulations produced by the child with either motoric manipulations or verbal elaborations produced by the experimenter during the training. It is difficult to determine from these studies whether the effectiveness of the training techniques were due to the child's motoric participation or to productions of the experimenter. Although the observational learning condition in the Borkowski, et. al. (1976) study was found to be effective on an immediate posttest, it did not prove durable and generalizable to a transfer test given two weeks later. This suggested to Borkowski, et. al. (1976) that active participation during training was necessary on the part of the child for the training to have any lasting effects.

Both Borkowski, et. al. (1976) and Zimmerman and Rocha (1986) used nonmediated transfer tasks to assess the generalizability of the effectiveness of elaboration strategies in facilitating learning of young children. Each of these studies found that children who

manipulated object pairs on the transfer task performed significantly better than those who did not manipulate the object pairs.

Borkowski, et. al. (1976) suggested that further research is needed to determine the effects of training for children who manipulated toys on the learning task but would be prevented from manipulating toys on the transfer task. Also additional research was suggested by these experimenters to determine the effects of training for those children not initially manipulating the toys on the learning task but who would be instructed to do so on the transfer task. Comparisons between these two groups of children could shed additional light on the effects of training.

Zimmerman and Rocha (1986) had found that both manipulating the toys plus generating and utilizing verbal mediational elaborations about toy pair interactions on the transfer task had not facilitated performance more than just manipulating the toys. However, there was no condition in this study that investigated the effects of verbal elaboration performance alone. These researchers like Borkowski, et. al. (1976) suggested that additional research was needed to investigate the effects of exposure to manipulation during the learning task when the children are prevented from manipulating the toys on the transfer task.

Differences in performance from training to transfer tasks may be due to the differential effectiveness of imposed versus induced strategies. In the imposed context, the experimenter provided the elaborations during training or the children produced them when they motorically manipulated paired-associate stimuli together. On the

assessment test, the children are merely required to retrieve from memory the elaborations that were initially provided for them during learning. Since relationships between object pairs are activity-based, the elaborations may be said to be dynamic. Elaboration, therefore, on the training task is considered to be reproductive and dynamic. However, when children are required to generate and utilize elaborations without the support of external aids after training, their elaborations may be said to be both dynamic and anticipatory.

Summary of the Research Findings and Rationale for the Study

It appears that a careful, conceptual analysis of the effects of elaboration strategies on young children's paired-associate learning efficiency could lead to greater clarity and understanding of their effectiveness. Such an analysis has been provided in this literature review in terms of three variables: the sensory modality form of the strategies employed, the level of prompting the strategies, and children's age.

In the area of children's paired-associate learning, sensory modality of elaboration strategies have included visual-imaginal, verbal, and combined visual-imaginal and verbal elaboration strategies (Dilley and Paivio, 1968; Holyoak, Hogeterp, & Yuille, 1972; and Jones, 1973). Categorical distinctions have been broadly drawn between imposed and induced elaboration strategies (Levin, 1976). Imposed strategies are externally presented to the learner in some manner. Different methods of presenting imposed elaboration strategies to young children reported in the literature have included

incorporating the strategies directly into learning materials (Rohwer, 1973), presenting them to children indirectly as a consequence of the children's motoric manipulation of paired-associate objects (Levin, 1976), and demonstrating them to children via modeling (Zimmerman and Rocha, 1984, 1986). Induced elaboration strategies are those which are internally generated by the learner without the aid of external supports. Induced elaboration strategies have included strategies that are generated and utilized spontaneously by the children according to task demands and strategies generated and utilized by the children in compliance with the experimenter's instructions (Levin, 1976).

Research on age-related factors in children's use of elaboration strategies have typically indicated that the ability to generate and utilize an elaboration strategy spontaneously according to task demands is a cognitively more difficult task than is the ability to generate and utilize such a strategy from experimental instruction (Montague, 1970 and Rohwer, 1972). Generally, it has been found that children younger than 7 to 8 years of age do not spontaneously use visual-imaginal or verbal elaboration strategies (Flavell, 1970, 1977; Jensen and Rohwer, 1965; Levin, 1976; Montague, 1970; Pressley, 1977; and Rohwer, 1972).

One question in this area that has generated a great deal of research was whether children used visual-imaginal or verbal elaborations effectively at an earlier age. It appears from this research that the effectiveness of the imposed visual-imaginal and imposed verbal elaboration strategies is dependent on the assessment

technique used (Dilley and Paivio, 1968; Jones, 1973; Paivio, 1970, and Perlmutter and Myers, 1975). In general, visual-imaginal elaborations produce greater learning efficiency when a nonverbal assessment technique is used. However, verbal elaborations are more facilitative when verbal recall assessment techniques are employed. Further, it has been found that combined visual-imaginal and verbal elaborations are more effective than either form of elaboration alone (Holyoak, Hogeterp, & Yuille, 1972; Jones, 1973; Perlmutter and Myers, 1975; and Rohwer, Kee, & Guy, 1975).

Wolff and his associates (Wolff and Levin, 1972; and Wolff, Levin, & Longobardi, 1972, 1974) extended the research literature on children's use of imposed elaboration strategies. These researchers were interested in whether preoperational children could generate and utilize dynamic visual imagery on paired-associate tasks. Wolff and his colleagues reasoned that preoperational children might be capable of using dynamic visual imagery if they could motorically manipulate paired-associate objects by making them interact in a meaningful way. According to Piaget and Inhelder (1971), children in the preoperational stage of development (2 years through 7 years of age) have imaginal representations that are reproductive and static in nature. These imaginal representations are like pictures because they do not capture active manipulations or transformations of stimuli that are presented. As such, pictorially-presented visual-imaginal elaboration strategies incorporated into learning materials should produce reproductive and static visual imagery in children and therefore, children from 4 to 7 years of age can benefit

from such elaboration strategies. However, until children reach the concrete operational stage of development (around 7 to 8 years of age) they are unable to benefit from dynamic visual-imaginal representations.

Further research was conducted by Bender, Levin, and McCabe (1976); McCabe (1973); and McCabe, Levin, & Wolff (1974) that explored the influence of motoric manipulation on verbal elaboration strategies. Both sets of studies focused on the effects of children's concurrent motoric manipulation of paired-associate items and their use of either visual-imaginal or verbal elaboration strategies. It was found that children who manipulated the items outperformed those who did not. From these findings, it was concluded that concurrent motoric manipulation of paired-associate items by making them meaningful interact represents an optimal learning strategy for preoperational children.

However, it is not clear from the research conducted by Wolff and his colleagues whether motoric manipulation by the children is necessary for the facilitative effects of learning to occur. Wolff and Levin (1972) found that children who manipulated the paired-associate items and those who watched an adult manipulate such items performed equally well on an immediate posttest. Brody, Mattson, and Zuckerwise (1978) found that children who watched an adult manipulate the items actually outperformed those who manipulated the items themselves. Wolff, Levin, & Longobardi (1974) and Borkowski, Levers, & Gruenenfelder (1976) found that children who manipulated the items and those who observed manipulations

between the items performed equally well on immediate posttests. However, on delayed posttests, child manipulators outperformed child observers. These researchers concluded that direct motoric manipulation by the children was necessary for any lasting effects on learning to occur.

Zimmerman and Rocha (1986) hypothesized that the quality of the information that was presented to the children by their motoric manipulations rather than the physical manipulation itself was the important facilitative variable on young children's learning. They found that children who manipulated the paired-associate items and those who observed these manipulations performed equally well on both immediate and delayed posttests. From these findings, it appears that preoperational children have the mental ability to use reproductive dynamic visual imagery without the external support of motoric manipulation.

In both the Borkowski, Levers, & Gruenenfelder (1976) and the Zimmerman and Rocha (1986) studies, delayed transfer tasks were used. Children who manipulated paired-associate items performed better than those who did not. In the Borkowski, et. al. (1976) study, children who had been instructed to manipulate the items initially tended to manipulate them more than children who had not initially been instructed to manipulate the items. However, in the Zimmerman and Rocha (1986) study, child manipulators and child observers manipulated the items equally often on the transfer task. Both groups of investigators suggested that additional research is needed to determine the effects of these imposed elaboration strategies on

children's learning efficiency on the transfer task when the children are prevented from manipulating the toy pairs. If such techniques are effective on a learning or transfer task given after training, then it can be concluded that preoperational children can be prompted to generate and utilize induced elaboration strategies by exposure to such strategies via modeling.

Further investigation is needed to disentangle some of the problems reported in the previous research studies. Information concerning comparisons among the effectiveness of visual-imaginal, verbal, and combined visual-imaginal and verbal elaboration strategies imposed via modeling has not been found in the literature. It is of interest to determine whether the effectiveness of these strategies is similar to the that found for imposed elaboration strategies incorporated into learning materials.

The chief theoretical question in this research proposal is whether young children who would not normally generate and utilize elaboration strategies could be prompted to do so after training through modeling procedures. It is also of importance to determine the effectiveness of the different forms of elaboration strategies in enhancing the children's performance both during training and on the subsequent learning tasks. It seems desirable to use training procedures which do not combine experimenter- and child-produced elaborations. Further, in order to determine the effectiveness of the modeling in prompting children to generate and utilize elaboration strategies, the same prompts should be given to both trained and the untrained children on the learning tasks. These

prompts should indicate both trained and untrained children's spontaneous generation and utilization of elaboration strategies according to task demands, their generation and utilization of such strategies when instructed to do so, and their utilization of an explicitly imposed elaboration strategy. Finally, a delayed posttest should be administered to assess the generalizability and stability of the training effects and instructional set effects on the children's performance.

Chapter 3

Research Design and Hypotheses

This research has been designed to answer questions that have arisen from an analysis of the literature on the effectiveness of elaboration strategies in enhancing young children's paired-associate learning efficiency. In keeping with the age ranges typically studied in the literature, 4- and 8-year-old children were used as subjects. Developmental comparisons between the performances of groups of trained 4-year-old, untrained 4-year-old, and untrained 8-year-old children were made across the different phases of the experiment.

The experiment was conducted in three phases. Phases 1 and 2 were administered in immediate succession on one day. Phase 3 was administered one week later (see Appendix B for research designs used during Phases 1, 2, and 3). Phase 1 consisted of elaboration training via modeling procedures. Separate groups of 4-year-old children were exposed to different sensory modality forms of imposed elaboration strategies by an adult model. These forms included visual-imaginal, verbal, and combined visual-imaginal and verbal elaborations. The performance of the trained 4-year-old children in this phase was compared to that of a group of untrained 4-year-old children and that of a group of untrained 8-year-old children assigned to no training control conditions.

It was predicted that Phase 1 presentation of imposed elaboration strategies via modeling would enhance the performance of the trained 4-year-old children's on a paired-associate task. It was also

predicted that imposed combined visual-imaginal and verbal elaboration strategies would promote better performance than either imposed visual-imaginal or imposed verbal elaboration strategies. Further, the imposed visual-imaginal elaborations were expected to promote better performance than were the imposed verbal elaborations. These predictions were deduced from the literature on imposed elaborations incorporated into learning materials. Additionally, it was predicted that trained 4-year-old children would outperform the untrained 4-year-old children. Further, the trained 4-year-old children were hypothesized to perform as well as the untrained 8-year-old children. However, the untrained 8-year-old children were expected to outperform the untrained 4-year-old children.

During Phase 2 immediately following Phase 1, the effectiveness of Phase 1 modeling and prompting the children to maximize paired-associate performance by using elaboration strategies was evaluated. The prompting conditions were designed to allow for the analysis of children's use of elaboration strategies under spontaneous, instructed, and imposed experimental conditions. The control set provided an index of children's spontaneous use of induced elaboration strategies when they received no instructions to generate such strategies. Comparisons among the children's responses to prompts to generate imaginal, verbal, and induced combined imaginal and verbal elaboration strategies were performed. Prompting children to meaningfully manipulate toy pairs was viewed as providing an optimal elaboration condition since children's manipulation of learning materials represents imposed elaboration. Prompting was

designed to indicate the children's ability to create elaborations. Children's manipulation of toy pairs provided a useful index of their ability to profit possibly from exposure to elaborations.

During Phase 2, the performances of trained 4-year-old children, untrained 4-year-old children, and untrained 8-year-old children under corresponding instructional prompting conditions were compared. These comparisons enabled an analysis of both the effectiveness of Phase 1 modeling and instructional prompts in enhancing the children's paired-associate performance. It was expected that trained 4-year-old children would perform most effectively when they were instructed to manipulate toy pairs. They were expected to display their next best level of performance when they were instructed to generate induced elaborations. They were expected to perform most poorly under the control instructional set.

The untrained 4-year-old children were likewise expected to perform most adequately under the manipulate condition. Their performance under the control instructional set and the generate induced elaborations instructional set were not expected to differ significantly.

Finally, the untrained 8-year-old children were expected to perform equally well from instructions to manipulate toy pairs and instructions to generate induced elaborations. However, both of these prompts were expected to enhance their performance compared to control instructions.

The trained 4-year-old children were expected to outperform the untrained 4-year-old children across all instructional sets. The 8-year-old children were also expected to outperform untrained 4-year-old children across all instructional sets. Further, the performance of the trained 4-year-old children was expected to be comparable to that of untrained 8-year-old children across all instructional sets.

Phase 3 consisted of a transfer test of the effectiveness of Phase 1 modeling after a one week's delayed time interval. The procedures for Phase 3 were identical to those used during Phase 2, however, a new set of learning materials was used. This phase was designed to allow for the analysis of the stability and generalizability of the modeling training. The same patterns of performances predicted for Phase 2 were also predicted for Phase 3.

Chapter 4

Method

Subjects

One hundred and fifty-two children served as subjects in the experiment. These children were selected from New York City nurseries, schools, and after-school programs. The children were randomly assigned to treatment conditions. The 4-year-old sample consisted of 112 children and the 8-year-old sample consisted of 40 children.

Materials

Toys. One hundred and two children's toys were used in the experiment. Half of these toys were animate and included such objects as a bear, a scarecrow, and a rabbit. The remaining toys were inanimate and included objects like an iron, a cup, and a boat. The toys were approximately equivalent in size varying from 1 to 6 inches on the widest dimension. The toys which had no mechanically moving parts were randomly paired into 51 items. The items were created in such a way that one toy in each pair was always animate, and the other toy was always inanimate. The animate toys were designated as stimulus toys and the inanimate toys were designated as response toys.

Seventeen pairs of toys were used for each phase of the experiment (see Appendix C for a list of these toy pairs). Two of these pairs of toys were used as practice items prior to the beginning of each task. The remaining 15 pairs of toys were used as test items. Within each list, the order of presentation

for the pairs of toys was determined randomly. This order, however, was held constant for all of the children.

Record Sheets. Three sets of record sheets were employed during the experiment. These sheets were used to record the children's recognition memory performance during the assessment periods of the three phases. Each set of record sheets had columns labelled stimulus toys, response toys, and other toys for each pair of toys used during that particular phase of the experiment.

Ancillary Materials. Cloth covers were used to cover stimulus and response toys before their presentation to the children. The covers were also used to conceal the stimulus toys from the children's view during assessment periods of the experiment when they were not being used. Shopping bags were used to store response toys after their presentation.

Procedure

The experiment was conducted in three phases. Phases 1 and 2 of the experiment were administered in immediate succession on the same day. Phase 3 was administered approximately one week later. Prior to the beginning of Phase 1, the familiarity of all of the toys that would be used in the experiment was tested by asking five 4-year-old and five 8-year-old children to label them. All of the children were able to correctly identify the toys.

During Phase 1, three groups of 4-year-old children received elaboration strategy training via modeling procedures. These trained children received imposed elaborations from an adult female model.

One group each of these children were exposed to either visual-maginal, verbal, or combined visual- imaginal and verbal elaborations. The performances of the children in these groups were compared to one another to determine the effectiveness of the modeling training of different sensory modality forms of elaborations. Further, the performance of these trained groups of children were compared to that of a group of untrained 4-year-old and a group of untrained 8-year-old children who had received control instructions (to remember the toy pairs) during Phase 1. These comparisons were created to provide additional information concerning the effectiveness of elaboration modeling training. Also, the performance of the untrained 4 and the untrained 8-year-old children were compared to one another to determine whether age effects would occur in the paired-associate learning efficiency of these children.

Phase 2 of the experiment was designed to investigate children's ability to generate induced elaboration strategies. Age differences in this ability were explored by making comparisons between the performance of groups of untrained 4- and untrained 8-year-old children under various instructional sets. The effectiveness of the modeling of imposed elaboration strategies immediately after training was analyzed also. Comparisons were made between the performance of each of the training groups of 4-year-old children under various instructional sets with the groups of untrained 4- and untrained 8-year-old children under the corresponding instructional sets. The effects of instructional set were studied in order to determine the

ability of each group of trained and untrained children to profit from use of elaboration strategies on a paired-associate task. The control instructional set was designed to determine each group of children's spontaneous generation of induced elaboration strategies. The instructional sets directing children to generate elaborations were designed to ascertain the children's ability to profit from direct prompting. Finally, the "manipulate toy pairs" instructional set was designed to assess the children's ability to beneficially use elaborations under an imposed maximal elaboration learning condition.

Phase 3 of the experiment was designed to answer all of the same questions that were addressed during Phase 2. However, it specifically was included to determine the effectiveness of Phase 1 elaboration training by modeling procedures after a one week delayed time interval.

The children were individually tested in each phase of the experiment. The experimenter sat on one side of a table facing each child. The child sat on the other side of the table facing the experimenter. All of the children completed the three phases. All appeared appropriately motivated, maintained eye contact with the experimenter, and complied with experimental instructions.

The paired-associate items in each phase were presented to each child for 10 seconds with a 5 second interval between trials. Two practice items were administered prior to the 15 test items in each phase to ensure that the children understood both experimental instructions and assessment procedures.

During Phase 1, the time for presenting elaborations via modeling was equated across the various forms. The presentation duration for all elaborations was 3 seconds. Each toy pair was placed on the table in front of the child for the remaining 7 seconds of that trial presentation.

Phase 1 Procedures. The 4-year-old children were randomly assigned to one of four experimental conditions with the provision that an equal number of boys and girls were placed in each condition. These conditions were imposed visual-imaginal elaboration training, imposed verbal elaboration training, imposed combined visual-imaginal and verbal elaboration training and nonmediational control. All of the 8-year-old children were assigned to a unprompted control condition. The general instructions given to all of the children during this phase were, "Today, we are going to play a game. I am going to show you some toys that go together. Try to remember that they belong together."

The 4-year-old children in the visual-imaginal elaboration training condition observed the adult model manipulate toy pairs according to a plan created prior to the experiment (see Appendix D for a list of these visually-presented elaborations). Each toy pair was then placed by the model side by side on the table in front of the children for the remainder of that trial presentation. The visual-imaginal elaboration list contained an interactive action sequence for each of the 17 paired-associate items used in Phase 1. These action sequences were constructed by embedding the paired-associate items in a visually meaningful context. Examples of

these visual-imaginal elaborations include a duck pulling a wagon, picking up a scarecrow by the seat of his pants with a pair of pliers, and a pig raking the table.

The 4-year-old children in the verbal elaboration training condition listened to the adult model describe a meaningful interaction between each toy pair which was placed on the table in front of them. These descriptions were provided by a list of verbal elaborations created prior to the experiment (see Appendix E for this list). This list contained 17 paired-associate items. Each description from this list embedded the stimulus and response labels of the toy pair in a meaningful sentence. These verbal elaborations were created in a way to correspond to the dynamic action sequences contained in the visual-imaginal elaboration list. Examples of the verbal elaborations included: "You pinch the scarecrow with pliers" and "The football player can't dry his hair with his helmet on".

The 4-year-old children in the combined visual-imaginal and verbal elaboration training condition both observed the adult model make each toy pair interact and also listened to her simultaneously descriptions of the interaction. The model then placed each toy pair on the table in front of the children for the remainder of that trial presentation. The visual-imaginal elaborations were identical to those used by the children in the visual-imaginal elaboration training condition. Also the verbal elaborations were the same as those used for the children in the verbal elaboration training condition. Both groups of the untrained 4- and the untrained 8-year-old children assigned to nonmediational control conditions

observed the adult model place each toy pair on the table in front of them.

Phase 2 Procedures. The trained 4-year-old children were randomly assigned to three Phase 2 instructional set conditions with the provision that an equal number of children and an equal number of boys and girls from each of the Phase 1 training conditions be placed in each instructional set condition. These instructional set conditions included control instructions, generate elaborations instructions, and manipulate toy pairs instructions. The untrained 4- and the untrained 8-year-old children were randomly assigned to five Phase 2 instructional prompt treatment conditions with the provision that an equal number of boys and girls be placed in each instructional prompt condition. The five instructional prompt conditions for the untrained children were designed to correspond to the three instructional prompt conditions of the trained 4-year-old children.

Since the untrained children had not been exposed to imposed elaborations during Phase 1, separate groups were now instructed to generate either induced visual-imaginal, induced verbal, or induced visual-imaginal and verbal elaborations. These instructional prompts correspond to the "use training strategy" instructional prompt created for the trained 4 year-old children. The five instructional prompts conditions for the untrained 4- and the untrained 8-year-old children included a control instruction, a generate induced visual-imaginal elaborations instruction, a generate induced verbal

elaborations instruction, a generate a combined visual-imaginal and verbal instruction, and a manipulate toy pairs instruction.

Phase 2 was administered immediately following Phase 1. The general instructions given to all of the children by the experimenter in this phase were, "Now, I have some more toys to show you. Try to remember which ones go together." Each toy pair was placed side by side on the table in front of each child across all treatment conditions.

The trained 4-, the untrained 4-, and the untrained 8-year-old children who received the control instruction were told to remember that the toys go together. However, they were not allowed to touch, manipulate or make any verbalizations about the toys. They received the same instruction for the two practice items prior to the test items.

The untrained 4-year-old children and the untrained 8-year-old children instructed to generate induced visual-imaginal elaborations as well as the trained 4-year-old children initially exposed to imposed visual-imaginal elaborations now instructed to generate induced elaborations by using the Phase 1 training strategy were told, "Form a picture in your head of the toys playing together". These children were not allowed to manipulate or verbalize about the toys. On the practice items, they were instructed to form a picture in their heads of the toys playing together. The children were then told, "Make the toys play together the way you pictured them in your head playing together". The children on these practice items received feedback from the experimenter concerning the adequacy of

the toy interactions. All of the children were able to make the toys play together meaningfully on the practice items.

The untrained 4-year-old children and the untrained 8-year-old children instructed to generate induced verbal elaborations as well as the trained 4-year-old children initially exposed to imposed verbal elaborations now instructed to generate elaborations by using the Phase 1 training strategy were told, "Make up a sentence about the toys playing together". These children were not allowed to touch or manipulate the toys. On the practice items, they were told to make up a sentence about the toys playing together. They received feedback from the experimenter about the adequacy of their sentences. All of the children were able to generate meaningful sentences for the practice items.

The untrained 4-year-old children and the untrained 8-year-old children instructed to generate induced combined visual-imaginal and verbal elaborations as well as trained 4-year-old children initially exposed to imposed combined visual-imaginal and verbal elaborations now instructed to generate induced elaborations by using the Phase 1 training strategy were told, "Form a picture in your head of the toys playing together," and "Make up a sentence about the toys playing together." On the practice items, these children were told to form a picture in their heads of the toys playing together. They were then told to make the toys play together the way they had formed a picture and to describe them in a sentence. They received feedback from the experimenter about the adequacy of both their toy interactions and their sentences. All of these children were able to make the toys

interact meaningfully and to generate meaningful sentences on the practice items.

The untrained 4-year-old, the untrained 8-year-old, and the trained 4-year-old children receiving the toy manipulation instruction were told to make the toys play together.

Phase 3 Procedures. During Phase 3, all subjects were assigned to the same instructional set conditions to which they had been assigned during Phase 2. Procedures for this phase were identical to those used in Phase 2. The general instructions given by the experimenter to all of the children across treatment conditions for this phase were, "Today, I have some new toys to show you. Try to remember how they go together".

Assessment Procedures. The same assessment procedures were used across all three phases of the experiment. Immediately after the 15 test items were presented to the children, they were administered a recognition memory test. The response toys were arrayed on the table in front of each child. The order of the response toys in the array was determined randomly prior to the experiment and was held constant for all children. Each stimulus toy was removed from beneath the cloth cover and placed on the table. The children were then instructed to hand the experimenter the toy from the response array that belonged with the stimulus toy. The experimenter recorded the children's responses on the record sheets. When a child handed the experimenter an incorrect toy, the experimenter recorded the name of that toy in the column marked "other toys". The response toy was

then returned to its position in the array and the stimulus toy was placed back in its position under the cloth cover before the beginning of the next trial.

Chapter 5

Results

The present research was conducted in three phases. The first phase was designed as a training session for the latter 2 phases. It also was designed to provide information concerning the nature of elaboration strategies presented to the learner through modeling techniques. It seemed desirable to determine whether such imposed strategy training would enhance 4-year-old children's performance. Additionally, it was important to ascertain whether visual elaboration training employing dynamic manipulation of object pairs by a model would yield results similar to those obtained in prior research with pictorial stimuli incorporated into learning materials. Phases 2 and 3 of the experiment were conducted in order to determine the effectiveness of modeling as a training technique in prompting 4-year-old children to induce or generate elaboration strategies. Phase 2 was designed to provide an index of this effectiveness immediately after training. Phase 3 was included to provide an estimate of the stability of this effectiveness after a one week delay interval.

During all three phases, comparisons in performance were made between 4-year-old children who had initially been exposed to a model using elaboration strategies and 4- and 8-year-old children who had not been exposed to such demonstrations. During Phases 2 and 3, the effectiveness of instructional set in prompting all of the groups of

children to use elaboration strategies also was explored. Further, the relative effectiveness of different forms of elaboration strategies was investigated under various testing conditions.

As a consequence of the number of hypotheses generated by this research and the amount of information to be presented, the results section was divided into three parts. For the purpose of readability, the hypotheses proposed and the findings relevant to those hypotheses were presented together within each section. The first part of the results section presents the hypotheses developed for Phase 1 and describes the relevant research findings. The next section of the results lists the specific research hypotheses advanced for Phases 2 and 3 along with the results. The final section describes the findings from the overall summary analyses performed on data from Phases 2 and 3.

Phase 1 Hypotheses and Research Findings

A 2 (sexes) by 5 (training conditions: untrained 8-year-olds, untrained 4-year-olds, trained 4-year-olds exposed to a model's visual elaborations, trained 4-year-olds exposed to a model's verbal elaborations, and trained 4-year-olds exposed to a model's combined visual and verbal elaborations) analysis of variance was conducted on the data from Phase 1. The means from this analysis are reported in Table 1. A main effect was found for the training groups variable, $F(4, 142) = 33.25, p \leq .01$ (see Table 2). Post hoc comparisons using Newman-Keuls procedures (Kirk, 1968) were performed on the data to determine between which training groups significant differences occurred.

TABLE 1
 Effects of Imposed Elaborations Presented Via Modeling on Children's
 Toy Pair Means

Group	Mean Number of Matches	Number of Subjects
Visual and verbal elaborations	11.54	28
Verbal elaborations	10.75	28
Visual elaborations	9.67	28
4-year-old control	5.43	28
8-year-old control	6.18	40

Note. The maximum number of correct toy pair matches is 15.

TABLE 2
 Phase 1 Analysis of Variance of Children's Toy Pair Associations
 (Training by Sex)

Source of variation	Sum of squares	Degrees of freedom	Mean square	F	Signif. of F
Training (T)	946.178	4	236.544	33.245	0.01**
Sex (S)	0.059	1	0.059	0.008	0.93
T x S	16.899	4	4.225	0.594	0.67
Residual	1010.367	142	7.115		
Total	1973.504	151			

** $p \leq .01$

The hypotheses that were predicted for Phase 1 regarding the effectiveness of imposed elaboration strategies presented to the learner by modeling procedures and the results that were obtained from the Newman-Keuls post hoc analysis are listed below:

1. Trained 4-year-old children ($M = 10.65$) were predicted to outperform untrained 4-year-old children ($M = 5.43$). This hypothesis was confirmed.
2. Trained 4-year-old children were predicted to perform as well as untrained 8-year-old children. Results indicated that the trained 4-year-old children ($M = 10.65$) performed significantly better than the untrained 8-year-old children ($M = 6.18$), $p < .05$.
3. Untrained 8-year-old children ($M = 6.18$) were predicted to outperform untrained 4-year-old children ($M = 5.43$). This hypothesis was not confirmed.
4. Trained 4-year-old children exposed to both a model's visual (manipulative) and verbal elaboration strategies ($M = 11.54$) were predicted to outperform trained 4-year-old children exposed to a model's visual (manipulative) elaboration strategies ($M = 9.67$). This hypothesis was confirmed, $p < .05$.
5. Trained 4-year-old children exposed to both a model's visual (manipulative) and verbal elaboration strategies ($M = 11.54$) were predicted to outperform trained 4-year-old children exposed to a model's verbal elaboration strategies ($M = 10.75$). This hypothesis was not confirmed.
6. Trained 4-year-old children exposed to a model's visual

(manipulative) elaboration strategies ($M = 9.67$) were predicted to outperform trained 4-year-old children exposed to a model's verbal elaboration strategies ($M = 10.75$). This hypothesis was not confirmed.

In briefly summarizing the results from Phase 1, the size of the training effects was marked. The groups of trained children ranged in mean performance of correctly matching 64% to 77% of the toy pairs. The mean performance across the trained groups was 71% of the toy pairs correctly matched. The untrained 8-year-old children's mean performance was 41% and that of the untrained 4-year-old children was 36%.

Phases 2 and 3 Specific Hypotheses and Research Findings:

Specific research hypotheses for Phases 2 and 3 addressed the effects of modeling training, instructional prompts, and sensory modality of induced elaboration strategies. The means used in conducting these contrasts can be found in Table 3. Standard deviations and standard errors used in these analyzes are presented in Table 4. All experimental groups in Phases 2 and 3 consisted of 8 subjects. Accordingly, the degrees of freedom for each a priori contrast was 14. For all directional contrasts, one-tailed t tests were used and for nondirectional contrasts, two-tailed t tests were used.

The specific hypotheses are enumerated below and are presented with the obtained data.

TABLE 3
Effects of Phase 1 Training, Instructional Prompts, and Sensory
Modality on Children's Toy Pair Means During Phases 2 and 3

Trained 4-year-old children					
Group (Phase 1 training)	Instructional prompts				
	Control	Use training strategy	Use training strategy	Use training strategy	Manipulate toys
Visual and verbal elaborations					
Phase 2	6.63	9.63	9.63	9.63	9.75
Phase 3	6.25	8.38	8.38	8.38	10.25
Verbal elaborations					
Phase 2	6.38	10.75	10.75	10.75	11.63
Phase 3	5.50	11.13	11.13	11.13	11.50
Visual elaborations					
Phase 2	5.13	8.63	8.63	8.63	9.13
Phase 3	5.88	8.50	8.50	8.50	10.63
Untrained 4- and 8-year-old children					
	Control	Use imaginal elab.	Use verbal elab.	Use imaginal & verbal elab.	Manipulate Toys
4-year-old control					
Phase 2	4.13	4.25	8.13	9.13	10.25
Phase 3	3.00	5.25	8.25	9.75	9.63
8-year-old control					
Phase 2	6.25	10.88	12.38	13.88	13.38
Phase 3	5.88	10.13	13.00	12.75	13.88

Note. The number of subjects in each cell is 8. The maximum number of toy pair matches is 15.

TABLE 4
 Standard Deviations and Standard Errors of Children's Toy Pair
 Associations for Phases 2 and 3

Group (training and prompt)	Standard Deviation	Standard Error
Visual-imaginal and verbal training		
Control instructions		
Phase 2	2.504	0.885
Phase 3	5.064	1.790
Visual-imaginal and verbal training		
Use training strategy		
Phase 2	2.326	0.882
Phase 3	3.543	1.253
Visual-imaginal and verbal training		
Manipulate toys		
Phase 2	3.284	1.161
Phase 3	3.770	1.333
Verbal training		
Control instructions		
Phase 2	3.021	1.068
Phase 3	3.117	1.102
Verbal training		
Use training strategy		
Phase 2	3.536	1.250
Phase 3	2.167	0.766
Verbal training		
Manipulate toys		
Phase 2	2.066	0.730
Phase 3	2.000	0.707
Visual-imaginal training		
Control instructions		
Phase 2	3.980	1.407
Phase 3	1.727	0.611

Visual-imaginal training		
Use training strategy		
Phase 2	4.207	1.487
Phase 3	4.472	1.581
Visual-imaginal training		
Manipulate toys		
Phase 2	2.800	0.990
Phase 3	2.825	0.999
4-year-old controls		
Control instructions		
Phase 2	4.224	1.493
Phase 3	2.619	0.926
4-year-old controls		
Use visual-imaginal elaborations		
Phase 2	2.605	0.921
Phase 3	3.105	1.098
4-year-old controls		
Use verbal elaborations		
Phase 2	3.399	1.202
Phase 3	2.915	1.031
4-year-old controls		
Use visual-imaginal and verbal elaborations		
Phase 2	2.100	0.743
Phase 3	3.655	1.292
4-year-old controls		
Manipulate toys		
Phase 2	3.012	1.065
Phase 3	2.973	1.051
8-year-old controls		
Control instructions		
Phase 2	2.964	1.048
Phase 3	2.800	0.990
8-year-old controls		
Use visual-imaginal elaborations		
Phase 2	3.137	1.109
Phase 3	4.764	1.684

8-year-old controls			
Use verbal elaborations			
Phase 2	3.335	1.179	
Phase 3	2.673	0.945	
8-year-old controls			
Use visual-imaginal and verbal elaborations			
Phase 2	2.100	0.743	
Phase 3	3.284	1.161	
8-year-old controls			
Manipulate toys			
Phase 2	1.847	0.653	
Phase 3	1.808	0.639	

Note. The number of children in each experimental group is 8.

I. Effectiveness of Phase 1 Modeling

A. Children's Spontaneous Use of Elaboration Strategies

After Phase 1 Modeling.

1. Trained 4-year-old children initially exposed to visual (manipulative) elaborations presented by a model and who later received control instructions (M = 5.13 in Phase 2 and 5.88 in Phase 3) were predicted to outperform untrained 4-year-old children who received control instructions (M = 4.13 in Phase 2 and 3.00 in Phase 3). The Phase 2 contrast was not significant but the Phase 3 contrast was significant ($t = 2.59, p < .01$).
2. Trained 4-year-old children initially exposed to a model's verbal elaborations and who later received control instructions (M = 6.38 in Phase 2 and 5.50 in Phase 3) were predicted to outperform untrained 4-year-old children who received control instructions (M = 4.13 in Phase 2 and 3.00 in Phase 3). The Phase 2 contrast was not significant but the Phase 3 contrast was significant ($t = 1.74, p = .05$).
3. Trained 4-year-old children initially exposed to both visual (manipulative) and verbal elaborations by a model and who later received control instructions (M = 6.63 in Phase 2 and 6.25 in Phase 3) were predicted to outperform untrained 4-year-old children who receive control instructions (M = 4.13 in Phase 2 and 3.00 in Phase 3). Both the Phase 2 contrast ($t = 1.44, p = .09$) and the

Phase 3 contrast ($t = 1.61$, $p = .07$) approached significance.

4. Trained 4-year-old children initially exposed to a model's visual elaborations and who later received control instructions ($M = 5.13$ in Phase 2 and 5.88 in Phase 3) were predicted to perform as well as 8-year-old children who received control instructions ($M = 6.25$ in Phase 2 and 5.88 in Phase 3). No significant difference was detected in the performance of these children in either phase.
5. Trained 4-year-old children initially exposed to a model's verbal elaborations and who later received control instructions ($M = 6.38$ in Phase 2 and 5.50 in Phase 3) were predicted to perform as well as 8-year-old children who received control instructions ($M = 6.25$ in Phase 2 and 5.88 in Phase 3). No significant difference in these children's performances was detected during either phase.
6. Trained 4-year-old children initially exposed to both visual (manipulative) and verbal elaborations by a model and who later received control instructions ($M = 6.63$ in Phase 2 and 6.25 in Phase 3) were predicted to perform as well as 8-year-old children who received control instructions ($M = 6.25$ in Phase 2 and 5.88 in Phase 3). No significant difference in the performance of these children was detected during either phase.

7. The 8-year-old children who received control instructions ($M = 6.25$ in Phase 2 and 5.88 in Phase 3) were predicted to outperform the untrained 4-year-old children who received control instructions ($M = 4.13$ in Phase 2 and 3.00 in Phase 3). The Phase 2 contrast was not significant but the Phase 3 contrast was significant ($t = 2.12, p = .03$).
8. Trained 4-year-old children initially exposed to visual elaborations by a model and who later received control instructions ($M = 5.13$ in Phase 2 and 5.88 in Phase 3) were predicted to perform as well as trained 4-year-old children initially exposed to verbal elaborations by a model and who later received control instructions ($M = 6.38$ in Phase 2 and 5.50 in Phase 3). No significant difference in the performance of these children was detected during either phase.
9. Trained 4-year-old children initially exposed to both visual and verbal elaborations by a model and who later received control instructions ($M = 6.63$ in Phase 2 and 6.25 in Phase 3) were predicted to outperform trained 4-year-old children initially exposed to visual elaborations by a model and who later received control instructions ($M = 5.13$ in Phase 2 and 5.88 in Phase 3). This hypothesis was not confirmed during either phase.
10. Trained 4-year-old children initially exposed to a model's both visual and verbal elaborations and who

later received control instructions ($M = 6.63$ in Phase 2 and 6.25 in Phase 3) were predicted to outperform trained 4-year-old children initially exposed to a model's verbal elaborations and who later received control instructions ($M = 6.38$ in Phase 2 and 5.50 in Phase 3). This hypothesis was not confirmed during either phase.

Summarizing the findings relevant to children's spontaneous use of induced elaborations after modeling, no significant differences were found among any of the Phase 1 training groups during Phase 2. However, during Phase 3 in that set, the trained 4-year-olds initially exposed to a model's visual (manipulative) or verbal elaborations outperformed the untrained 4-year-olds (all $p_s \leq .05$).

In addition, trained 4-year-olds exposed to a model's visual (manipulative) and verbal elaborations tended to outperform ($p < .09$ in Phase 2 and $.07$ in Phase 3) the untrained 4-year-olds. No significant differences were detected between the performance of the trained 4- and the untrained 8-year-olds during Phase 3.

B. Children's Ability to Profit from Prompts to Use Elaboration Strategies after Phase 1 Modeling.

11. Trained 4-year-old children initially exposed to a model's visual (manipulative) elaborations and who later received instructions to generate imaginal elaborations ($M = 8.63$ in Phase 2 and 8.50 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to use imaginal elaborations ($M = 4.25$ in Phase 2 and 5.25 in Phase 3). The contrast for Phase 2

($t = 2.50$, $p = .01$) was significant and the contrast for Phase 3 ($t = 1.69$, $p = .06$) approached significance.

12. Four-year-old children trained to use verbal elaborations and who later received instructions to use them ($M = 10.75$ in Phase 2 and 11.13 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to use verbal elaborations ($M = 8.13$ in Phase 2 and 8.25 in Phase 3). The Phase 2 contrast approached significance ($t = 1.51$, $p = .08$) and the Phase 3 contrast was significant ($t = 2.24$, $p = .02$).
13. Four-year-old children trained to use both imaginal and verbal elaborations and who later received instructions to use both elaborations ($M = 9.63$ in Phase 2 and 8.38 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to use both imaginal and verbal elaborations ($M = 9.13$ in Phase 2 and 9.75 in Phase 3). This hypothesis was not confirmed during either phase.
14. Four-year-old children trained to use imaginal elaborations and who later received instructions to use them ($M = 8.63$ in Phase 2 and 8.50 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to use imaginal elaborations ($M = 10.88$ in Phase 2 and 10.13 in Phase 3). No significant difference in these children's performances was detected

- during either phase.
15. Four-year-old children trained to use verbal elaborations and who later received instructions to use them ($M = 10.75$ in Phase 2 and 11.13 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to use verbal elaborations ($M = 12.38$ in Phase 2 and 13.00 in Phase 3). No significant difference was detected in these children's performance during either phase.
 16. Four-year-old children trained to use both imaginal and verbal elaborations and who later received instructions to use them both ($M = 9.63$ in Phase 2 and 8.38 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to use both imaginal and verbal elaborations ($M = 13.88$ in Phase 2 and 12.75 in Phase 3). No differences reached significance during either phase.
 17. The 8-year-old children who received instructions to use imaginal elaborations ($M = 10.88$ in Phase 2 and 10.13 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to use imaginal elaborations ($M = 4.25$ in Phase 2 and 5.25 in Phase 3). Both the Phase 2 contrast ($t = 4.60$, $p = .01$) and the Phase 3 contrast ($t = 2.42$, $p = .02$) were significant.
 18. The 8-year-old children who received instructions to

use verbal elaborations ($M = 12.38$ in Phase 2 and 13.00 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to use verbal elaborations ($M = 8.13$ in Phase 2 and 8.25 in Phase 3). Both the Phase 2 contrast ($t = 2.52$, $p = .01$) and the Phase 3 contrast ($t = 3.40$, $p = .01$) were significant.

19. The 8-year-old children who received instructions to use both imaginal and verbal elaborations ($M = 13.88$ in Phase 2 and 12.75 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to use both imaginal and verbal elaborations ($M = 9.13$ in Phase 2 and 9.75 in Phase 3). Both the Phase 2 contrast ($t = 4.52$, $p = .01$) and the Phase 3 contrast ($t = 1.73$, $p = .05$) were significant.
20. Four-year-old children trained to use imaginal elaborations and who later received instructions to use them ($M = 8.63$ in Phase 2 and 8.50 in Phase 3) were predicted to perform as well as 4-year-old children trained to use verbal elaborations and who later received instructions to use verbal elaborations ($M = 10.75$ in Phase 2 and 11.13 in Phase 3). These differences did not reach statistical significance during either phase.
21. Four-year-old children trained to use both imaginal and verbal elaborations and who later received instructions to use them both ($M = 9.63$ in Phase 2 and 8.38 in

- Phase 3) were expected to outperform 4-year-old children trained to use imaginal elaborations and who later received instructions to use imaginal elaborations ($M = 8.63$ in Phase 2 and 8.50 in Phase 3). This hypothesis was not confirmed during either phase.
22. Four-year-old children trained to use both imaginal and verbal elaborations and who later received instructions to use them both ($M = 9.63$ in Phase 2 and 8.38 in Phase 3) were expected to outperform 4-year-old children trained to use verbal elaborations and who later received instructions to use verbal elaborations ($M = 10.75$ in Phase 2 and 11.13 in Phase 3). This hypothesis was not confirmed. During Phase 3, 4-year-old children trained and prompted to use verbal elaborations, contrary to prediction, significantly outperformed 4-year-old children trained and prompted to use both visual and verbal elaborations ($t = -1.87$, $p = .04$).
23. Untrained 4-year-old children who received instructions to use verbal elaborations ($M = 8.13$ in Phase 2 and 8.25 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to use imaginal elaborations ($M = 4.25$ in Phase 2 and 5.25 in Phase 3). Both the Phase 2 contrast ($t = 2.56$, $p = .01$) and the Phase 3 contrast ($t = 1.99$, $p = .03$) were significant.
24. Untrained 4-year-old children who received instructions

to use verbal elaborations (M = 8.13 in Phase 2 and 8.25 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to use both imaginal and verbal elaborations (M = 9.13 in Phase 2 and 9.75 in Phase 3). This hypothesis was not confirmed in either phase.

25. Untrained 4-year-old children who received instructions to use both imaginal and verbal elaborations (M = 9.13 in Phase 2 and 9.75 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to use imaginal elaborations (M = 4.25 in Phase 2 and 5.25 in Phase 3). Both the Phase 2 contrast ($\underline{t} = 4.12$, $p = .01$) and the Phase 3 contrast ($\underline{t} = 2.65$, $p = .01$.) were significant.
26. The 8-year-old children who received instructions to use imaginal elaborations (M = 10.88 in Phase 2 and 10.13 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to use verbal elaborations (M = 12.38 in Phase 2 and 13.00 in Phase 3). No significant difference in the performance of these children was detected during either phase.
27. The 8-year-old children who received instructions to use both imaginal and verbal elaborations (M = 13.88 in Phase 2 and 12.75 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions

to use imaginal elaborations ($M = 10.88$ in Phase 2 and 10.13 in Phase 3). During Phase 2, children instructed to use both elaborations significantly outperformed those instructed to use imaginal elaborations ($t = 2.25$, $p = .04$).

28. The 8-year-old children who received instructions to use both imaginal and verbal elaborations ($M = 13.88$ in Phase 2 and 12.75 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to use verbal elaborations ($M = 12.38$ in Phase 2 and 13.00 in Phase 3). No significant difference was detected in these children's performance during either phase.

In summary, children's ability to profit from instructions to use or induce elaborations after modeling was found to vary according to children's Phase 1 training conditions. The 8-year-olds significantly outperformed the untrained 4-year-olds during both phases regardless of the type of elaborations that the children were instructed to use (all p 's $< .05$). The 8-year-old children who were instructed to induce both imaginal and verbal elaborations also significantly outperformed the trained 4-year-olds who received these instructions during both phases (p 's $< .05$). No significant differences were detected, however, during either phase between the performances of the 8- and trained 4-year-olds who were instructed to induce imaginal or verbal elaborations.

In addition, the trained 4-year-olds outperformed the untrained 4-year-olds during Phase 2 when both groups were instructed to use imaginal elaborations ($p = .01$) and in Phase 3, when both groups received instructions to use verbal elaborations ($p = .02$). The performance of the trained 4-year-old children who were instructed to use imaginal elaborations in comparison to that of the untrained 4-year-olds receiving the same instructions approached significance during Phase 3 ($p = .06$). Likewise, the performance of the trained 4-year-old children compared to the performance of the untrained 4-year-old children who were instructed to use verbal elaborations approached significance during Phase 2 ($p = .08$). No significant differences were found during either phase between the performance of the trained and untrained 4-year-olds who were instructed to use both imaginal and verbal elaborations. Among the groups of trained 4-year-old children, only one significant finding was detected. During Phase 3, children trained and instructed to use verbal elaborations outperformed children trained and instructed to use both imaginal and verbal elaborations ($p = .04$).

C. Children's Ability to Profit from Instructions to Manipulate Toy Pairs after Phase 1 Modeling.

29. Four-year-old children trained to use imaginal elaborations and who later received instructions to manipulate toy pairs ($M = 9.13$ in Phase 2 and 10.63 in Phase 3) were expected to outperform untrained 4-year-old children who were instructed to manipulate toy pairs ($M = 10.25$ in Phase 2 and 9.63 in Phase 3). This hypothesis

was not confirmed.

30. Four-year-old children trained to use verbal elaborations and who later received instructions to manipulate toy pairs ($M = 11.63$ in Phase 2 and 11.50 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to manipulate toy pairs ($M = 10.25$ in Phase 2 and 9.63 in Phase 3). The Phase 2 contrast not significant but the Phase 3 contrast approached significance ($t = 1.48$, $p = .08$).
31. Four-year-old children trained to use both imaginal and verbal elaborations and who later received instructions to manipulate toy pairs ($M = 9.75$ in Phase 2 and 10.25 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to manipulate toy pairs ($M = 10.25$ in Phase 2 and 9.63 in Phase 3). This hypothesis was not confirmed.
32. Four-year-old children trained to use imaginal elaborations and who later received instructions to manipulate toy pairs ($M = 9.13$ in Phase 2 and 10.63 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to manipulate toy pairs ($M = 13.38$ in Phase 2 and 13.88 in Phase 3). The 8-year-old children significantly outperformed the 4-year-old children during both Phase 2 ($t = -3.58$, $p = .01$) and Phase 3 ($t = -2.74$, $p = .02$).
33. Four-year-old children trained to use verbal elaborations

and who later received instructions to manipulate toy pairs ($M = 11.63$ in Phase 2 and 11.50 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to manipulate toy pairs ($M = 13.38$ in Phase 2 and 13.88 in Phase 3). The 8-year-old children during Phase 2 almost significantly outperformed the 4-year-old children ($t = -1.79$, $p = .10$). During Phase 3, the 8-year-old children did significantly outperform the 4-year-old children ($t = -2.49$, $p = .03$).

34. Four-year-old children trained to use both imaginal and verbal elaborations and who later received instructions to manipulate toy pairs ($M = 9.75$ in Phase 2 and 10.25 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to manipulate toy pairs ($M = 13.38$ in Phase 2 and 13.88 in Phase 3). The 8-year-old significantly outperformed the 4-year-old children during both Phase 2 ($t = -2.72$, $p = .02$) and Phase 3 ($t = -2.45$, $p = .03$).
35. The 8-year-old children who received instructions to manipulate toy pairs ($M = 13.38$ in Phase 2 and 13.88 in Phase 3) were expected to outperform untrained 4-year-old children who received instructions to manipulate toy pairs ($M = 10.25$ in Phase 2 and 9.63 in Phase 3). Both the Phase 2 contrast ($t = 2.50$, $p = .01$) and the Phase 3 contrast ($t = 3.45$, $p = .01$) were

significant.

36. Four-year-old children trained to use imaginal elaborations and who later received instructions to manipulate toy pairs ($M = 9.13$ in Phase 2 and 10.63 in Phase 3) were expected to outperform 4-year-old children trained to use verbal elaborations and who later received instructions to manipulate toy pairs ($M = 11.63$ in Phase 2 and 11.50 in Phase 3). This hypothesis was not confirmed. During Phase 2, children trained to use verbal elaborations who were prompted to manipulate the toys significantly outperformed children trained to use imaginal elaborations who were prompted to manipulate the toys ($t = -2.03$, $p = .03$).
37. Four-year-old children trained to use both imaginal and verbal elaborations and who later received instructions to manipulate toy pairs ($M = 9.75$ in Phase 2 and 10.25 in Phase 3) were expected to outperform 4-year-old children trained to use imaginal elaborations and who later received instructions to manipulate toy pairs ($M = 9.13$ in Phase 2 and 10.63 in Phase 3). This hypothesis was not confirmed.
38. Four-year-old children trained to use both imaginal and verbal elaboration and who later received instructions to manipulate toy pairs ($M = 9.75$ in Phase 2 and 10.25 in Phase 3) were predicted to outperform 4-year-old children trained to use verbal elaboration and

who later received instructions to manipulate toy pairs ($M = 11.63$ in Phase 2 and 11.50 in Phase 3). This hypothesis was not confirmed. During Phase 2, children trained to use verbal elaboration and prompted to manipulate the toys almost significantly outperformed children trained to use both imaginal and verbal elaboration and prompted to manipulate the toys ($t = -1.37$, $p = .10$).

In summary, the findings concerning children's ability to profit from instructions to manipulate toy pairs after modeling training, performances of trained 4-, untrained 4-, and untrained 8-year-old children were varied. The 8-year-old children who were instructed to manipulate toy pairs significantly outperformed 4-year-olds trained to use either imaginal or both imaginal and verbal elaborations and who later were instructed to manipulate toy pairs during Phases 2 and 3 (p 's $< .05$). The 8-year-old children also significantly outperformed the untrained 4-year-olds who were instructed to manipulate toy pairs in both phases (p 's $\leq .01$).

Furthermore, the performance of the 8-year-olds instructed to manipulate toy pairs was significantly better than trained 4-year-olds initially exposed to a model's verbal elaborations and who later were instructed to manipulate toy pairs in Phase 3 ($p = .03$). Within this instructional condition, 8-year-olds outperformed ($p < .10$) the 4-year-olds trained to use verbal elaborations and who later received instructions to manipulate toy pairs during Phase 2. Among the trained 4-year-old children, those initially exposed to

a model's verbal elaborations and who later were instructed to manipulate toy pairs significantly outperformed those initially exposed to a model's visual (manipulative) elaborations and who were later instructed to manipulate toy pairs during Phase 2 ($p = .03$). No other significant differences were found among the performances of the trained 4-year-old children. Also no significant differences were detected between the performance of the untrained 4-year-old children instructed to manipulate toy pairs and any group of the trained 4-year-olds receiving that instruction during either phase of the experiment.

II. Effectiveness of Instructional Prompts

A. The Effectiveness of Instructions to Manipulate Toy Pairs Contrasted with Control Instructions.

39. Four-year-old children trained to use imaginal elaboration and who later received instructions to manipulate toy pairs ($M = 9.13$ in Phase 2 and 10.63 in Phase 3) were predicted to outperform 4-year-old children trained to use imaginal elaboration and who later received control instructions ($M = 5.13$ in Phase 2 and 5.88 in Phase 3). Both the Phase 2 contrast ($t = 2.33$, $p = .02$) and the Phase 3 contrast ($t = 4.06$ for, $p = .01$) were significant.
40. Four-year-old children trained to use verbal elaboration and who later received instructions to manipulate toy pairs ($M = 11.63$ in Phase 2 and 11.50 in Phase 3) were predicted to outperform 4-year-old children trained to

use verbal elaboration and who later received control instructions ($M = 6.38$ in Phase 2 and 5.50 in Phase 3). Both the Phase 2 contrast ($t = 4.06, p = .01$) and the Phase 3 contrast ($t = 4.58, p = .01$) were significant.

41. Four-year-children trained to use both imaginal and verbal elaboration and who later received instructions to manipulate toy pairs ($M = 9.75$ in Phase 2 and 10.25 in Phase 3) were predicted to outperform 4-year-old children trained to use both imaginal and verbal elaboration and who later received control instructions ($M = 6.63$ in Phase 2 and 6.25 in Phase 3). Both the Phase 2 contrast ($t = 2.14, p = .03$) and the Phase 3 contrast ($t = 1.79, p = .05$) were significant.
42. Untrained 4-year-old children who received instructions to manipulate toy pairs ($M = 10.25$ in Phase 2 and 9.63 in Phase 3) were predicted to outperform untrained 4-year-old children who received control instructions ($M = 4.13$ in Phase 2 and 3.00 in Phase 3). Both the Phase 2 contrast ($t = 3.34, p = .01$) and the Phase 3 contrast ($t = 4.73, p = .01$) were significant.
43. The 8-year-old children who received instructions to manipulate toy pairs ($M = 13.38$ in Phase 2 and 13.88 in Phase 3) were predicted to outperform 8-year-old children who received control instructions ($M = 6.25$ in Phase 2 and 5.88 in Phase 3). Both the Phase 2 contrast ($t =$

5.77, $p = .01$) and the Phase 3 contrast ($t = 6.79$, $p = .01$) were significant.

Briefly summarizing the above findings, all of the children benefited significantly more from instructions to manipulate toy pairs than they did from nonmediational control instructions to remember the toy pairs during both phases of the experiment (all p 's $< .05$).

B. The Effectiveness of Instructions to Manipulate Toy Pairs Compared to Instructions to Use Induced Elaborators.

44. Four-year-old children trained to use imaginal elaboration and who later received instructions to manipulate toy pairs ($M = 9.13$ in Phase 2 and 10.63 in Phase 3) were predicted to outperform 4-year-old children trained to use imaginal elaboration and who later received instructions to use imaginal elaboration ($M = 8.63$ in Phase 2 and 8.50 in Phase 3). This hypothesis was not confirmed.
45. Four-year-old children trained to use verbal elaboration and who later received instructions to manipulate toy pairs ($M = 11.63$ in Phase 2 and 11.50 in Phase 3) were predicted to outperform 4-year-old children trained to use verbal elaboration and who later received instructions to use verbal elaboration ($M = 10.75$ in Phase 2 and 11.13 in Phase 3). This hypothesis was not confirmed.
46. Four-year-old children trained to both both imaginal

and verbal elaboration and who later received instructions to manipulate toy pairs ($M = 9.75$ in Phase 2 and 10.25 in Phase 3) were predicted to outperform 4-year-old children trained to use both imaginal and verbal elaboration and who later received instructions to use both imaginal and verbal elaboration ($M = 9.63$ in Phase 2 and 8.38 in Phase 3). This hypothesis was not confirmed.

47. Untrained 4-year-old children who received instructions to manipulate toy pairs ($M = 10.25$ in Phase 2 and 9.63 in Phase 3) were predicted to outperform untrained 4-year-old children who received instructions to use imaginal elaboration ($M = 4.25$ in Phase 2 and 5.25 in Phase 3). Both the Phase 2 contrast ($t = 4.26, p = .01$) and the Phase 3 contrast ($t = 2.88, p = .01$) were significant.
48. Untrained 4-year-old children who received instructions to manipulate toy pairs ($M = 10.25$ in Phase 2 and 9.63 in Phase 3) were predicted to outperform untrained 4-year-old children who received instructions to use verbal elaboration ($M = 8.13$ in Phase 2 and 8.25 in Phase 3). This hypothesis was not confirmed.
49. Untrained 4-year-old children who received instructions to manipulate toy pairs ($M = 10.25$ in Phase 2 and 9.63 in Phase 3) were predicted to outperform untrained 4-year-old children who received instructions to use both

- imaginal and verbal elaboration ($M = 9.13$ in Phase 2 and 9.75 in Phase 3). This hypothesis was not confirmed.
50. The 8-year-old children who received instructions to use imaginal elaboration ($M = 10.88$ in Phase 2 and 10.13 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to manipulate toy pairs ($M = 13.38$ in Phase 2 and 13.88 in Phase 3). Contrary to prediction, during both Phase 2 ($t = -1.94$, $p = .07$) and Phase 3 ($t = -2.08$, $p = .06$), 8-year-old children who manipulated the toys tended to outperform those who were prompted to use imaginal elaboration.
51. The 8-year-old children who received instructions to use verbal elaboration ($M = 12.38$ in Phase 2 and 13.00 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to manipulate toy pairs ($M = 13.38$ in Phase 2 and 13.88 in Phase 3). No significant difference was detected in the performance of these children during either phase.
52. The 8-year-old children who received instructions to use both imaginal and verbal elaboration ($M = 13.88$ in Phase 2 and 12.75 in Phase 3) were predicted to perform as well as 8-year-old children who received instructions to manipulate toy pairs ($M = 13.38$ in Phase 2 and 13.88 in Phase 3). No significant difference in these children's performance was detected during either phase.

Summarizing these findings, no significant differences were found between the untrained 8-year-olds, the untrained 4-year-olds, and the trained 4-year-old children who were instructed to use verbal or both imaginal and verbal elaboration and those who were instructed to manipulate the toys. Similarly, it was found that the trained 4-year-olds' ability to benefit from instructions to use imaginal elaboration and their ability to profit from instructions to manipulate toy pairs did not differ significantly during either phase. However, the untrained 4-year-olds significantly benefited more from manipulating toy pairs than they did from instructions to use imaginal elaboration in both Phases 2 and 3 (p 's $< .01$). In terms of the performance of the 8-year-olds, children's ability to perform better under instructions to manipulate toy pairs as contrasted to instructions to use imaginal elaboration approached significance both in Phase 2, ($p = .07$) and in Phase 3, ($p = .06$).

C. The Effectiveness of Prompts to Use Elaborations Compared to Control Instructions.

53. Four-year-old children trained to use imaginal elaboration and who later received instructions to use imaginal elaboration ($M = 8.63$ in Phase 2 and 8.50 in Phase 3) were predicted to outperform 4-year-old children trained to use imaginal elaboration and who later received control instructions ($M = 5.13$ in Phase 2 and 5.88 in Phase 3). The Phase 2 contrast was significant ($t = 1.71$, $p = .05$) and the Phase 3 contrast approached significance ($t = 1.55$, $p = .07$).

54. Four-year-old children trained to use verbal elaboration and who later received instructions to use verbal elaboration ($M = 10.75$ in Phase 2 and 11.13 in Phase 3) were predicted to outperform 4-year-old children trained to use verbal elaboration and who later received control instructions ($M = 6.38$ in Phase 2 and 5.50 in Phase 3). Both the Phase 2 contrast ($t = 2.66, p = .01$) and the Phase 3 contrast ($t = 4.19, p = .01$) were significant.
55. Four-year-old children trained to use combined imaginal and verbal elaboration and who later received instructions to use both imaginal and verbal elaboration ($M = 9.63$ in Phase 2 and 8.38 in Phase 3) were predicted to outperform 4-year-old children trained to use both imaginal and verbal elaboration and who later received control instructions ($M = 6.63$ in Phase 2 and 6.25 in Phase 3). The Phase 2 contrast ($t = 2.48, p = .01$) was significant, but the Phase 3 contrast was not.
56. Untrained 4-year-old children who received control instructions ($M = 4.13$ in Phase 2 and 3.00 in Phase 3) were predicted to perform as well as untrained 4-year-old children who received instructions to use imaginal elaboration ($M = 4.25$ in Phase 2 and 5.25 in Phase 3). No significant difference in these children's performance was detected during either phase.
57. Untrained 4-year-old children who received instructions

to use verbal elaboration ($M = 8.13$ in Phase 2 and 8.25 in Phase 3) were predicted to outperform untrained 4-year-old children who received control instructions ($M = 4.13$ in Phase 2 and 3.00 in Phase 3). Both the Phase 2 contrast ($t = 2.09$, $p = .03$) and the Phase 3 contrast ($t = 3.79$, $p = .01$) were significant.

58. Untrained 4-year-old children who received instructions to use both imaginal and verbal elaboration ($M = 9.13$ in Phase 2 and 9.75 in Phase 3) were predicted to outperform untrained 4-year-old children who received control instructions ($M = 4.13$ in Phase 2 and 3.00 in Phase 3). Both the Phase 2 contrast ($t = 3.00$, $p = .01$) and the Phase 3 contrast ($t = 4.25$, $p = .01$) were significant.
59. The 8-year-old children who received instructions to use imaginal elaboration ($M = 10.88$ in Phase 2 and 10.13 in Phase 3) were predicted to outperform 8-year-old children who received control instructions ($M = 6.25$ in Phase 2 and 5.88 in Phase 3). Both the Phase 2 contrast ($t = 3.03$, $p = .01$) and the Phase 3 contrast ($t = 2.18$, $p = .02$) were significant.
60. The 8-year-old children who received instructions to use verbal elaboration ($M = 12.38$ in Phase 2 and 13.00 in Phase 3) were predicted to outperform 8-year-old children who received control instructions ($M = 6.25$ in Phase 2 and 5.88 in Phase 3). Both the Phase 2 contrast

($t = 3.88$, $p = .01$) and the Phase 3 contrast ($t = 5.21$, $p = .01$) were significant.

61. The 8-year-old children who received instructions to use both imaginal and verbal elaboration ($M = 13.88$ in Phase 2 and 12.75 in Phase 3) were predicted to outperform 8-year-old children who received control instructions ($M = 6.25$ in Phase 2 and 5.88 in Phase 3). Both the Phase 2 contrast ($t = 5.94$, $p = .01$) and the Phase 3 contrast ($t = 4.51$, $p = .01$) were significant.

In summary, 8-year-olds profited significantly more from all of the elaboration instructions than they did from the control instructions during both phases (all p s $< .05$). Furthermore, it was found that the trained and untrained 4-year-olds benefited more from instructions to use verbal elaborations than they did from the control instructions in Phases 2 and 3 (all p 's $< .05$). Additionally, the trained 4-year-olds were able to benefit significantly more from instructions to use imaginal elaboration than they could from control instructions during Phase 2 ($p = .05$). This ability approached significance during Phase 3 ($p = .07$). Untrained 4-year-olds were unable to benefit any more from instructions to use imaginal elaboration than they were from the control instructions during either phase. Concerning the efficacy of instructions to use both imaginal and verbal elaboration, the trained and the untrained 4-year-olds benefited significantly more from these instructions than they did from control instructions during Phase 2 (p 's $< .05$).

However, during Phase 3, the untrained 4-year-olds were again able to benefit significantly from these instructions more than from control instructions, ($p < .01$), whereas the trained 4-year-olds were not.

A brief synopsis of the results from the Phases 2 and 3 a priori contrasts indicates that 21 of the 43 directional hypotheses were confirmed during Phase 2 and 24 were confirmed during Phase 3. Two hypotheses approached significance during Phase 2 and three approached significance during Phase 3. Of the 18 nondirectional hypotheses, 12 were confirmed during Phase 2 and 12 were confirmed during Phase 3.

Although it is technically not possible to confirm the null hypothesis because a variety of factors can lead to nonsignificance such as reliability or lack of experimental control, conclusions were drawn about nonsignificant differences in the present study because of the high level of experimental control that was introduced into the procedure and the widespread presence of significant differences among trained and untrained groups indicating that the dependent measures were in fact reliable.

An indication of the size of the effects among the groups of children shows that trained children who received the control instructions correctly matched on the average 40% of the toy pairs during Phase 2 and 40% during Phase 3, untrained 4-year-old children averaged matching correctly 28% of the toy pairs during Phase 2 and 20% during Phase 3, and untrained 8-year-old children averaged matching correctly 42% of the toy pairs during Phase 2 and 40% during Phase 3.

For groups of children who were prompted to use imaginal elaborations, trained children averaged matching correctly 58% of the toy pairs during Phase 2 and 57% during Phase 3. Untrained 4-year-old children's mean performance under this prompt was 28% of correct matches during Phase 2 and 35% during Phase 3. The 8-year-old children averaged correctly matching 73% of the toy pairs during Phase 2 and 68% during Phase 3.

Under the prompt to use verbal elaborations, trained children averaged 72% of the matches during Phase 2 and 74% during Phase 3. Untrained 4-year-old children correctly matched on the average 54% of the toy pairs during Phase 2 and 55% during Phase 3. The untrained 8-year-old children averaged 83% of the matches during Phase 2 and 87% during Phase 3.

For groups of children who received the prompt to use imaginal and verbal elaborations, trained children averaged 64% of the matches during Phase 2 and 56% during Phase 3. Untrained 4-year-old children averaged 61% of the matches during Phase 2 and 65% during Phase 3. The 8-year-old children correctly matched on the average 93% of the toys under this prompt during Phase 2 and 85% during Phase 3.

Under the prompt to manipulate toys, the trained children averaged correctly matching 68% of the toys during Phase 2 and 72% of the toys during Phase 3. Untrained 4-year-old children's mean performance was 68% of the matches during Phase 2 and 64% during Phase 3. The 8-year-old children correctly matched on the average 89% of the toy pairs during Phase 2 and 93% during Phase 3.

Phases 2 and 3 Summary Analysis

The use of a full factorial design for conducting the overall summary analysis of the data from Phases 2 and 3 was precluded because the instructional prompt variable was nested within the Phase 1 training variable. In order to ensure tight control, each group of trained 4-year-old children was exposed to only one sensory modality form of elaboration during Phase 1. During Phases 2 and 3, the groups of trained children in the "use training strategy" prompting condition were told to use the elaboration strategy in which they had received training during Phase 1. However, groups of untrained 4- and untrained 8-year-old children who had not received any elaboration training during Phase 1 were instructed to use either imaginal, verbal, or both imaginal and verbal elaboration. Consequently, the data of the trained 4-year-old children was analyzed separately from that of the untrained 4- and the untrained 8-year-old children for the summary analysis of Phases 2 and 3. The only hypothesis proposed for this summary was that a similar pattern of results would be obtained from both phases of the experiment.

The data for the trained 4-year-old children were analyzed using a 2 (sexes) by 3 (Phase 1 training conditions: imposed visual, imposed verbal, and imposed both visual and verbal elaboration) by 3 (instructional prompts: control, use training strategy elaboration, and manipulate toy pairs) by 2 (phases) repeated analysis of variance. Sexes, Phase 1 training conditions, and instructional prompts were entered as between-subjects factors and phases was entered as the within-subjects factor.

This analysis (see Table 5) indicated that instructional prompts significantly influenced the performance of the trained 4-year-old children during Phases 2 and 3, $F(2,54) = 15.810$, $p < .01$. Newman-Keuls procedures (Kirk, 1968) revealed that children who were instructed to use the type of elaboration modeled during training ($M = 9.92$) as well as those who were instructed to manipulate toy pairs ($M = 10.06$) significantly outperformed children who received control ($M = 5.96$) instructions (both p 's $< .01$). However, children who were instructed to use the elaboration strategy that was modeled during training and those who were instructed to manipulate toy pairs did not significantly in performance. No significant differences were detected in effectiveness among the sensory modality forms of elaboration that were initially modeled for the children. Neither were any sex or phase differences found.

A repeated measures analysis of variance was also performed on the Phases 2 and 3 data of the untrained 4- and 8-year-old children. A 2 (sexes) by 2 (Phase 1 training conditions: 4-year-old control and 8-year-old control) by 5 (instructional prompts: control, use imaginal elaboration, use verbal elaboration, use both imaginal and verbal elaboration, and manipulate toy pairs) by 2 (phases) design was employed. Sexes, Phase 1 training conditions, and instructional prompts were again entered as between-subjects factors. Phases was again entered as the within-subjects factor.

This analysis (see Table 6) indicated that both Phase 1 training conditions, $F(1,60) = 46.83$, $p < .01$, and instructional prompts, $F(4,60) = 19.67$, $p < .01$, significantly influenced the untrained

TABLE 5
 Repeated Measures Analysis of Variance for Trained 4-Year-Old
 Children's Toy Pair Associations During Phases 2 and 3
 (Training, Prompts and Sex)

Source of variation	Sum of squares	Degrees of freedom	Mean square	F	Signif. of F
Within cells (WC)	927.375	54	17.174		
Sex (S)	31.174	1	31.174	1.815	0.18
Training (T)	56.000	2	28.000	1.630	0.21
Prompts (P)	543.041	2	271.521	15.810	0.01**
S x T	14.222	2	7.111	0.414	0.66
S x P	24.347	2	12.174	0.709	0.50
T x P	30.458	4	7.615	0.443	0.78
S x T x P	8.819	4	2.205	0.128	0.97
Phases (Ph)	0.062	1	0.062	0.011	0.92
S x Ph	10.562	1	10.562	1.829	0.18
T x Ph	8.167	2	4.083	0.707	0.50
P x Ph	6.292	2	3.146	0.545	0.58
S x T x Ph	0.167	2	0.083	0.014	0.99
S x P x Ph	2.375	2	1.187	0.206	0.82
T x P x Ph	8.292	4	2.073	0.359	0.84
S x T x P x Ph	9.708	4	2.427	0.420	0.79
Ph x WC	311.875	54	5.775		
Total	1992.935	143	13.937		

** $p \leq .01$

Note. The total number of subjects is 72.

TABLE 6
 Repeated Measures of Variance for Untrained 4- and 8-Year-Old
 Children's Toy Pair Associations During Phases 2 and 3
 (Training, Prompts, and Sex)

Source of variation	Sum of squares	Degrees of freedom	Mean square	F	Signif. of F
Within cells (WC)	845.875	60	14.098		
Sex (S)	29.756	1	29.756	2.111	0.15
Training (T)	660.156	1	660.156	46.827	0.01**
Prompts (P)	1108.975	4	277.244	19.666	0.01**
S x T	3.306	1	3.306	0.235	0.63
S x P	61.025	4	15.256	1.082	0.37
T x P	45.250	4	11.312	0.802	0.53
S x T x P	116.350	4	29.087	2.063	0.10
Phases (Ph)	0.506	1	0.506	0.143	0.71
S x Ph	0.056	1	0.056	0.016	0.90
T x Ph	0.506	1	0.506	0.143	0.71
P x Ph	5.775	4	1.444	0.408	0.81
S x T x Ph	0.056	1	0.056	0.016	0.90
S x P x Ph	21.475	4	5.369	1.517	0.21
T x P x Ph	15.900	4	3.975	1.123	0.36
S x T x P x Ph	12.850	4	3.212	0.908	0.47
Ph x WC	212.375	60	3.540		
Total	3140.189	159			

**p \leq .01

Note. The total number of subjects is 80.

children's performance during Phases 2 and 3. The 8-year-old children ($M = 11.24$) performed much better than did the untrained 4-year-old-children ($M = 7.17$). Newman-Keuls procedures were performed on the instructional prompts variable. These analyses revealed that untrained children who were instructed to use verbal elaboration ($M = 10.44$), to use both imaginal and verbal elaboration ($M = 11.38$), and to manipulate toy pairs ($M = 11.78$) all significantly outperformed untrained children receiving control ($M = 4.81$) instructions (all $ps < .01$). No significant differences were found in the performance of untrained children who were instructed to use imaginal elaboration and those who received control instructions. Further, it was found that untrained children instructed to use both imaginal and verbal elaboration ($M = 11.38$) or to manipulate toy pairs ($M = 11.78$) significantly outperformed untrained children receiving use imaginal elaboration ($M = 7.63$) instructions (both $ps < .05$). However, the performance of the untrained children who were instructed to use imaginal elaboration or who were instructed to use verbal elaboration did not vary significantly. No other significant differences emerged from these analyses.

Chapter 6

Discussion

The discussion will be divided into sections. The findings from Phase 1 will be discussed separately from those of the other phases. The findings from Phases 2 and 3 will be discussed together since Phase 3 closely paralleled Phase 2. Additionally, the findings from Phases 2 and 3 will be discussed under two major headings. First, developmental trends in the untrained 4- and untrained 8-year-old children's use of elaboration strategies at each of the levels of the typology will be discussed. Second, the effectiveness of modeling as a training method in enhancing the performance of the trained 4-year-old children at each of the levels of the typology will be discussed.

Imposed Elaboration Strategies Presented Via Modeling

All forms of the modeled elaboration strategies were found to significantly enhance the paired-associate learning efficiency of the trained 4-year-old children in comparison to that of the untrained 4- and 8-year-old children. These findings offer further support concerning the usefulness of imposed elaboration in enhancing young children's performance on such tasks (Levin, 1976; Pressley, 1977; and Rohwer, 1973). Additionally, these findings support the earlier claims of Zimmerman and Rocha (1984, 1986) that modeling is an effective technique for presenting these strategies to young children. Further, these findings suggest that children as young as 4 years of age can benefit from elaboration strategies presented via

modeling. Similarly, 4-year-old children have been reported able to profit from elaboration incorporated into learning materials (Holyoak, Hogeterp, and Yuille, 1972) and elaboration produced as a by-product of children's manipulation of learning materials (Wolff and Levin, 1972; Wolff, Levin, and Longobardi, 1972, 1974; and Levin, McCabe, and Bender, 1975).

Unexpectedly, the 8-year-old control group performed no better than the 4-year-old control group and significantly worse than all groups of 4-year-old children who were exposed to elaboration demonstrations by an adult model. Although Paris (1978) and Pressley (1977) suggested that elementary school children outperform preschool children on paired-associate tasks, this was not the case in this experiment. These findings indicate that 8-year-old children do not spontaneously use elaboration strategies to help them meet task demands in a paired-associate context any more than do 4-year-old children. Earlier conclusions by Rohwer (1972, 1973) that children do not become proficient in this ability until late childhood or early adolescence are supported by these results.

Concerning the effectiveness of sensory modality forms of imposed elaboration presented via modeling, it had been predicted that visually-presented elaboration would be better remembered than would verbally-presented elaboration. However, no difference was obtained between these forms of elaboration. This prediction had been based primarily on work presented by Jones (1973) and Perlmutter and Myers (1975). These researchers claimed that the assessment technique

employed on paired-associate tasks was the critical factor in determining the relative effectiveness of visually- and verbally-presented elaboration. Visual elaboration should be more effective when nonverbal assessment techniques were used and verbal elaboration should be more effective when verbal assessment techniques were used. The present study employed a recognition assessment technique which required the children to pick up the response toy from an array of toys as the stimulus toy was presented by the experimenter. As such, no verbal response on the part of the children was required.

In accounting for the differences found between the studies, it is possible that the paired-associate items were not presented in the same way. Within the verbal context, there is no indication in the Jones (1973) and Perlmutter and Myers (1975) studies that stimulus-response items were concretely present, whereas in the present study they were.

Other explanations are also possible. The Jones (1973) and Perlmutter and Myers (1975) experiments imposed strategies within the learning materials. This study employed modeling in presenting imposed elaboration. Visual elaboration incorporated into learning materials consist of static pictures of integrated scenes. Modeled demonstrations of visual elaboration, on the other hand, use dynamic action sequences between object pairs by motorically making the items meaningfully interact. It is hard to imagine that the latter presentations would be less informative to 4-year-old children. However, such an interpretation would appear to support the Piagetian

position (Piaget and Inhelder, 1971) that preoperational children's internal representations are limited to reproductive and static copies of sensorially presented information. These children are presumably incapable of mental operations necessary to capture dynamic manipulations in externally presented materials. It should be noted, however, that contrary to the Piagetian position, in this experiment, 4-year-old children exposed to visual elaboration presented by a model outperformed both 4 and 8-year-old children not exposed to such modeled demonstrations. Therefore, the research suggests that children within this age group are capable of generating dynamic as well as reproductive internal representations.

Secondarily, the prediction of superiority of visually-presented elaboration contrasted to verbally-presented elaboration was based on suppositions by Bruner (1964, 1966), Montessori (1964), and Yando, Seitz, and Zeigler (1978) that preschool children rely predominantly on imagery rather than verbal forms of representation. These theorists, however, based their postulates on other tasks than paired-associates. The present results appear to support the position espoused by Montague (1970) and Piaget (1962) who claimed that visual-imaginal and verbal forms of representation follow a similar developmental course.

Another unexpected finding concerning the effectiveness of both visual and verbal elaboration presented via modeling was obtained. It had been anticipated that the combination of these elaborations would act additively to enhance the performance of the children

relative to either the visually-presented or the verbally-presented elaboration alone. This prediction had been based on the findings of several researchers (e.g., Kolers, 1983; Kosslyn, 1980, 1981; Kosslyn and Pomerantz, 1977; Paivio, 1971, 1977, & 1978; Palmer, 1975; Salamon, 1979; and Shepard, 1975) who claimed that imaginal and verbal modes of representation represent qualitatively different dimensions of information. Although the combined elaborations were more effective than the visual ones, they were not any more effective than the verbal ones. What this suggests, within this context at least, is that adding verbal elaborations to visual ones improve performance, however, adding visual elaborations to verbal ones do not.

In a previous study, Zimmerman and Rocha (1986) had obtained an opposite effect. In that experiment, combined verbal and visual elaborations were no more effective than visual elaborations alone. That finding, however, had been attributed to an experimental artifact. Both groups of children had correctly matched almost all of the item pairs. Further, no verbal elaboration condition had been included in that study. Therefore, no comparisons between combined and verbal elaborations were possible.

In the present study, no ceiling level was reached in any of the groups. It is possible that the verbal condition conveyed slightly more contextual detail than did the visual condition. Although no significant differences were detected in the performances of the two groups, children in the verbal condition ($M = 10.75$) did score higher than those in the visual condition ($M = 9.67$). The verbal

elaboration used in the present study had been initially used in the adult verbal elaboration condition of the Zimmerman and Rocha (1984) study. They had been created to provide high quality information and were somewhat humorous. However, they also had been created to match the visual elaborations. Additionally, it is possible that dynamic action sequences created by manipulating toy pairs may not be as distinctive as verbal descriptions. More research is needed to explore this issue further.

The finding that combined elaborations were more effective than visual but not verbal elaboration supports the previous work of Reese (1970a) and Rohwer (1970). These researchers concluded that the verbal medium was superior to the visual medium in incorporating elaboration into learning materials to preschool children. Reese (1970a) suggested that verbal systems are more organized than visual ones because relationships are explicitly stated. However, in visual presentations, children may fail to notice the depicted relationships.

This issue may be one of speed of processing incoming information. In the present study, it appeared that children responded more quickly to the visually-presented elaborations. Although the presentation times were held constant across all of the conditions, children in the visual condition frequently signalled to the experimenter that they had grasped the relationship and that they would like to move ahead to the next item. However, none of the children in the verbal condition made such communications. Possibly, the children in the visual condition quickly formed representations

that were less complete than that of children in the verbal condition.

In summary, findings from Phase 1 indicated that all forms of imposed elaboration strategies presented via modeling were effective in enhancing the paired-associate performance of the 4-year-old children. The ability of these children to outperform 8-year-old children is an indication of the extent of this effectiveness. These findings suggest that 4-year-old children are capable of forming dynamic as well as reproductive internal representations on paired-associate tasks.

It does not appear that the effects of imposed elaboration strategies presented via modeling completely parallel those of imposed elaboration strategies incorporated into learning materials. In the latter category, combined elaborations have been found to be more effective than either visual or verbal elaboration alone. Whereas, in the modeling category, the combined elaborations were only more effective than the visual ones. Additionally, within the modeling category, no differences were detected between the effectiveness of visual and verbal elaboration. However, with elaboration incorporated into learning materials, the relative effectiveness of the form of elaboration had been found to depend upon the assessment technique. Further modeling research is needed to determine why adding a visual elaboration to a verbal one improves performance, whereas the converse does not.

Developmental Trends in Untrained 4- and 8-Year-Old Children's Use of Elaboration Strategies

As predicted, differences were found to exist between untrained 4- and 8-year-old children in their use of elaboration strategies. During Phases 2 and 3, 8-year-old children outperformed 4-year-old children at both the imposed level and the prompted elaboration level. Additionally, the 8-year-old children outperformed the 4-year-old children during Phase 3 at the spontaneously-induced elaboration level. These findings clearly indicate that 8-year-old children are naturally more proficient than 4-year-old children in their use of elaboration strategies. Based on the results of the a priori contrasts, the superiority of the 8-year-old children during Phase 3 at the spontaneously-induce elaboration level could be accounted for by a decrease in the performance of the 4-year-old children rather than an increase by 8-year-old children. Apparently, 4-year-old children were not able to maintain performance on a difficult task, whereas the 8-year-olds were.

It appears that 8-year-old children do not spontaneously induce elaboration on paired-associate tasks. The performance of the 8-year-old children in this condition during Phases 2 and 3 did not differ from that of the untrained 4-year-olds within the same condition during either Phase 1 or Phase 2. The finding that 8-year-old children did not spontaneously induce elaboration on these tasks supports claims made by Rohwer (1972, 1973) that these children do not use this type of elaboration strategy until late childhood or early adolescence.

Further, it was found that 4-year-old children who manipulated toy pairs outperformed 4-year-old children who were instructed to remember the toy pairs. However, 8-year-old children who manipulated toy pairs outperformed 4-year-old children who manipulated the toys. This finding suggests that although 4-year-old children do benefit from imposed elaboration, their capacity to employ this type of elaboration is not completely developed.

Holyoak, Hogeterp, and Yuille (1972) found that 4-year-old children were as capable as 8-year-old children in effectively utilizing imposed strategies that were incorporated into learning materials. However, those elaborations had been experimentally-produced, whereas the imposed motoric manipulation elaborations employed in this experiment were child-produced.

Zimmerman and Rocha (1984, 1986) suggested that the quality of children's elaborations must be taken into account in assessing their effectiveness. They suggested that it is the information that is conveyed by the manipulation that is the critical factor rather than the physical contact itself. Research exists (Brody, Mattson, & Zuckerwise, 1978; Wolff and Levin, 1972; and Zimmerman and Rocha, 1984) that adults produce qualitatively better elaborations. Similarly, McCabe (1973) report that 7-year-old children produce qualitatively better toy manipulations than do 4-year-old children. In the light of these findings, it is not surprising that the 8-year-old children performed better than the 4-year-old children within the motoric manipulation category.

An additional piece of qualification information is available in a rough form from analyses of imposed elaborational strategies. In comparing the performance of untrained children during Phases 2 and 3 who were instructed to manipulate toy pairs with the performances of vicariously trained 4-year-old children during Phase 1, no significant differences were detected. This suggests that modeled elaborations and motoric elaborations were equally effective. Zimmerman and Rocha, (1986) reported similar results concerning visual and both visual and verbal elaboration presented via modeling and motoric manipulations. However, they had not included a verbal elaboration condition.

The findings from the present study confirmed previous research concerning preschool children's ability to induce imaginal elaboration from instructional prompts. The untrained 4-year-old children were unable to benefit from these instructions any more than they could from control instructions. However, they were able to improve their performance when instructed to elaborate verbally or combined imaginally and verbally. Unexpectedly, the performance of the children in these experimental conditions was as good as that of peers in the imposed condition.

The performance of untrained 4-year-old children who were prompted to use verbal elaboration was equal to that of youngsters who were prompted to use both imaginal and verbal elaboration. Since the untrained 4-year-olds had been unable to profit from prompts to induce imaginal elaboration, it is likely that their peers in the combined imaginal and verbal condition used only verbal ones.

Evidence that 4-year-old children can benefit from prompts to induce verbal elaboration supports conclusions drawn by Levin, Bender, & McCabe (1975); McCabe (1973); and McCabe, Levin, & Wolff (1974) who concluded that such instructions enhance the performance of 4-year-old children.

Further research is needed, however, to explain why children in this age group were able to profit from prompts to induce verbal but not imaginal elaboration. Part of the explanation may lie in the internal nature of imaginal elaboration. Children prompted to use verbal elaboration were told to make sentences of the toy pairs interacting, whereas, children prompted to use imaginal elaboration were told to form pictures in their heads of the toys interacting. It is unlikely that the children in either condition failed to understand the experimental instructions because two practice items had been given to ensure comprehension.

As for the 8-year-old children, prompts to induce all of the forms of elaboration under investigation in Phases 2 and 3 produced significantly better memory than displayed by children in the control condition. Additionally, prompts to induce both verbal and combined imaginal and verbal elaboration were as effective as elaboration imposed by the children's manipulation of the toy pairs. However, imposed elaborations tended to produce better memoric performance than prompts to induce imaginal elaboration during Phases 2 ($p = .07$) and 3 ($p = .06$). Apparently even for the 8-year-old children, the ability to induce imaginal elaboration from instructional prompting is not fully developed.

Furthermore, prompts to induce combined imaginal and verbal elaboration during Phase 2 were more effective than prompts to induce imaginal elaboration. Unlike the 4-year-old children, it appears that the 8-year-old children generated both imaginal and verbal elaboration to a certain degree within this condition because prompts to induce verbal elaboration were not significantly more effective than were prompts to induce imaginal elaboration. However, during Phase 3, no significant differences were found between the prompts to induce any of these elaborations. Such a finding suggests that during Phase 3, the 8-year-old children induced only one strategy despite prompting to induce combined imaginal and verbal elaboration. Evidently, the form chosen was verbal because children in this condition communicated overt verbal elaborations to the experimenters. Apparently, for even 8-year-old children, cognitive strain is created when prompted to use dual constructions and they quickly abandon such strategies.

Indications that prompting 8-year-old children to induce both elaborations were more effective than prompting them to induce only imaginal elaboration conflicts with results of Levin, Davidson, Wolff, & Citron. They found that prompts to 7-year-old children to induce imaginal, verbal, and combined imaginal and verbal elaboration were equally effective; however, these researchers prompted the children to induce covert verbal rather than overt verbal elaboration. As previously discussed, it does not appear that prompts to induce overt and covert verbal elaboration produce similar results. More research is needed in this area.

Only two discrepancies were noted on the basis of the a priori contrasts regarding the Phase 3 results compared to Phase 2 results for untrained 4- and 8-year-old children. The untrained and unprompted 4-year-old children's performance decreased dramatically from Phase 2 to Phase 3, but the 8-year-old children's performance remained stable. This finding had been explained previously in terms of the inability of the younger children to maintain their performance on a difficult task. The other difference between the two phases was found in comparisons of the performances of 8-year-old children who were prompted to use imaginal and both imaginal and verbal elaboration. The children prompted to use combined strategies significantly outperformed the children receiving only the imaginal prompt during Phase 2 but not Phase 3. It was previously suggested that additional cognitive strain occurs when young children produce two constructions, and this led these children to use only verbal elaboration during Phase 3.

Taken as a whole, these findings support the developmental hypothesis that young children are able to induce elaboration upon instructional prompts earlier than they can spontaneously to task demands. In support of the previous theoretical work in the area, the untrained 4-year-old children in the toy manipulation condition outperformed untrained 4-year-old children who were prompted to use imaginal elaboration. As previously theorized, the 4-year-old children were unable to benefit from prompts to use imaginal prompts, whereas the 8-year-old children could benefit from such prompts.

However, the present results taken along with those of Levin, Bender, & McCabe (1975); McCabe (1973); and McCabe, Levin, & Wolff (1974) suggest that 4-year-old children can profit from prompts to induce verbal and imaginal and verbal elaboration. It was suggested that these children were able to benefit from prompts to use combined elaborations because they probably only used verbal elaboration. This supposition was based on the inability of these children to profit from prompts to use imaginal elaboration. Future research should be directed at comparing the effectiveness of prompting children to use covert verbal elaboration versus imaginal elaboration as well as to children's manipulation of learning materials.

Effectiveness of Modeling in Enhancing 4-Year-Old Children's Performance Immediately After Training and After a Delayed Time Interval

The effectiveness of modeling as a training procedure in demonstrating to 4-year-old children the use of elaboration strategies was assessed during Phases 2 and 3. Phase 2 provided an index of this effectiveness immediately after training, whereas Phase 3 provided an estimate of this effectiveness after a one week delayed time interval.

Modeling was found to enhance the performance of the trained 4-year-old children at the induced levels of the typology; however, the effects of modeling at the imposed level were negligible. The strongest modeling effects were experienced when the children were prompted to use elaboration.

Effectiveness of Modeling at the Prompted Induced Elaboration Level. Modeling was found to enhance the performance of 4-year-old children who were prompted to use either imaginal or verbal elaboration. Trained 4-year-old children were able to benefit more from both of these prompts than were untrained ones. Further, the performance of trained 4-year-old children prompted to use these elaborations was comparable to the groups of 8-year old children who were either prompted to use imaginal or verbal elaboration.

Although the untrained 4-year-old children had been able to benefit from prompts to use verbal elaboration, trained 4-year-olds who were prompted to use them significantly outperformed untrained 4-year-old children during Phase 3, and they also tended to do so during Phase 2 ($p = .08$). Moreover, untrained 4-year-old children did not profit from prompts to use imaginal elaboration during either phase, whereas the trained 4-year-old children benefited from these prompts during both phases.

However, training appears to be ineffective in enhancing 4-year-old children's performance when they are prompted to use both imaginal and verbal elaboration. Both the trained and the untrained 4-year-old children performed equally well and significantly worse than the 8-year-old children who were prompted to use these elaborations. It should be noted that both the trained and the untrained 4-year-old children performed better when they were prompted to use both imaginal and verbal elaboration than when they received no prompts. Consequently, it appears that prompting, not the modeling, was responsible for this increase in performance.

It is puzzling that training via modeling enabled 4-year-old children to imaginally or verbally elaborate but not to use both imaginal and verbal elaboration. Unlike the untrained 4-year-old children, it seems unlikely that these children only used verbal elaboration when they were prompted to use both elaborations. Their performance under this instructional prompt was somewhat worse than trained children prompted to use verbal elaboration during Phase 2 and was significantly worse during Phase 3. It appears that instructing 4-year-olds to use combined elaboration is too demanding for them.

Research conducted by McCabe (1973) and McCabe, Levin, and Wolff (1974) has indicated that children in this age group are unable to simultaneously generate two cognitive constructions (verbal elaboration and toy manipulations). This may occur because young children have difficulty in simultaneously considering two sources of information (Piaget, 1962). McCabe, Levin, & Wolff (1974) found that the 4-year-old children produced qualitatively poorer verbal elaboration when they are instructed to make a sentence about the toys and also to manipulate the toys. Perhaps, the trained children prompted to use both imaginal and verbal elaboration also produced poorer verbal elaboration than the trained children who were prompted only to use verbal elaboration. Such a finding could explain why their performance was lower than that of the trained children prompted to use verbal elaboration. Cognitive strain may have been created when these children attempted to construct dual elaborations. Since untrained 4-year-old children had been unable to benefit from

prompts to use imaginal elaboration, it seems likely that they used only verbal elaboration when they were prompted to induce both imaginal and verbal elaboration.

Eight-year-old children, on the other hand, were more proficient in coordinating dual constructions. They may not have experienced the same degree of cognitive strain that the trained 4-year-old children experienced under this instructional prompt. Since the 8-year-old children who were prompted to use both imaginal and verbal elaboration outperformed 8-year-old children who were prompted to use imaginal elaboration during Phase 2, it appears that they could generate both forms of elaboration. Nevertheless, during Phase 3, the 8-year-old children prompted to use combined elaboration did not outperform the 8-year-old children prompted to use imaginal elaboration. This finding suggests that the 8-year-old children prompted to use combined elaboration probably opted to use only one form of elaborator, a verbal form, during this phase. These children were compelled by the experimenter to produce sentences regarding how the toy pairs could interact. They probably opted to induce only one form of elaboration under dual strategy prompting because of greater cognitive difficulty.

During both phases, trained children who were prompted to use elaboration performed as well as youngsters on whom elaboration was imposed. Like the untrained 4-year-old children, these children benefited from prompts to use verbal and both imaginal and verbal elaboration. However, unlike the untrained 4-year-olds, they were also able to benefit from prompts to induce imaginal elaboration

during both phases. This finding suggests that in addition to prompting, training is necessary for 4-year-old children to use imaginal elaboration.

Effectiveness of Modeling at the Unprompted Induced Level.

Modeling effects were evident also when children received control instructions (to remember the toy pairs) during Phase 3. This condition had been designed to provide an index of children's ability to spontaneously use elaboration according to task demands. Although no differences were found among the performances of trained 4-year-old children, untrained 4-year-old children, and untrained 8-year-old children during Phase 2, all groups of trained 4-year-old children outperformed untrained 4-year-olds and performed as well as the 8-year-olds during Phase 3. Trained children were not allowed to manipulate or overtly describe the toy pairs. Since their performance was not any better than that of the untrained 4-year-old children, it seems unlikely that they were inducing elaboration spontaneously during this phase. Further, the performance of trained 4-year-old children during Phase 3 was not found to differ from their performance during Phase 2 which suggests that they still could not spontaneously elaborate. However, the performance of the untrained 4-year-old children deteriorated from Phase 2 to Phase 3, and created these differences. Evidently, modeling effects generalized to a new task.

Effectiveness of Modeling at the Imposed Elaboration Level.

Training effects were negligible in this condition. Eight-year-old children significantly outperformed both trained and untrained

4-year-old children during both phases. Additionally, untrained 4-year-old children performed as well as trained 4-year-old children during both phases. Among children who manipulated toys, there was a tendency for those who had received verbal elaboration training to outperform untrained 4-year-old children during both Phase 2 and Phase 3.

It had been predicted that exposing 4-year-old children to toy manipulations by an adult model would increase their performance. Further, it was anticipated that children who were exposed to both the toy manipulations and verbal descriptions of these manipulations would display even greater learning. Consequently, among children who manipulated toys, those trained to use imaginal elaboration were expected to outperform untrained 4-year-old children and also 4-year-old children who were trained to use verbal elaboration. These children were also expected to perform as well as 8-year-old children who manipulated the toys. It was believed that among children who manipulated the toys, those trained to use both imaginal and verbal elaboration would outperform children trained to use imaginal elaboration because they should also use covert verbal elaboration.

Since these results did not turn out as expected, it appears that all groups of trained 4-year-olds as well as untrained 4-year-olds benefited optimally from their own toy manipulations. The 8-year-old children's superior performance to these groups of 4-year-old children indicates that they may have produced qualitatively better toy manipulations. This finding appears to support conclusions by

McCabe (1973) that 7-year-old children produce qualitatively better toy manipulations than do 4-year-old children. Previously research by Brody, Mattson, & Zuckerwise (1978) and Zimmerman and Rocha (1984) has suggested that young children can benefit more from observing adult-produced elaboration than they can from peer-produced elaboration because of qualitative differences between adult and child productions. These research findings also indicate that younger children may profit more from observing the toy manipulations of older children than from manipulating the toys themselves.

Effectiveness of the Form of the Modeled Elaborations. Prompts given to the trained children to use imaginal, verbal, and both imaginal and verbal elaboration were all equally effective during Phase 2. This finding supports research performed by Levin, Davidson, Wolff, & Citron (1973). These researchers found that 7-year-old children were no more able to profit from prompts to induce both imaginal and verbal elaboration than they were from prompts to use either form of elaborator alone. However, the verbal elaboration that the children in that experiment were instructed to use was covert rather than overt. Also these children had not been exposed to a model's elaboration prior to the learning task.

It had been predicted in this experiment that children who were exposed to the both visual and verbal elaboration by an adult model during Phase 1 would outperform those exposed to either the visual or the verbal elaborations of the model at all levels of the typology during Phases 2 and 3. This prediction had been based on the work of several researchers (e.g., Kolers, 1983; Kosslyn, 1980, 1981; Kosslyn

and Pomerantz, 1977; Paivio, 1971, 1977, & 1978; Palmer, 1975; Saloman, 1979; and Shepard, 1975) who had claimed that imaginal and verbal modes of representation represent qualitatively different dimensions of information. Consequently, it appeared that these two forms of elaboration additively enhanced children's memory.

It was surprising to find during Phase 2 that children trained to use both imaginal and verbal elaboration performed no better than those who were trained to use either verbal or imaginal elaboration (regardless of prompting). During Phase 3, children trained and prompted to use verbal elaboration outperformed youngsters who were trained and prompted to use combined elaboration. Previously, it was suggested that children who were trained and prompted to induce both imaginal and verbal elaboration may have created poorer sentences than children trained and prompted to elaborate verbally because of the greater cognitive strain in generating two constructions. Why these children did not also perform less well than youngsters who were trained and prompted to induce imaginal elaboration is unknown. Also it is unknown why their memory should be inferior to children who were trained and prompted to induce verbal elaboration during Phase 3 but not during Phase 2. Clearly more research is needed to clarify this finding.

At the other two levels of the typology during Phases 2 and 3, it was found that training children to use both imaginal and verbal elaboration was no more effective than training them to use either imaginal or verbal elaboration. Trained children appeared not to spontaneously induce elaboration. Modeling seemed to act in a manner

to maintain the children's performance on a difficult task rather than to induce elaboration. Whereas compared to toy manipulations, none of the forms of modeling significantly improved the trained children's performance. It was previously suggested that all of the 4-year-old children benefited maximally from their own toy manipulations. However, it appears that the toy manipulations of 4-year-olds may have been qualitatively poorer than those of the 8-year-old children. Nevertheless, among children who manipulated toys, the verbally trained children outperformed the visually trained children during Phase 2. The latter group of children also tended to outperform youngsters who received the both visual and verbal training during Phase 2 ($p = .10$) and also the untrained 4-year-old children during Phases 2 ($p = .15$) and 3 ($p = .08$). It was suggested that these verbally trained children may have produced covert verbal elaboration when they manipulated the toys, whereas the other groups of children did not.

Although the combined imaginal and verbal elaboration training did not produce superior memory as expected, training children to use imaginal elaboration was as effective as training them to use verbal elaboration at both of the induced levels of the typology during both phases and at the imposed level during Phase 3. It appears that children are not only capable of generating dynamic, reproductive imagery within a paired-associate learning context, but they are also capable of generating dynamic, anticipatory imagery as well.

Previous researchers in the literature on elaboration had reached similar conclusions, but their studies had methodological flaws.

Different instructional prompts were presented to trained and untrained children during posttesting. Experimenter-produced elaborations and child-produced elaborations had been combined during training so that it was unclear whether it was necessary or not for the children to motorically elaborate during the training. Also verbal and visual-imaginal elaborations had been combined during training. Consequently, children on the later learning tasks may have been using either form or both forms of elaboration.

Stability of Modeling Effects. A final question in determining the effectiveness of modeling as a training method concerned whether effects displayed immediately after training would remain durable over a one week interval. At the imposed level, no training effects were found at either time period. At the spontaneous elaboration level, effects were noticeable only after the delayed time interval. It was suggested that modeling functioned to maintain the performance of the trained children on a difficult task. At the prompted elaboration level, children trained and prompted to use imaginal and those trained and prompted to use verbal elaborations performed as well as the 8-year-old children who received the same instructional prompts during both phases. Furthermore, the superior performance of children trained and prompted to use imaginal and those trained and prompted to use verbal elaborations in comparison to untrained 4-year-old children receiving the same instructional prompts was noted during both phases. Among children given instructional prompts to use imaginal elaborations, trained 4-year-old children outperformed untrained 4-year-old children during Phase 2 and also

tended to do so during Phase 3 ($p = .06$). Likewise, trained 4-year-old children prompted to induce verbal elaborations outperformed untrained 4-year-old children who were prompted to use verbal elaborations during Phase 2 ($p = .08$) and Phase 3 ($p < .05$).

In brief, the effects of modeling found during Phase 2 were found also during Phase 3. At the spontaneously-induced elaboration level, effects of modeling were more evident after a time delay interval. These findings suggest that the effects of modeling are stable over a one week interval.

Summary

During Phase 1, the effectiveness of elaborations presented via modeling was explored. All forms of elaboration presented by modeling were found effective in enhancing the performance of the trained 4-year-old children in comparison to those of both the untrained 4- and the untrained 8-year-old children. Combined visual and verbal elaboration was more effective than visual elaboration. This finding implies that adding a verbal elaboration to a visual one improved performance, whereas adding a visual elaboration to a verbal one did not. Two possible explanations for this finding were discussed. First, it was suggested that the verbally-created elaborations may have contained more contextual detail than visual ones. Second, it appeared to the experimenter that children responded more quickly to the visual elaborations than they did to verbal elaborations. Thus, they may have processed these elaborational relationships less deeply than verbal ones.

During Phases 2 and 3, developmental trends in the untrained 4- and 8-year-old children's use of elaborational strategies at the different levels of the typology were found. The 8-year-old children outperformed the 4-year-old children at all the levels of the typology during both phases with the exception of the spontaneously-induced elaboration level during Phase 2. As a consequence of the relatively poor performance of both age groups at this level, it was suggested that neither group was very proficient in spontaneously-inducing elaborations within paired-associate contexts.

The finding that 8-year-old children outperformed 4-year-old children at both of the other levels of the typology suggests that the older children are more proficient than the younger ones in using elaboration strategies on these tasks.

Although the 8-year-old children outperformed untrained 4-year-old children at both the imposed elaboration and prompted elaboration levels, these 4-year-old children were able to perform significantly better than they could when given no elaboration help (the unprompted elaboration level). Likewise, the 8 year-old children significantly benefited from imposed elaborations as well as from prompts to use elaborations. Surprisingly, the untrained 4-year-old children were able to benefit from instructional prompts to induce both verbal and combined imaginal and verbal elaborations as much as they were from imposed elaborations. Since these children had been unable to benefit from prompts to induce imaginal elaborations, they probably induced only verbal elaborations despite prompts to use both elaborations.

Modeling was found to be effective as a training procedure during both Phases 2 and 3 in enhancing the performance of trained 4-year-old children. However, the effects of this training were more pronounced at some of the levels of the typology than at others. The strongest training effects were obtained when prompts to use elaborations were given. Trained children who were prompted to use imaginal or verbal elaborations outperformed untrained 4-year-old children. Furthermore, they performed as well as the 8-year-old children.

Training effects were also evident during Phase 3 at the unprompted elaboration level. All groups of trained 4-year-old children outperformed the untrained 4-year-old children. These children also performed as well as the 8-year-old children. The modeling effects at this level were only evident after a delayed time interval. Modeling, at this level, maintained the children's performance.

Effects of modeling in conjunction with manipulation were negligible. Apparently, both the trained and untrained 4-year-old children are performing at their maximum level of elaborative competence when directly manipulating toys. It was suggested that the superior performance of the 8-year-old group in comparison with all groups of the 4-year-old children may have been due to the higher quality of the former's toy manipulations.

Regarding the effectiveness of the various forms of elaborations that were modeled, no general effects were noted. However, a finer-grained analysis of modeling outcomes at each of the levels of

the typology did reveal some effects at both the prompted elaboration and the motoric elaboration levels. At the prompted elaboration level, children instructed to form verbal elaborations significantly outperformed those instructed to use both imaginal and verbal elaboration during Phase 3. It was suggested that this finding may reflect less an effect of training than it may reflect the difficulty that these children encountered when they attempted to construct two elaborations.

At the toy manipulation level, children trained to use verbal elaborations outperformed those trained to use imaginal elaborations during Phase 2. Additionally, the children trained to use verbal elaborations tended to outperform those trained to use combined elaborations when both groups were instructed to manipulate toy pairs during Phase 2. This group of children trained to use verbal elaborations tended to outperform the untrained 4-year-old children when both groups were instructed to manipulate the toys during both Phases 2 and 3. Apparently, the children trained to use verbal elaborations created verbal elaborations when manipulating the toys, whereas all of these other groups of children only did so when instructed.

Concerning the stability of training outcomes, the effects of modeling in enhancing the learning of 4-year-old children who were prompted to use either imaginal or verbal elaborations in comparison to the learning of untrained children were found to be durable over a one week delayed time interval. At the unprompted elaboration level, the effects of modeling were only evident after this delayed time

interval. It appeared that modeling increased the children's ability to maintain performance on a difficult task.

In conclusion, the present study demonstrates that trained children as young as 4 years of age are capable of generating dynamic anticipatory imagery as well as dynamic reproductive imagery on paired-associate tasks. Contrary to conclusions drawn by Wolff and Levin (1972), Wolff, Levin, and Longobardi (1972), and Wolff, Levin, and Longobardi (1974), these children can form imaginal representations without motorically manipulating learning materials. They were able to learn to use imaginal elaborations by observing a model's elaborations.

Further, contrary to findings of Flavell (1970), Kendler (1964), and Kendler (1962), this age group of children were able to use verbal mediators in the form of elaborations when they were so instructed. However, it should be noted that the former researchers explored preschool children's use of serial rehearsal verbal mediators rather than elaboration mediators. The present findings support conclusions reached by Levin, McCabe, and Bender (1975), McCabe (1973), and McCabe, Levin, and Wolff (1974) who stated that 4-year-old children could benefit from prompts to verbally elaborate. In addition, this study found that training and prompting children to use verbal elaborations improved their learning significantly more than only prompting them to use verbal elaborations.

Contrary to expectations that different forms of information should act additively to improve learning because they represent different dimensions of the information (Kosslyn, 1980; Paivio, 1977

and 1978; Palmer, 1975; Salamon, 1979; and Shepard, 1975), it was found that training and prompting children to simultaneously use imaginal and verbal elaborations did not improve their learning more than training and prompting to use imaginal elaborations. Further, children who were trained and prompted to use verbal elaborations outperformed those trained and prompted to use both forms of elaboration. It was suggested in the present study that 4-year-old children experience difficulty when they try to simultaneously produce two forms of elaboration. McCabe (1973) and McCabe, Levin, and Wolff (1974) reached similar conclusions.

Findings from the present study support conclusions reached by Zimmerman and Rocha (1984 and 1986) that modeling is a particularly effective technique in demonstrating to children how to use elaboration strategies. Children were able to improve their performance by observing the elaborations of a model on both immediate and delayed posttests.

Directions for Future Research

The present experiment was limited to the analysis of two age groups because of the scope of the planned research. These two age groups consisted of 4-year-old and 8-year-old children. These age groups had been selected for study for theoretical reasons. Previously, it had been indicated that 4-year-old children could benefit from imposed but not induced elaboration. Eight-year-old children, however, could benefit from both imposed elaborations and also elaborations induced by instructional prompts. Future research should be conducted in which other age groups are subjected to the

present experimental manipulations in order to more fully complete the present developmental picture of children's ability to use elaboration strategies on paired-associate tasks. Particularly useful for such an analysis would be the inclusion of an older age group of children 11 or 12 years old who may already display some proficiency in spontaneously-inducing elaborations.

Further research is also needed in the area of imposed elaboration presented via modeling. In this experiment, it had been predicted that modeled demonstrations of combined elaborations would produce superior performance for the 4-year-old children relative to the other forms of elaborations. Although children exposed to combined elaborations outperformed those exposed to visual elaborations, they did not outperform those exposed to verbal elaborations. This finding indicated that adding a verbal elaboration to a visual one improved performance, whereas, adding a visual elaboration to a verbal one did not. Two possible explanations for this finding were suggested. Perhaps, the verbally-presented elaborations were somewhat more contextually detailed than were the visual ones. Also, it seems possible that the children grasped relationships quicker but processed them less deeply within the visual context than they did in the verbal context. Clearly, more research is indicated to determine the reason for this finding.

Also in the area of elaboration strategies presented via modeling, it was found that 8-year-old children outperformed both trained and untrained children when they were instructed to

manipulate toys during both Phases 2 and 3. Prior to conducting the present research, it had been considered plausible that exposing 4-year-old children to the toy manipulations of an adult model might improve the quality of their own toy manipulations on a later task. However, no training effects were obtained, and thus, it appeared that both the trained and the untrained 4-year-old children were performing optimally from their own toy manipulations. The superior performance of the 8-year-old children who manipulated the toys to both that of the trained and the untrained 4-year-old children indicated that developmental differences occurred in response to enactive expression as well as covert expression.

Some evidence exists (McCabe, 1973) that indicates that older children produce qualitatively better toy manipulations than do younger children. Qualitative differences in toy manipulations could account for the differences in the performances of the two age groups of children at this level. Such a finding would be consistent with the position espoused by Zimmerman and Rocha (1984, 1986) that the quality of the elaborations is an important variable in enhancing young children's learning efficiency on paired-associate tasks. If 8-year-old children produce qualitatively better toy manipulations than do 4-year-old children, perhaps the younger children could improve their performance more by observing the productions of the older children than by manipulating the toys themselves. Further research should be conducted on this issue.

Among the trained groups of children who manipulated toys during Phase 2, those trained to use verbal elaborations outperformed those

trained to use imaginal elaborations. Additionally, children trained to use verbal elaborations tended to outperform those trained to use combined elaborations during Phase 2. Further, toy manipulating children who were trained to use verbal elaboration also tended to outperform untrained 4-year-old children both during Phase 2 and Phase 3. It was suggested that perhaps children trained to use verbal elaborations generated covert verbal elaborations as they manipulated the toys, whereas these other groups of children did not. This issue should be further explored.

Research is also indicated to ascertain why 4-year-old children without training are capable from benefiting from prompts to induce verbal elaborations, but they are unable to benefit from prompts to induce imaginal elaborations. Both forms of elaborations require children to construct dynamic action sequences between object pairs. Perhaps the difference between the effectiveness of these two forms of elaborations may be due to the inherently more internalized nature of imaginal as contrasted to overt verbal elaborations. When children are prompted to use imaginal representations, they are asked to construct a private symbolization relating the objects pairs. When they are prompted to use overt verbal elaborations, on the other hand, they are asked to publically describe the interaction of toy pairs. This additional requirement of making the symbolization publically communicable within the verbal context may stimulate higher quality or greater confidence in their cognitive processing. Either effect may make these elaborations more memorable during later assessment tasks.

Another possible explanation of why prompts to use overt verbal elaborations are more facilitative than prompts to use imaginal elaborations for this age group also should be considered. It may be more productive to consider overt verbal elaborations generated in response to instructional prompts as a special case of imposed rather than induced elaborations. Levin (1976) suggested that imaginal representations produced as a by-product of children's direct manipulation of learning materials should be considered as a kind of imposed elaboration. These elaborations were considered imposed because on assessment tasks, the children merely had to retrieve from memory reproductive representations of the manipulations. They did not have to create novel, anticipatory representations. Although the internal representations produced as a by-product of the children's motoric manipulations were dynamic, they were reproductive rather than anticipatory. This rationale can be applied to the verbal elaboration context. When children produce overt verbal elaborations in the form of sentences, they only have to retrieve reproductive representations of these sentences on subsequent assessment tasks. They do not have to internally create novel elaborations, and thus these representations may be considered both dynamic and reproductive. However, prompts to use either imaginal or covert verbal elaborations must be considered to generate anticipatory as well as dynamic internal representations since novel elaborations have to be internally constructed. More research is clearly needed in this area to further explore why prompts to induce these two forms of elaborations produce different results. From both of the above

explanations, it appears that prompts to use covert verbal elaborations may represent a closer parallel to prompts to induce imaginal elaborations.

In attempting to explain why modeling appeared ineffective despite prompting children to induce combined elaborations, it was suggested that the modeling was not the critical variable at issue here. Rather, it appeared likely that requiring the 4-year-old children to construct dual elaborations was too cognitively demanding for them. The effects of such cognitive strain on children's use of elaboration strategies should be further explored.

At the unprompted induce elaboration level, modeling effects were found during Phase 3 but not during Phase 2. It appeared from these findings that modeling did not increase children's use of elaboration at this level; rather, it served to maintain constant performance of the trained children on a difficult task. Further research is indicated to determine the nature of the effects of modeling at this level.

Educational Implications

The present findings emphasize the value of elaboration as a learning strategy in enhancing the associative learning of both preschool and early-elementary-school children. Such a strategy is important to educators because many of the school tasks for children at these age levels are essentially associative. Children are taught early reading, writing, spelling, and counting tasks by engaging in simple associative exercises. The items to be learned in such tasks will be remembered better by the children when they are embedded in

interactions or relationships. An example of an elaboration on a school task designed to teach children the correspondence between letters of the alphabet and the beginning letters of words would be to make a toy dog dance on top of a three-dimensional letter 'D' to emphasize that both the words 'dog' and 'dance' begin with the letter 'D'.

Additionally, these findings suggest that demonstration teaching techniques are highly effective in presenting elaborations to preschool children. These children benefit as much from elaborations that are presented by adult models as they do from their own manipulation of the learning materials. Further, they can profit from modeled elaborations that are visually-presented, verbally-presented, or both visually- and verbally-presented. Consequently, they can be taught in small groups as well as individually when elaboration is used as a learning strategy.

Demonstration teaching procedures are also highly effective in training preschool children to generate their own elaborations on later tasks. Children learn how to use these strategies by observing the elaborations of adult models. Learning how to use an elaboration strategy on associative tasks is important because it enables children to transfer new information in an easy-to-learn manner. Children can develop their own learning skill rather than remaining dependent on the quality of instruction.

Although preschool children learn how to use elaboration strategies by observing others using them, it is also necessary to tell them when to use these strategies. Neither preschool or

early-elementary-school children will elaborate to any great extent unless they are instructed to do so.

Curriculum guides can be prepared for teachers illustrating the usefulness of elaboration strategies in improving children's learning on associate tasks. It would be beneficial to outline the classification system of elaboration strategies that has emerged from the present research in such guides. This classification system should prove particularly helpful in eliminating confusion concerning children's ability to profit from different types and forms of elaboration strategies at different ages. Additionally, information concerning the effectiveness of prompts in enhancing children's use of elaboration strategies at different ages should also be of value to teachers.

In brief, even preschool children can improve their paired-associate learning efficiency by using elaboration strategies. They can benefit from elaborations that are presented to them by adults and they can be trained to generate their own strategies. Therefore, teachers do not have to wait for elaboration skills to emerge ontogenetically. They can show children how to use these strategies. However, it is important also to instruct children when to use elaborations on associative tasks.

APPENDIX A

GLOSSARY

GLOSSARY

Combined imaginal and verbal elaboration: Elaboration in which a learner simultaneously generates imaginal and verbal forms of the elaboration such as an image of a duck pulling a wagon and a description of this action.

Combined visual-imaginal and verbal elaboration: Elaboration that is simultaneously visually and verbally presented to the learner. During assessment, the learner retrieves an imaginal representation of the visually presented form of the elaboration and a verbal representation of the verbally presented form of the elaboration.

Elaboration: A mediational strategy which creates a relationship between the members of an association.

Elaboration forms: The sensory modality that is evoked when an elaboration is encoded into memory or retrieved from memory.

Elaboration typology: A classification system used to distinguish elaborations that are created under different prompting conditions. This classification is comprised of three levels: imposed elaborations, induced elaborations that are generated in response to instructional prompts, and induced elaborations that are generated in response to task demands. Children are able to use imposed elaborations earlier than they are induced elaborations. They are able to use induced elaborations that are generated in response to instructional prompts earlier than they

are able to spontaneously generate induced elaborations according to task demands.

Induced elaboration: Elaboration that a learner internally generates in response to instructional prompts or task demands.

Imaginal elaboration: A form of induced elaboration in which the learner generates an image or a mental picture of members of an association in some relationship.

Imposed elaboration: Elaboration that is externally presented to the learner or externally produced by the learner as a by-product of an activity in which he or she is engaged.

Imposed elaboration categories: The three categories of imposed elaboration include elaborations that are incorporated into learning materials, elaborations that are produced as a by-product of the learner's manipulation of the learning materials, and elaborations that are presented via modeling.

Interactive context: An elaboration context in which the members of an association are integrally involved in some relationship such as a mouse jumping out of a boat.

Mediational strategies: Learning strategies that people used to solve abstract or complex learning problems. The purpose of these strategies is to transform the complex or abstract information into an easier to learn form.

Prompted induced elaborations: Elaborations that learners generate in response to instructions to use elaborations.

Static context: A nonelaborative context in which members of an association are simultaneously presented without a relationship

being formed between them such as a duck and a wagon that are placed on a table in front of a child.

Unprompted induced elaborations: Elaborations that are spontaneously generated by the learner in response to task demands.

Verbal elaborations: Elaborations that are verbally presented to the learner or that are verbally generated by the learner.

Visual-imaginal elaborations: Elaborations that are visually presented to the learner and that are imaginatively recreated by the learner during assessment.

APPENDIX B

RESEARCH DESIGNS USED FOR PHASES 1, 2 AND 3

PHASE 1 RESEARCH DESIGN

The Effects of Imposed Elaborations Presented Via Modeling on
Children's Toy Pair Associations

Trained 4-year-olds combined visual (manipulative) and verbal elaborations
Trained 4-year-olds verbal elaborations
Trained 4-year-olds visual (manipulative) elaborations
Untrained 4-year-olds no elaboration control
Untrained 8-year-olds no elaboration control

PHASES 2 AND 3 RESEARCH DESIGN

The Effects of Phase 1 Training, Instructional Prompts, and Sensory
Modality on Children's Toy Pair Associations

<u>Trained 4-year-old children</u>					
Phase 1 training	Instructional prompts				
	Control instruct.	Induce Phase 1	Manipulate toys		
<u>strategy</u>					
Visual (manipulative) & verbal elaborations		Use imag. & verbal elab.			
Phase 2					
Phase 3					
Verbal elaborations		Use verbal elab.			
Phase 2					
Phase 3					
Visual (manipulative) elaborations		Use imag. elab.			
Phase 2					
Phase 3					

<u>Untrained 4- and untrained 8-year-old children</u>					
Phase 1 training	Instructional prompts				
	Control instruct.	Use imag. elab.	Use verbal elab.	Use Imag. & verbal elab.	Manipulate toys
4-Year-Old					
Control					
Phase 2					
Phase 3					
8-Year-Old					
Control					
Phase 2					
Phase 3					

APPENDIX C

PAIRED-ASSOCIATE TOYS USED DURING PHASES 1, 2, AND 3
IN ORDER OF PRESENTATION

PHASE 1

Pair members in the order presented during the task

Stimulus ToyResponse Toy

Practice Items

- | | |
|--------------|-------------|
| a. Gorilla | Baby Bottle |
| b. Scarecrow | Pliers |

Test Items

- | | |
|------------------------------|----------------|
| 1. Mouse | Boat |
| 2. Whale | Comb |
| 3. Giraffe | Scissors |
| 4. Bear | Plate |
| 5. Horse | Alphabet Block |
| 6. Baby | Hat |
| 7. Yoda ("Stars Wars" dwarf) | Gun |
| 8. Frog | Truck |
| 9. Bird | Screwdriver |
| 10. Snoopy | Bulldozer |
| 11. Mailman | Box of Soap |
| 12. Deer | Coffee Pot |
| 13. Skunk | Iron |
| 14. Duck | Wagon |
| 15. Pig | Rake |

PHASE 2

Pair members in the order presented during the task

Stimulus ToyResponse Toy

Practice Items

- | | |
|--------------------|-----------|
| a. Football Player | Blowdryer |
| b. Alligator | Leaf |

Test Items

- | | |
|-----------------|---------------|
| 1. Monkey | Airplane |
| 2. Skelton | Necklace |
| 3. ET | Camera |
| 4. Elephant | Trumpet |
| 5. Tweety Bird | Bat |
| 6. Space Turtle | Telescope |
| 7. Man | Wrench |
| 8. Dinosaur | Yo Yo |
| 9. Grasshopper | Calculator |
| 10. Witch | Saw |
| 11. Tiger | Car |
| 12. Santa Claus | Record Player |
| 13. Robot | Badge |
| 14. Snail | Globe |
| 15. Raccoon | Sunglasses |

PHASE 3

Pair members in the order presented during the task

Stimulus ToyResponse Toy

Practice Items

- | | |
|-----------------|---------------|
| a. Raggedy Anne | Mirror |
| b. Rabbit | Tennis Racket |

Test Items

- | | |
|-----------------|---------------|
| 1. Hippopotamus | Microscope |
| 2. Smurf | Guitar |
| 3. Donkey | Phone |
| 4. Snake | Flashlight |
| 5. Clown | Football |
| 6. Sheep | Piano |
| 7. Beetle | House |
| 8. Fish | Watch |
| 9. Snowman | Basket |
| 10. Chicken | Ironing Board |
| 11. Kangaroo | Flag |
| 12. Spaceman | Gym Bag |
| 13. Lion | Umbrella |
| 14. Dragon | Ax |
| 15. Ghost | Chair |

APPENDIX D

LIST OF TOY MANIPULATIONS PRESENTED BY THE ADULT MODEL

TOY MANIPULATIONS PRESENTED BY THE ADULT MODEL ON PRACTICE ITEMS
DURING PHASES 1, 2, AND 3

Stimulus Toy

Response Toy

Phase 1 Practice Items

- a. Gorilla Baby Bottle
The experimenter holds the gorilla as if it were a baby and pretends to feed it with the baby bottle.
- b. Scarecrow Pliers
The scarecrow is chased by the pliers and is grabbed by the seat of the pants with them.

Phase 2 Practice Items

- a. Football Player Blowdryer
The experimenter dries the football player's helmet with the blowdryer.
- b. Alligator Leaf
The alligator eats the leaf.

Phase 3 Practice Items

- a. Raggedy Anne Mirror

Raggedy Anne looks at herself in the mirror.
- b. Rabbit Tennis Racket
The rabbit swings the tennis racket.

TOY MANIPULATIONS PRESENTED BY THE ADULT MODEL ON PHASE 1 TEST ITEMS

<u>Stimulus Toy</u>	<u>Response Toy</u>
1. Mouse	Boat
The mouse jumps out of the boat.	
2. Whale	Comb
The experimenter combs the back of the whale with the comb.	
3. Giraffe	Scissors
The experimenter cuts the giraffe's toes with the scissors.	
4. Bear	Plate
The experimenter puts the plate in the bear's face.	
5. Horse	Alphabet Block
The horse jumps on top of the alphabet block.	
6. Baby	Hat
The hat is placed on top of the baby's head.	
7. Yoda ("Star Wars") Gun	
Yoda shoots the gun.	
8. Frog	Truck
The frog jumps over the truck.	
9. Bird	Screwdriver
The bird sits on top of the screwdriver.	
10. Snoopy	Bulldozer
Snoopy drives the bulldozer across the table.	
11. Mailman	Box of Soap
The experimenter pretends to pour soap from the box on the front and back of the mailman's uniform.	

- 12 Deer Coffee Pot
The stout of the coffee pot is put on the deer's mouth.
13. Skunk Iron
The skunk irons the table with his feet.
14. Duck Wagon
The duck pulls the wagon
15. Pig Rake
The pig rakes the table.

APPENDIX E

LIST OF VERBAL ELABORATIONS PRESENTED BY THE ADULT MODEL

VERBAL ELABORATIONS PRESENTED BY THE ADULT MODEL ON PRACTICE ITEMS
DURING PHASES 1, 2, AND 3

Stimulus Toy

Response Toy

Phase 1 Practice Items

- a. Gorilla Baby Bottle
They feed baby gorillas from a bottle.
- b. Scarecrow Pliers
You pinch the scarecrow with pliers.

Phase 2 Practice Items

- a. Football Player Blowdriver
The football player can't dry his hair with his helmet on.
- b. Alligator Leaf
The alligator ate the leaves.

Phase 3 Practice Items

- a. Raggedy Anne Mirror
Raggedy Anne looked at her face in the mirror.
- b. Rabbit Tennis Racket
The rabbit swings the tennis racket.

VERBAL ELABORATIONS PRESENTED BY THE ADULT MODEL ON PHASE 1 TEST
ITEMS

<u>Stimulus Toy</u>	<u>Response Toy</u>
1. Mouse	Boat
Mice leave the boat when they think it will sink.	
2. Whale	Comb
Whales can't comb their hair without hands.	
3. Giraffe	Scissors
Giraffes are too tall to cut their toenails.	
4. Bear	Plate
The bear ate porridge from the plate.	
5. Horse	Alphabet Block
The horse jumped on top of the alphabet block.	
6. Baby	Hat
The baby put on a hat.	
7. Yoda ("Starwars" Dwarf)	Gun
Yoda shoots the gun.	
8. Frog	Truck
The frog jumped over the truck.	
9. Bird	Screwdriver
The bird sat on the screwdriver.	
10. Snoopy	Bulldozer
Snoopy chased the Red Baron with the bulldozer.	
11. Mailman	Box of Soap
The mailman cleaned his uniform with soap from the box.	

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