

**Acquisition, Generalisation and Retention of Object Names  
in 4 Year Old Children: A Comparison of Child-Led and  
Adult-Led Learning Interactions**

A dissertation  
submitted in partial fulfilment  
of the requirements for the Degree  
of  
Master of Education  
in the University of Canterbury  
by  
Laura-Lee K. McLay

University of Canterbury, New Zealand

December, 2003

## CONTENTS

	PAGE
LIST OF TABLES .....	4
LIST OF FIGURES .....	5
ACKNOWLEDGEMENTS .....	7
ABSTRACT .....	8
CHAPTER 1 INTRODUCTION .....	9
CHAPTER 2 LITERATURE REVIEW .....	18
CHAPTER 3 METHOD .....	26
Participants .....	26
Settings .....	26
Materials .....	27
Testing Procedure .....	29
General Procedure .....	32
CHAPTER 4 RESULTS .....	34
Individual Data .....	34
Grouped Results .....	38
CHAPTER 5 DISCUSSION .....	47
REFERENCES .....	55
APPENDIXES .....	57
APPENDIX 1 A List of the 42 animals included in the pre-test .....	57

APPENDIX 2	Photographs of each of the 42 3-dimensional model animals.....	58
APPENDIX 3	The animals included in the practice sets for each child, for both the Child-Led and Adult-Led teaching and the adjustments made to each group for each child.....	62
APPENDIX 4	The stimulus pronunciation ratings, stimulus distinctiveness ratings and species categorisation for each of the animals in Set A and Set B.....	67
APPENDIX 5	Photographs of each of the 2-dimensional stimulus items included in the generalisation test for Set A and Set B.....	69
APPENDIX 6	The daily test scores for acquisition, and the retention and generalisation scores for each of the seven subjects.....	73

## LIST OF TABLES

TABLE	PAGE
1. The characteristics of each of the seven participants in the study .....	26
2. The sequence of practise and testing sessions for each child, during each sessions.....	33
3. The total number of questions asked and the total number of animal names learned for each of the seven subjects in (a) the Child-Led teaching condition and (b) the Adult-Led teaching condition .....	37
4. The average number of animal names learned, the average number retained and the average number generalised during (a) the Child-Led teaching condition and (b) the Adult-Led teaching condition for the seven children in the experiment.....	38

## LIST OF FIGURES

FIGURE	PAGE
1. The cumulative number of animals correctly named by Child 1 during Child-Led and Adult-Led interaction lessons.....	41
2. The cumulative number of animals correctly named by Child 2 during Child-Led and Adult-Led interaction lessons.....	41
3. The cumulative number of animals correctly named by Child 3 during Child-Led and Adult-Led interaction lessons.....	42
4. The cumulative number of animals correctly named by Child 4 during Child-Led and Adult-Led interaction lessons.....	42
5. The cumulative number of animals correctly named by Child 5 during Child-Led and Adult-Led interaction lessons.....	43
6. The cumulative number of animals correctly named by Child 6 during Child-Led and Adult-Led interaction lessons.....	43
7. The cumulative number of animals correctly named by Child 7 during Child-Led and Adult-Led interaction lessons.....	44
8. The total percentage of animals correctly retained for	

each child in the Child-Led and Adult-Led teaching

interactions..... 45

9. The total percentage of animals correctly generalised for

each child in the Child-Led and Adult-Led teaching

interactions..... 46

## **ACKNOWLEDGEMENTS**

I would like to thank my research supervisor, Dr John Church, for the many hours of assistance and guidance provided over the past year of study. John has gone beyond what could have been expected and his wisdom has been greatly appreciated. I would like to thank the families and children who participated in this experiment and made it all possible. The time dedicated by the children and their families and the effort that was put in made my experience both enjoyable and very rewarding. Finally, I would like to thank those who provided me with a number of the necessary materials and resources required to undertake this study.

## **ABSTRACT**

In recent times incidental teaching has become the preferred method for encouraging children's learning and language development within the early childhood setting. It is argued that this naturalistic, unstructured and predominantly child-led style of teaching is the best way of fostering children's language acquisition and generalisation across settings. Few studies however have compared this method with more traditional, structured, adult-led teaching strategies. The present experiment compared the effectiveness of child-led and adult-led teaching interactions in the acquisition, retention and generalisation of object names in seven, 4-year old children. A comparison of the effects of the two teaching conditions revealed that children learned more object names during the adult-led interactions. However this difference did not prove to be significant. No difference was found between the two groups in either retention or generalisation. These findings have significant implications for the way in which young children should be taught and raises questions about one of the fundamental assumptions underlying developmentally appropriate practice.



# **CHAPTER 1**

## **INTRODUCTION**

Teaching procedures can be arranged on a continuum from child-directed through to teacher-directed. Both of these teaching procedures are supported by the research literature yet child-directed and teacher directed teaching practices are based on very different philosophies of education.

Child-directed teaching practice is derived from the principles of developmentalism. Developmentalism emphasises the sufficiency of people's innate and natural desire to learn, the adverse effects of interference with a child's natural proclivities and tendencies, and the importance of creating learning experiences that are compatible with those that occur in a natural learning environment (Stone, 1996; NAEYC, 1996). Ultimately, according to these principles, learning environments which caters for a child's natural tendencies and inclinations are optimal because they are consistent with the natural course of development.

The interest in developmentally appropriate practice has resulted in a shift towards more naturalistic and less structured types of early education (Stone, 1996; NAEYC, 1996). Developmentally appropriate practices are based on three important sets of information. The first is information pertaining to child development and learning. What kinds of experiences are age appropriate, achievable, but also challenging to the children. The second is the individual needs, preferences, strengths and weaknesses of the child. The third is the need for those in contact with the child to be aware of the social and cultural contexts in which children develop so that every learning experience is meaningful for both the child and their family.

These ideals of developmentally appropriate practice currently guide early teacher education and the early childhood teaching environment which is created.

Examples of teaching methods that are compatible with the principles of developmentally appropriate practice include the facilitation of children's play, discovery learning and incidental teaching. Facilitation of children's play involves use of the child's choice of play activity to create learning opportunities. Discovery learning, involves children selecting their own learning targets and working independently to achieve these targets. Incidental teaching involves (a) organising the environment in such a way that the child will be encouraged to initiate conversations which can be used to provide opportunities for teaching and learning, (b) the use of learning activities which coincide with the child's skill level and interest, (c) responding to the child in such a way as to encourage language learning and generalisation and (d) providing praise for the child in their attempts to communicate (Warren & Kaiser, 1986; Peterson, 2003; Hart & Risley, 1980).

At the opposite end of the teaching methods continuum is teacher-directed teaching. Teacher directed teaching methods include direct instruction, teacher-directed classroom activities and discrete-trial training. Teacher-directed classroom lessons involve the teacher organising and controlling instructional materials, lesson content and curriculum delivery. The teacher provides the opportunities to respond. The teaching setting is typically arranged by the teacher to minimise distractions and enhance task attention. Teaching materials are typically selected by the teacher and differential reinforcement is usually employed by the adult leading the interaction (Lovaas & Taubman, 1981; Lovaas, 1996; Stahmer & Schreibman, 1992). Direct Instruction for example, involves a highly scripted teaching activity that is fast paced, provides a large number of practice opportunities, involves constant interaction

between the child and the teacher and curriculum steps which are determined and sequenced in a structured fashion by the teacher according to the individual child's needs.

The proponents of more structured approaches to teaching, such as behaviour analysts, tend to argue that the teacher is responsible for the child's progress and for ensuring that the child is actively involved in the learning process. The teaching involves both planned interactions and unplanned interactions and teaching is undertaken in both the natural unstructured environment as well as in more structured settings. The proponents of more structured methods often argue that if a child has not learned what was being taught then the teacher has not taught them appropriately.

Child-directed teaching methods tend to be favoured over teacher-directed methods by early childhood educators and many primary school teachers. Those in favour of incidental teaching argue that incidental teaching incorporates teaching techniques such as shaping, prompting and reinforcement which are known to be effective (Warren & Kaiser, 1986;). Incidental teaching is used in contexts where language is used and where the natural cues are the same as those in typical environments and so generalisation of learning is more likely (Peterson, 2003). It is thought that the improved generalisation results from the fact that the contingencies of reinforcement are much less discriminable during incidental teaching than they are in a one-to-one training session. It is argued that incidental teaching provides a large number of learning opportunities as it is conducted at various times and in various contexts throughout the child's day (Warren & Kaiser, 1986; Bishop, Doepke & Trotter, 2000; Peterson, 2003) and hence results in faster acquisition and better retention. It is argued that language skills taught by this approach are more

functional for the child as they result in control of the environment, continued interaction with an adult, and realization of the child's communicative intentions (Warren & Kaiser, 1986; Peterson, 2003) and ultimately it is claimed that this leads to increased language initiations and responsiveness to others and increases in the variety in the child's communicative experiences (Warren & Kaiser, 1986).

While incidental teaching is widely supported, widely used and taught to pre-service early childhood teachers, a number of criticisms have been levelled at this style of teaching. Firstly, it is argued that, while developmentally appropriate practice may be effective when used with children whose individual circumstances and developmental maturity provide adequate preparation and motivation for schooling, it is yet to be shown that it is an effective method for those who are at risk for school failure due to low expectations, inadequate learning opportunities or low motivation (Stone, 2000; Schweinhart, 1997).

Secondly, developmentally appropriate practice suggests that attempts to teach those who are unmotivated or not ready for schooling may prove harmful for the child (Stone, 2000). This significantly limits the use of practices that may otherwise be effective for these children given that they are provided with sufficient instruction, reinforcement and practice.

Finally, an over-reliance on incidental teaching disadvantages introverted children because a failure on the part of the child results in a decrease in the teacher's expectation of what the child can accomplish. This is of particular concern as learning requires a certain amount of practice and practice requires a certain degree of motivation and desire to learn on the part of the child. Children who are not intrinsically motivated, therefore, may require some form of extrinsic or external reinforcement in order to generate such desire and motivate practice. The proponents

of developmentally appropriate practice however discourage the use incentives arguing that the child may become dependent on external sources of motivation (Stone, 2000; Schweinhart, 1997).

At the opposite end of the spectrum there are a number of arguments advanced in favour of teacher-directed methods. Firstly, teacher-directed teaching is almost always conducted with a group of children thus providing the children with a number of opportunities to participate in the group, interact with peers and also receive one-on-one attention. Instruction tends to be logically sequenced so that important rules and concepts are systematically taught and quickly acquired. Brief placement tests identify whether the child is capable of learning the concepts to be taught, and thus when a concept is taught the child is able to acquire it very quickly. Short yet frequent practice sessions ensure that new knowledge is retained and the pace of the interaction ensures that children's attention is maintained. Brief proficiency tests provide information about the skills the child needs to be taught and the skills which the child already knows so that the child is sufficiently challenged rather than simply engaging day after day in activities which they have already learned to perform.

The effectiveness of teacher directed instruction for children with developmental delays has been extensively studied and repeatedly demonstrated (Lovaas & Taubman, 1981; Lovaas, 1996; Stahmer & Schreibman, 1992; Koegel & Frea, 1993; McEachin, Smith & Lovaas, 1993).

While there is much research support for teacher-directed instruction critics of this type of teaching argue that instructional methods which emphasise academic skills and minimise young children's choice-making lead to high levels of childhood stress (Golbeck, 2001). Critics argue that, although children may achieve more

highly on academic achievement tests, they rate their abilities lower, are more dependent on adults and have lower expectations of their personal achievement (Stipek et al, 1992; Golbeck, 2001). It is further argued that teacher-directed activities fail to encourage the social, emotional and creative development of children due to the structured nature of the learning environment (Schweinhart, 1997) and that they may result in an erosion of the child's natural interests and interfere with the child's attempts to make their experiences meaningful. Finally, it is suggested that the high levels of reinforcement commonly used in teacher-directed classrooms may lead the child to become dependent on extrinsic reward systems and subsequently result in a loss of intrinsic motivation to learn (Stone, 2000).

The most recent NAEYC Position Statement (NAEYC, 1996) argues that both child-directed and teacher-directed activities have an important place in the education of early childhood and primary school children. The Position Statement argues that teachers should employ a wide range of teaching strategies to enhance the learning and development of children in the centre or classroom. To do this involves encouraging children to devise and implement their own learning tasks. Teachers should be encouraged to present a wide range of novel stimuli and novel experiences, and present a variety of ideas and experiences in order to broaden the scope of children's interests. Teachers should use a variety of teaching strategies, such as modelling, focused attention, verbal encouragement and prompting, reinforcement, physical proximity and information giving in order to enhance children's involvement in, and effort in meaningful activities and teachers should guide and assist children in the acquisition of new skills as is necessary. Teachers should provide activities which are continually challenging for the child and while at the same time enabling the child to be successful enough to maintain a sense of

competence and a willingness to take risks. In summary, the NAEYC guidelines state that children construct their own understanding of concepts, and they benefit from instruction by more competent peers and adults and benefit from engaging in self-initiated, spontaneous play and from teacher-planned and structured activities, projects and experiences (NAEYC 1996).

The use of Child-Led and Adult-Led teaching interactions is further supported by the Division of Early Childhood of the Council for Exceptional Children which advises that educators use a learning set which is already known by the child prior to introducing new instruction to maintain the effect of reinforcing performance. They suggest that a high level of novel materials and guided practice should be provided and that obligatory responding should be quickly shifted to nonobligatory responding. Finally they suggest that children should be provided with a number of practice opportunities in which the child can independently apply skills once they have been acquired (Division of Early Childhood of the Council for Exceptional Children, 1993).

In the study described in the report the following terms and definitions have been used.

*Incidental Teaching:* Incidental teaching is defined as a set of learner-teacher interactions in which (a) learning opportunities are initiated by the child, (b) the number of learning opportunities and target responses are determined by the child, (c) the environment and materials in that environment are set up in a way that will encourage language development and (d) the child receives reinforcement for initiating an interaction in the form of continued interaction with “the teacher”

In this study, the incidental teaching procedure will be referred to as the “Child-Led” teaching condition. The Child-Led condition involves the following sequence of events.

A	B	C
Stimulus	Behaviour	Consequence
Environment or activity	Child	Adult
(e.g. Picture)	(e.g. Question)	(e.g. Answer)

*Teacher-Led Procedure:* As it is used in this study, teacher-led teaching is defined as a set of teacher-learner interactions in which (a) the adult initiates the interaction, (b) the child responds and (c) the child receives some kind of feedback, reinforcement or correction following their response and (d) the number of learning opportunities is determined by the teacher.

In this study, the teacher-led procedure will be referred to as the “Adult-Led” teaching condition. The Adult-Led teaching condition involves the following sequence of events.

A	B	C
Stimulus	Behaviour	Consequence
Adult	Child	Adult
(e.g. Picture + question)	(e.g. Answer)	(e.g. Feedback)

Teacher-led interactions may also include prompting or modelling in the A (antecedent) position.

The present study was designed to explore the acquisition, retention and generalisation which results from child-led teaching interactions and adult-led teaching interactions, in younger children. This question was selected because it has significant implications for the way in which early childhood educators should be trained and ultimately, the way in which young children might best be taught. This is



of particular relevance to the author who works with young children with autism. Currently, these children are being taught using predominantly adult-led teaching methods. However, the use of these methods with young children is frequently criticised as inappropriate for young children (Stipek et al, 1992; Golbeck, 2001; Schweinhart, 1997).

## **CHAPTER TWO**

### **LITERATURE REVIEW**

One of the teaching strategies which is frequently advocated for use at the early childhood level is incidental teaching. The effects of incidental teaching have been studied by a number of investigators (e.g. Hart & Risley 1968, 1974, 1975 1980; Hemmeter, Ault, Collins & Meyer, 1996).

The initial Hart and Risley study (Hart & Risley, 1968), used incidental teaching to teach children colour names. In this study, preschool children from disadvantaged backgrounds were taught by teachers to ask for toys they wanted to play with before removing them from a shelf. When the children requested they were given immediate positive teacher attention and access to the toy which they had requested. Once the child was able to request, the teachers prompted the child to specifically label the desired item using a noun label. For example, when the child asked, "Can I play with that?", the teacher asked, "What is that?". If the child labelled the item they were reinforced by being given the toy that they had named. If they did not label the item they were prompted to do so through verbal imitation, e.g., "Say play dough". When the children were regularly using nouns in their requesting, the teacher introduced a colour labelling requirement whereby, if the colour of the item was obvious, the child was taught to include the colour of the item in their request. For example, if the child asked to play with the play dough, the child was asked, "What colour is the play dough?" Correct responses were followed by verbal praise and access to the toy that was correctly labelled and incorrect responses led the teacher to prompt the correct response. As a result of this experiment colour naming

increased significantly and the children maintained their use of the colour labels when the requirement was removed.

In the follow-up studies by Hart and Risley (1974, 1975), a very similar procedure was followed whereby incidental teaching situations were deliberately set up so that highly desirable items were withheld from the children until they requested these items by verbally labelling them.

The first of these follow-up studies (Hart & Risley, 1974) followed 12 disadvantaged preschool children over an 8 month period. In this study the classroom environment was set up in such a way that the children could only gain access to certain materials by verbally requesting them. Whenever the children selected an item which they wanted to play with, the child was prompted to ask for it. Initially the child was able to ask for the item simply by using the noun label. When this had been learned, the child was required to use an adjective-noun combination. The child was then required to use a colour adjective-noun combination in order to obtain the item and finally, the child was required and prompted to describe what they would do with the item using a compound sentence.

As a result of introducing these requirements, the children's use of noun labels, adjective-noun combinations and compound sentences increased steadily. When the requirement to use adjective-noun combinations and compound sentences was removed and novel stimuli were introduced, however, the use of these language forms significantly decreased (Hart & Risley, 1974). The findings of this study are replicated in Hart and Risley (1975).

The final study by Hart and Risley (1980) compared the language development of the children in the 1974 experiment against that of two control groups. The subjects in the study attended one of three preschools. The first was a

preschool which predominantly included children from a disadvantaged background, yet used incidental teaching during free play. The disadvantaged children who were exposed to incidental teaching procedures were also part of the previous Hart and Risley (1974) study. This was the experimental group. The second included children from a disadvantaged background where the teachers had not been trained to use incidental teaching techniques, and the third group included children from an upper-middle class background whose teachers were also not using incidental teaching techniques. Language use was recorded solely during free play sessions. When the children were initially compared, language development in the experimental group followed a similar trajectory to that of the other disadvantaged group. By the end of the eight month intervention period however, those in the experimental group demonstrated much more extensive vocabularies and more elaborate sentence use than the disadvantaged children in the control group and they displayed an overall pattern of language use similar to that of the children from the advantaged backgrounds.

In all of the Hart and Risley studies, (1968, 1974, 1975, 1980), the incidental teaching process was described as having three main elements. The first was that the teacher set up a situation that required or elicited language use, without directly prompting it. The second was that the child's use of more complex language was immediately reinforced by the child gaining access to the toy which they wanted to play with. The third was the requirement to use increasingly complex language forms in order to gain access to the desired toy.

Hemmeter et al. (1996) examined the rates of spontaneous language use after incidental teaching procedures were implemented. In this study, four moderately disabled, elementary school students were taught target responses using a mand-

model incidental teaching technique. This involved withholding materials from the child by placing them out of the child's reach and waiting for the child to request the desired item. If the child did not request the item or include the targeted response in their request the correct statement or response was modelled. If the child spontaneously requested the item using the appropriate language form they were given access to the toy and verbally reinforced. The subjects in this study showed a significant increase in their use of spontaneous language targets. However this increase was not maintained or generalised following the intervention period.

While there have been a number of studies that have examined the effectiveness of incidental teaching, very few studies have compared child-led and adult-led teaching in a controlled fashion. One of the reasons for this may be because incidental teaching techniques have been assumed not only to be consistent with developmentally appropriate practice but also to be more effective with young children than teacher-directed learning experiences.

There appear to have been three direct comparisons of the effectiveness of incidental teaching and teacher directed teaching. In the first of these (Miranda-Linne & Melin, 1992) two children with autism were taught using incidental teaching and discrete-trial teaching methods. The incidental teaching procedure involved displaying a series of coloured items on a shelf in the classroom. When the child initiated an activity by looking at one of the items on the shelf, trying to reach it or naming it, the teacher asked the child to label the colour of the item requested. The child was reinforced by gaining access to the toy requested. The teacher-directed condition by comparison involved individually presenting each practice stimulus and asking the child what colour it was. Incorrect responses were followed by prompts

and all correct responses were reinforced orally and with edibles. Twenty trials were performed daily for each condition.

The results of this study demonstrated that during the acquisition phase discrete-trial teaching produced faster acquisition and greater generalisation of the colour adjectives that were being taught. In the follow-up test that was conducted a week after conclusion of the experiment both subjects had received mastery criteria on all of the stimulus items in each of the teaching conditions. However the children in the incidental teaching group produced greater generalisation, more spontaneous language usage and equal retention of the colour names that had been practised.

In the second study, by Cavallaro & Bambara (1982), the incidental teaching condition consisted of the teacher mediating materials as much as they could so as to use natural opportunities to teach language. For example, as the child initiated involvement in an activity the teacher focused attention on that child and briefly withheld the item requested. If the child did not respond the teacher prompted or modelled the target response. When the child responded they were given the item and praised. The direct teaching method in this study involved asking the child directly to label the item they wanted by asking, for example, "What is it?". Incorrect responses were followed by verbal prompts and they were once again praised and given access to the toys that they had named following correct responses. This study did not control for the number of practice opportunities in each condition. Cavallaro and Bambara (1982) report that incidental teaching produced a higher rate and variety of two word utterances in language-delayed preschool children. However, neither the direct teaching nor the incidental teaching condition resulted in any increase in the overall complexity of language use.

In the third study McGee, Krantz and McClannahan (1985) taught relational prepositions such as “beside” and “under”. The incidental teaching procedure involved displaying toys on shelves in the corner of the classroom on top of, beside, under, in front of etc., shoeboxes. When the child initiated a request the teacher asked, “Where is the toy?”. Errors were followed by prompts, eg, “Tell me under the box”. Correct responses were followed by descriptive praise and access to the toy regardless of whether the response was prompted or unprompted. The teacher-directed procedure involved the teacher presenting items at a desk where the toys were displayed relative to the shoebox. The teacher then asked the child to tell them where the item was. Once again errors were followed by prompts and corrects were followed by descriptive praise and 5 seconds access to an item of choice that was not used as training stimulus. Twenty practice opportunities were provided for each condition daily, the schedule of reinforcement was kept constant across both teaching conditions through contingent access to materials, and the level of difficulty of the prepositions was held constant.

The findings of this study demonstrated no significant difference in the rates of acquisition or retention between the incidental teaching condition and the discrete trial teaching condition. However incidental teaching produced greater generalisation and more spontaneous language usage. The findings of this study were inconsistent with the findings of the previous studies in terms of acquisition but were consistent with respect to generalisation and spontaneous language use across the two teaching conditions.

Collectively these studies produced somewhat contradictory findings and there were a number of fundamental flaws apparent in the studies by Cavallaro and Bambara (1982) and Miranda-Linne and Melin (1992). The first was that many of

the child initiated interactions were turned into teacher led interactions when the teacher asked a prompting question. In this sense many of the interactions in the incidental condition in these studies were adult-directed. In addition to this, the teachers had to provide some direct teaching in order for the child to learn how to respond correctly to the different stimulus displays.

The finding that discrete-trial teaching produced faster initial acquisition and generalisation in the Miranda-Linne and Melin study (1992) is worthy of further investigation as it suggests that some children may need to acquire language through discrete-trial teaching before they are able to acquire and use language in incidental teaching situations.

Whether or not children acquire, generalise and retain new language more rapidly during child-led or adult-led teaching interactions has significant implications for how children of all developmental backgrounds should be taught and ultimately what should be considered developmentally appropriate practice. The belief that preschool children should experience only incidental teaching interactions is central to the early childhood philosophy of developmentally appropriate practice. Underlying this belief is the assumption that young children acquire, retain and generalise new language more rapidly as a result of child-led rather than adult-led learning interactions.

The aim of the present study is to test this assumption by directly comparing the acquisition, retention and generalisation of object names during child-led and adult-led learning interactions.

In order to compare the relative effectiveness of child-led and adult-led learning opportunities a procedure must be devised for controlling the number of learning opportunities during each condition. One way of maintaining a consistent



number of practice opportunities across both conditions is to conduct the child-led teaching condition prior to the adult-led teaching condition. The number of questions the child-asks in the child-led teaching condition can then be counted and an identical number of questions subsequently asked by the adult in the adult-led condition. This control is essential in order to ensure that any difference in rate of learning under each condition is attributable to who led the teaching interactions rather than differences in the amount of practice which occurred.

In order to achieve an uncontaminated measure of the effects of child-led versus adult-led interactions it is also important to remove the teacher prompting which has occurred so extensively in previous studies of incidental teaching. This can be achieved by pre-teaching the child participants to ask all the question during the child-led sessions. This will result in an experiment in which the only difference between the two conditions; child-led interaction and adult-led interaction, is in terms of who leads the interaction and who responds to the question.

With these experimental controls in place it should be possible to measure the effects of child-led and adult-led teaching on rate of acquisition, generalisation and retention of object names in 4-year old preschool children.

## CHAPTER 3

### METHOD

#### *Participants*

The participants in the present study consisted of seven, 4-year old children. Five of these children attended regular mainstream preschools. They were all typically developing children and had no recognised learning deficits or disorders. The characteristics of the seven children are shown in Table 1. Child participants were recruited through contact with parents known to the experimenter. The procedure, purpose and aim of the experiment was described in written and oral form to all of the parents prior to seeking their consent. Informed consent was obtained from the parents or guardians in each case.

*Table 1. Characteristics of each of the seven participants in the study*

	<i>Age</i>	<i>Gender</i>	<i>Preschool Attendance</i>	<i>Socio-economic status</i>
	Years/months	Male/Female		
Child 1	4.5	F	Yes	Middle class
Child 2	4.6	M	Yes	Middle class
Child 3	4.9	F	No	Upper Middle class
Child 4	4.3	F	Yes	Middle class
Child 5	4.11	F	Yes	Middle class
Child 6	4.8	M	Yes	Middle class
Child 7	4.11	F	Yes	Middle class
			No	

#### *Settings*

The experiment was conducted in a room of the child's home which was determined by the child, and agreed to by the parents. For most of the children the area of the home where the experiment was conducted was the same for both

teaching conditions. For Child 1, the experiment was conducted each day at the dining room table with the child's mother present. For Child 2, the experiment was conducted during each session on the dining room floor with the child's mother present. The experiment was conducted in the dining room, on the floor for Child 3 with the presence of the child's carer. For Child 4 the first half of the practice sessions were conducted in the lounge room and for the second half of the sessions, on the bedroom floor. The mother chose to be present in the room for the initial two or three sessions then was not. The experiment was conducted at the dining room table for all of the sessions, for Child 5 and the child's mother was not constantly in the room where we did the experiment. For Child 6 each session was conducted in the lounge in the presence of the child's mother and the experiment was conducted on the floor. The experiment was undertaken at the coffee table for Child 7 with her mother present at all times. When the experiment was conducted at a table the stimulus materials were displayed on trays on the table. When the experiment was conducted on the floor the materials were presented on trays on the floor.

### *Materials*

The materials used in the study consisted of two separate sets of between 18 and 20 model animals. The exact number depended on the number of animals which the child could not yet name. For each child, the two sets contained an identical number of animals. The animals were presented as 3-dimensional models. Photographs of the model animals can be seen in Appendix 2. For Child 1, Child 2, Child 5 and Child 7 the Child-Led teaching procedure consisted of the animals in Set A and the Adult-Led teaching procedure included the animals in Set B. For Child 3, Child 4 and Child 6 the Child-Led teaching condition consisted of the animals in Set B and the Adult-Led teaching condition consisted of the Animals in Set A.

Slight changes were made to the sets used for individual children in order to maintain equal numbers of models in Set A and Set B for each child. The sets of stimulus items used for each child are listed in Appendix 3.

The animals included in each group and the level of difficulty of each set was held constant across both sets using the following procedure. First each item in the total stimulus set was classified according to (a) their stimulus distinctiveness, (b) their ease of pronunciation and (c) their species type. Stimulus distinctiveness and ease of pronunciation were rated on a 3-point scale. For stimulus distinctiveness, a rating of one meant that there were either none or one distinctive feature, a rating of two represented two distinctive features and a rating of three represented three or more distinctive features. A distinctive feature was defined, for example, as more than one colour. A rating of one for ease of pronunciation represented one syllable in the name of the animal, a rating of two represented two syllables in the name of the animal and a rating of three represented three or more syllables in the name of the animal. For the purpose of a species rating the animals were classified as birds, sea creatures, goat or deer like animals, monkeys, lizards or none of the above. Initially all of the items were separated into two groups based on the stimulus distinctiveness rating for each animal. This was organised so that there were an equal number of animals with a rating of one, two or three in each of the two groups. The animals in the two groups were then readjusted so that there were an equal number of animals in each group with a rating of one, two or three for ease of pronunciation. Finally, the groups were adjusted again so that there were an equal number of animals of each species, where possible. The stimulus ratings for each animal can be seen in Appendix 4.

The generalisation test involved materials which contained the same animals used during the two experimental conditions but presented in the form of 2-dimensional pictures that were produced off the internet. The photographs of the 2-dimensional animals that were used in the generalisation test can be seen in Appendix 5.

The experiment also included an activity or game for the child to play when they had completed each of the learning activities. The following games were used for this purpose: Guess who?, View Master, Barnyard Bingo, play dough and play dough equipment, colouring activities and Snakes and Ladders.

### *Testing Procedures*

*Pre-test.* A pre-test was conducted prior to beginning the experiment to identify any models which the child could name already. This pre-test involved the child being asked to label each of the animals they were shown. Any animals which the child could already name were removed from the child's set. This test included all 42 of the model animals listed in Appendix 1.

The daily testing procedure involved presenting the animals and asking the child to name the animals that were pointed to, i.e., "What is the name of this animal?". The child was given 3-4 seconds to respond and if they did not or if they answered incorrectly the experimenter moved on to the next animal without correcting or prompting a response. The animals that were labelled correctly were put on one tray and the animals that were labelled incorrectly were put on a second tray. The responses which were correct and incorrect were recorded on conclusion of the oral test.

*Daily tests.* Two tests were conducted per session during the course of the experiment: one for the animals used in the Child-Led teaching condition and one for

the animals used in the Adult-Led teaching condition. The first was conducted immediately prior to the first teaching session and the second prior to the second teaching session. Only the animal names which the child had not learned were tested during these daily tests. A printed recording form containing the names of the Set A and Set B animals was prepared for each child and the child's test responses, whether correct or incorrect were recorded. If the child mastered the names of all of the animals presented in each Set the experiment ended for that child and the rate of acquisition over the set was calculated.

*Retention test.* Three weeks after the final daily test a retention test was conducted to measure the child's recall of the names of those animals that had been learned during the daily practice sessions. The materials for this test included all of those animals that had been learned up until the final daily test. Animal names that had not been learned were not tested.

*Generalisation test.* An identical testing procedure was used for the generalisation test. This was also administered three weeks following conclusion of the practice sessions. It consisted of the two-dimensional stimulus items (photographs) shown in Appendix 5.

### *Procedures*

An alternating treatments design was used to compare the effects of the Child-Led and Adult-Led teaching conditions on the acquisition, retention and generalisation of animal names. The experimental conditions involved two "games". The first game, the Child's Game, was for the Child-Led teaching condition and the second game, the Teacher's Game, was for the Adult-Led teaching condition. Each child completed both teaching conditions.

*Child-Led teaching condition.* In the Child-Led condition (the Child's Game) the child was presented with a tray containing all of the Set A or Set B animals assigned to that condition. Prior to the experiment the child was taught to ask the experimenter questions about these animals. In order to train question asking the experimenter modelled the Child's Game with a third person in which the third person asked the experimenter questions and received an answer and a reward for doing so. As a result of this training the child learned to point to or hold up an animal from the tray and ask "What is the name of this animal?" They were then told the name by the experimenter. The child was free to ask such questions as many times as they liked and in any order until they either became bored or disinterested or until 8 minutes had passed. In other words the length of Child's Game sessions was determined by the child.

*Adult-Led teaching condition.* In the Adult-Led condition (the Teacher's Game), the experimenter asked the child to name the animals, e.g. "Tell me the name of this animal", and the experimenter controlled selection of the items to be displayed on the tray. The number of questions the experimenter asked was the same as the number that the child had asked during the immediately preceding Child's Game session. In addition, the experimenter in the Adult-Led condition targeted four animals at a time and asked questions repeatedly about these animals until their names had been learned.

The Child-Led teaching session always occurred prior to the adult directed teaching session (either that day or the preceding day) in order to ensure that the number of learning opportunities was the same across both conditions. This was done by recording the number of learning opportunities during the Child's Game. A learning opportunity was defined as a child question followed by an adult answer. During the

Teacher's Game a learning opportunity was defined as a teacher questions followed by a correct naming response from the child or an error followed by a correction.

For each teaching condition, the 18-20 models selected for that condition were put on two trays. The first tray was for the animals that were being practiced and the second tray was for the animals that had been learned and no longer needed to be practised. If an animal was named correctly during the daily test, that animal was transferred to the second tray so that the number of animals on the practice tray gradually decreased from day to day. If an animal was incorrectly named on the test it was kept among the practice stimuli on the first tray.

### *General Procedures*

Child 1, Child 2, Child 3 and Child 4 began approximately one week prior to the remaining three children. Two or three children were visited each day. Each child was visited 6-8 times. The length of each visit depended on the amount of time the child spent on each activity but the maximum stay was 30 minutes. The first visit involved the Child-Led condition only and on subsequent days the condition to be conducted first in the session alternated, i.e. on Day 2 the teacher-led condition was conducted first and on Day 3 the child-led condition was conducted first.

Each child was visited at 48 hour intervals. Upon arrival at the child's home approximately five minutes was taken to interact with the child and get materials set into the appropriate groups. Upon setting up, a test was conducted for the items that were to be practiced first during the session. Any items correctly named were then removed from the tray, and practice on the remaining items began. On conclusion of this practice the child was invited to play a game which lasted for approximately five minutes or alternatively they were able to continue with the next practice session which a number of children chose to do. Prior to the second practice session of the



visit the second test was conducted. This test included the materials which were to be practiced in the second session. Once again the items that were labelled correctly were removed from the stimulus set. Following this test, the practice for that set of animals was conducted. On conclusion of this practice the child was invited once again to play a game for up to five minutes. They were also given a tangible reward such as a lollipop or sticker which they could keep.

The order of practice and test presentation is shown in Table 2.

*Table 2. The sequence of practise and testing for each child during each session.*

Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
C.P.	A.P.	C.T.	A.T.	C.T.	A.T.	C.T.	A.T.	A.T.
	C.T.	C.P.	A.P.	C.P.	A.P.	C.P.	A.P.	
	C.P.	A.T.	C.T.	A.T.	C.T.	A.T.	C.T.	
		A.P.	C.P.	A.P.	C.P.	A.P.		

*C.P. refers to the Child-Led practice sessions, A.P. refers to the Adult-Led practice sessions, C.T. refers to the test for the Child-Led condition, A.T. refers to the test for the Adult-Led condition.*

Three weeks following conclusion of the practice for each individual child the generalisation and retention tests were administered. This was spread over two consecutive days. The retention test was conducted on the first of these days and the generalisation test was conducted on the second of these days.

## CHAPTER FOUR

### RESULTS

#### *Individual Data*

Figures 1-7 show the rate of acquisition of animal names during a) the Child-Led teaching sessions and b) the Adult-Led teaching sessions for each of the seven children in the experiment.

Figures 8 and 9 show the total number of animals correctly named on the 3-week retention test and generalisation test under each teaching condition for each child in the study. The results for each of the acquisition, retention and generalisation tests for each individual child can be seen in Appendix 6.

*Child 1.* As can be seen from Figure 1, Child 1 learned at a highly consistent rate across the Child-Led and Adult-Led teaching conditions and the total number of animals learned by the final test was 15 for the Adult-Led teaching interactions and 16 for the Child-Led interactions. As can be seen in Figure 8, Child 1 retained 75 percent of the animals that were learned in the Child-Led condition and only 57 percent of the names practised during the Adult-Led teaching condition. Figure 9, shows that this child correctly generalised 44 percent of the names practiced during the Child-Led teaching sessions and only 14 percent of the names practised during the Adult-Led teaching sessions.

*Child 2.* As can be seen in Figure 2, during the initial four tests the Adult-Led teaching interactions appeared to generate a higher rate of acquisition than the Child-Led interactions with a total of five animals learned on the first day in the Adult-Led condition, compared to only two in the Child-Led condition. During the final three days however the child was learning similar numbers of names under both conditions

and by Day 7 Child 2 had learned the names for all of the animals in the Child-Led and Adult-Led conditions. As can be seen in Figure 8, Child 2 successfully retained 77 percent of the animals learned in the Child-Led teaching condition and 72 percent of the names learned in the Adult-Led teaching condition. The results for generalisation, as can be seen in Figure 9, demonstrate that this child correctly generalised 72 percent of the animal names learned in the Child-Led condition and 78 percent of the names learned in the Adult-Led teaching condition.

*Child 3.* As can be seen from Figure 3, Child 3 learned consistently more animal names during the Adult-Led teaching interactions than during the Child-Led teaching interactions. By the final test Child 3 had learned a total of 17 animal names in the Adult-Led condition and only 13 in the Child-Led condition. Figure 8 demonstrates that Child 3 retained 85 percent of the animal names learned in the Child-Led teaching condition but only 76 percent of the animals learned in the Adult-Led teaching condition. As can be seen in Figure 9, Child 3 was able to generalize 72 percent of the animal names learned in the Child-Led teaching condition and 82 percent of the animal names in the Adult-Led teaching condition.

*Child 4.* Figure 4, shows that Child 4 learned essentially the same number of animal names during the Child-Led condition as during the Adult-Led condition although progress was more steady during the Adult-Led condition. By Day 7 Child 4 had learned 16 animal names in the Adult-Led teaching condition, and 15 in the Child-Led teaching condition. As can be seen in Figure 8, Child 4 retained 87 percent of the animal names learned in the Child-Led teaching condition and 81 percent in the Adult-Led teaching condition. As can be seen in Figure 9, this child correctly generalised 67 percent of the animal names that were learned in the Child-

Led teaching condition and 69 percent of the names learned in the Adult-Led teaching condition.

*Child 5.* Figure 5 shows that Child 5 learned significantly more animal names in the Adult-Led condition than in the Child-Led condition but that this difference is almost entirely due to the greater number of names acquired on the first day of the Adult-Led condition. From Day 3 on the acquisition slopes are essentially parallel. By the final test on Day 7, Child 5 had learned a total of 13 animal names in the Child-Led teaching condition and a total of 17 in the Adult-Led teaching condition. As can be seen in Figure 8, Child 5 was able to correctly retain 85 percent of the animal names that had been learned in the Child-Led condition and 88 percent of the animal names learned in the Adult-Led teaching condition. As can be seen in Figure 9, Child 5 correctly generalised 85 percent of the animals that were learned in the Child-Led teaching condition and 82 percent of the animal names that were learned in the Adult-Led teaching condition.

*Child 6.* As can be seen in Figure 6, Child 6 learned virtually the same number of animal names from day to day during both teaching conditions. By the seventh and final test Child 6 had learned 18 of the animal names in the Adult-Led condition and 17 in the Child-Led condition. Figure 8 shows that Child 6 correctly retained 100 percent of the animal names that were learned in the Child-Led teaching condition and 94 percent of the animals learned in the Adult-Led teaching condition and Figure 9 shows that Child 6 correctly generalised 94 percent of the names learned in the Child-Led teaching condition and 89 percent of the names learned in the Adult-Led teaching condition.

*Child 7.* Figure 7 demonstrates that Child 7 learned very slightly more animal names in the Adult-Led teaching condition when compared to the Child-Led teaching

condition. By the final test, Child 7 had learned 13 animal names in the Child-Led teaching condition and 16 in the Adult-Led teaching condition. Figure 8 shows that Child 7 correctly retained 69 percent of the names learned in the Child-Led teaching condition and 56 percent of the names learned in the Adult-Led teaching condition. Figure 9 shows that Child 7 correctly generalised 23 percent of the names learned in the Child-Led teaching condition and 44 percent of the names learned in the Adult-Led teaching condition.

*The Relationship between total questions asked and rate of acquisition in the Child-Led and Adult-Led teaching conditions.*

Table 3 gives the total number of questions asked by each of the seven children in the Child-Led teaching condition and the number of animal names acquired in both the Child-Led and Adult-Led teaching conditions.

*Table 3. The total number of questions asked and the total number of animals learned for each of the seven subjects in teaching condition (a) the Child-Led teaching condition and (b) the Adult-Led teaching condition.*

	<i>Total Questions asked during all sessions in each teaching condition</i>	<i>Number of animal names acquired</i>	
		<i>Child-Led condition</i>	<i>Adult-Led condition</i>
<i>Child 3</i>	55	13	17
<i>Child 7</i>	58	13	16
<i>Child 5</i>	61	13	17
<i>Child 2</i>	62	18	18
<i>Child 4</i>	69	15	16
<i>Child 1</i>	78	16	15
<i>Child 6</i>	87	17	18

As can be seen from Table 3 Child 3, Child 7 and Child 5 asked the least number of total questions. These three subjects also had the largest difference in acquisition between the two teaching conditions with a total of 13 animal names

acquired in the Child-Led teaching condition and 16 or 17 names acquired in the Adult-Led teaching condition. This was a comparatively large difference between the two teaching conditions when compared to the other subjects and there appears to be a relationship between the number of questions asked and the number of animals acquired in each of the two teaching conditions. This pattern demonstrates that those children who asked the fewest questions acquired a larger number of animal names in the Adult-Led teaching condition than in the Child-Led teaching condition. Overall, however, there does not appear to be any relationship between the number of questions asked and the total number of animal names acquired.

## Grouped Results

*Scores of the two groups on criterion measures.*

The average number of names acquired, the mean total retained (after 3 weeks) and the mean scores on the generalisation test for each condition are shown in Table 4.

*Table 4. The average number of animal names learned, the average number retained and the average number generalised during (a) the Child-Led teaching condition and (b) the Adult-Led teaching condition for the seven children in the experiment.*

	<i>Acquisition (Acquired))</i>		<i>Retention (Number)</i>		<i>Generalisation (Number)</i>	
	M	S.D.	M	S.D.	M	S.D.
<i>Child-Led condition</i>	15.0	2.09	12.6	2.70	9.9	4.15
<i>Adult-Led condition</i>	16.6	1.30	12.6	2.92	11.1	4.61

The average number of names learned, for the Child-Led teaching condition was 15.0, and the average number learned during the Adult-Led condition was 16.6. This difference is not significant. ( $t = 1.49$ ,  $p > 0.05$ ).

The standard deviation was 1.3 for the Adult-Led teaching condition and 2.09 for the Child-Led teaching condition suggesting that there was less variation among the number of animal names learned in the Adult-Led condition than in the Child-Led condition.

As can be seen in Table 4, there was no difference at all in the average retention rates across the two teaching conditions. The average number of names retained was 12.6 in the Child-Led teaching condition and 12.6 in the Adult-Led condition. The retention scores ranged from a low of 9 (Child 7) to a high of 18 (Child 6) in the Child-Led teaching condition and a low of 9 in the Adult-Led teaching condition and a high of 17 (Child 6) in the Adult-Led teaching condition. This variation among individuals is consistent across both teaching conditions with a standard deviation of 2.7 in the Child-Led teaching condition and 2.92 in the Adult-Led teaching condition.

As can be seen from Table 4, the average number of animal names correct on the generalisation test was slightly higher in the Adult-Led teaching condition (11.14), than in the Child-Led teaching condition (9.86) and the variation among the scores was also slightly higher in the Adult-Led teaching condition (4.61) than in the Child-Led teaching condition (4.15). The difference in the total number of generalised correct responses was not however, significant ( $t = 0.52$ ,  $p > 0.05$ ). As can be seen in Figure 9, the results for the generalisation test showed a lot of variation between the subjects with the generalisation scores ranging between 3 (Child 7) and 17 (Child

6) in the Child-Led condition and 2 (Child 1) and 16 (Child 6) in the Adult-Led condition.

#### *Inter-marker agreement*

The tests of 20 percent of the seven children were scored by an independent person. This person received two hours training in how to score each of the children's responses for each of the tests. The inter-marker agreement was 100 percent across the 12 tests which were co-marked.



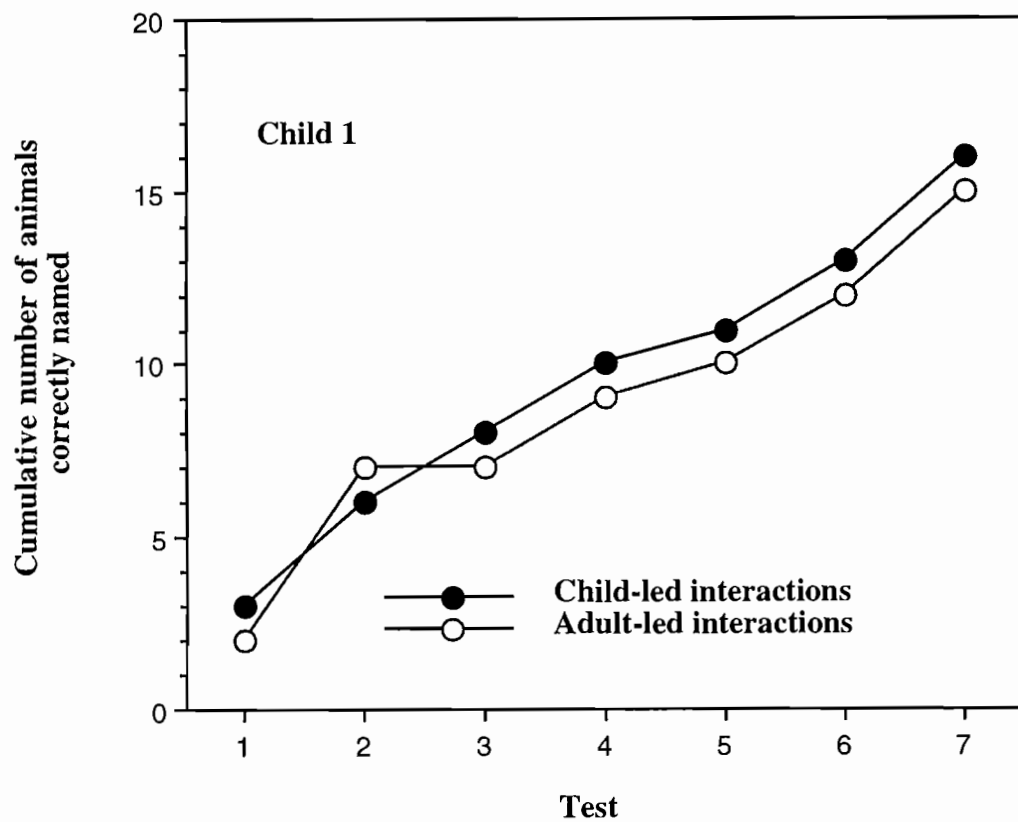


Figure 1. The cumulative number of animals correctly named by Child 1 during Child-led and Adult-led interaction lessons.

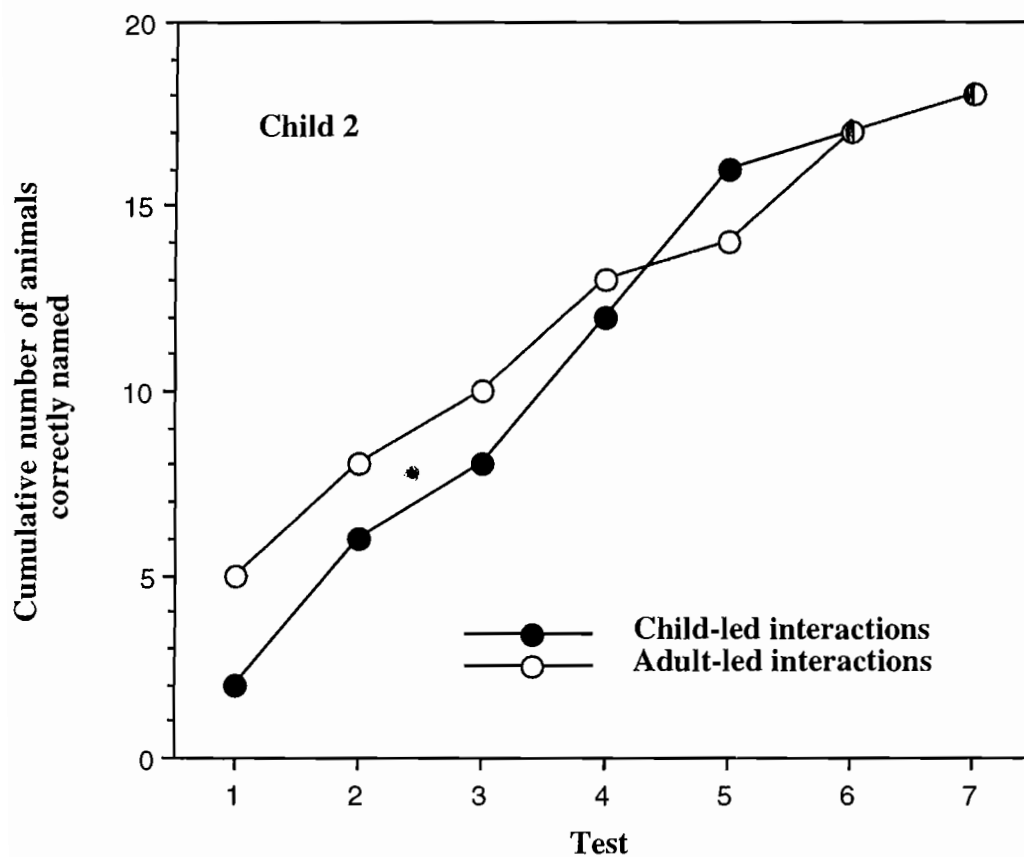


Figure 2. The cumulative number of animals correctly named by Child 2 during Child-led and Adult-led interaction lessons.

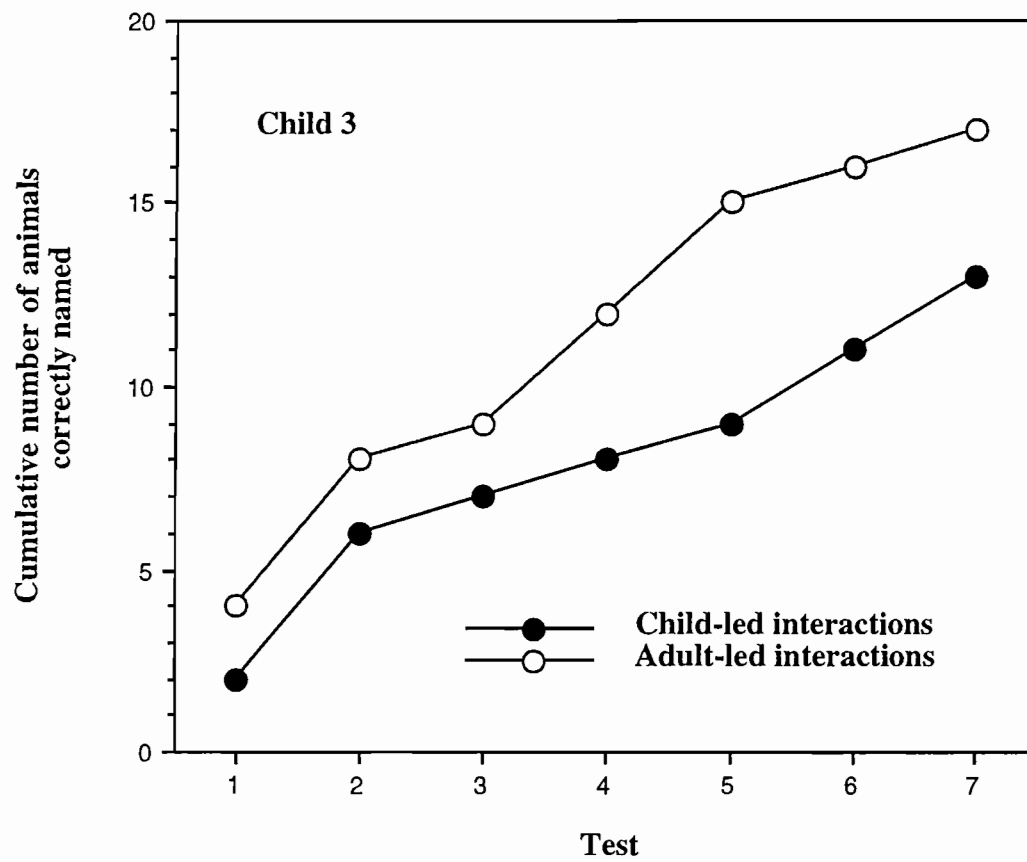


Figure 3. The cumulative number of animals correctly named by Child 3 during Child-led and Adult-led interaction lessons

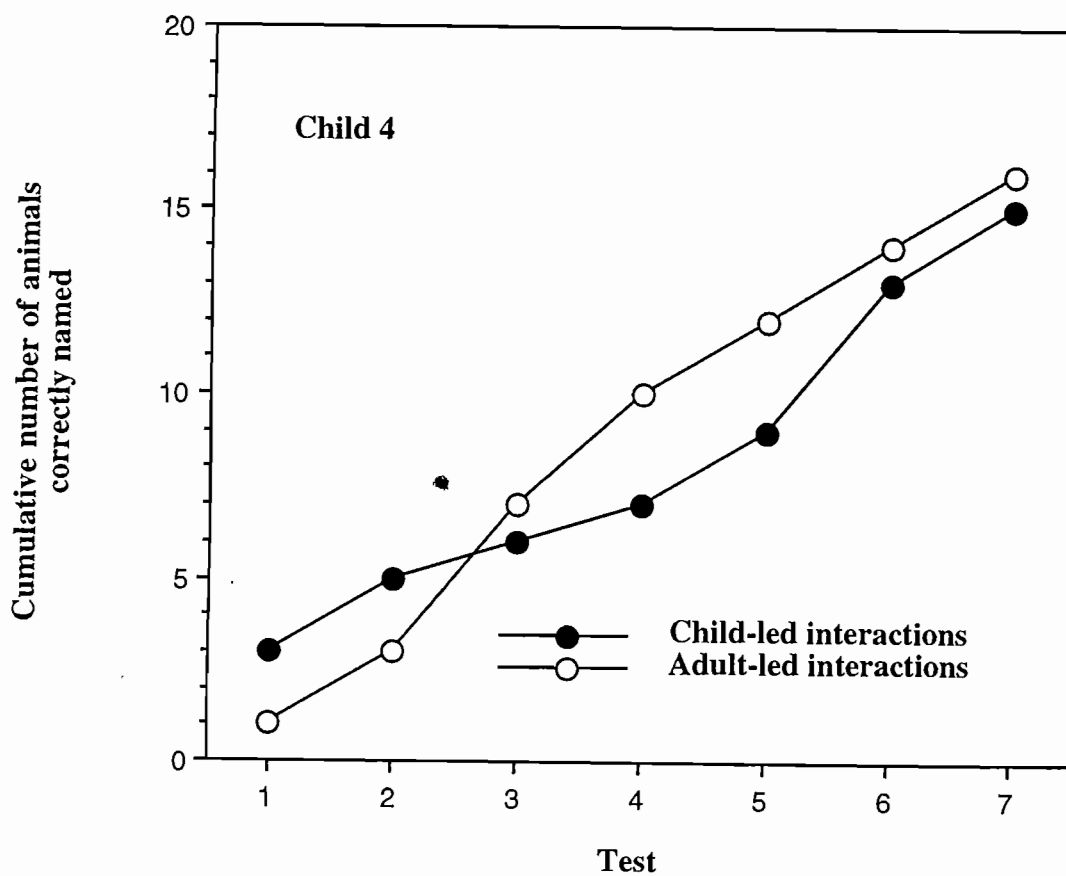


Figure 4. The cumulative number of animals correctly named by Child 4 during Child-led and Adult-led interaction lessons

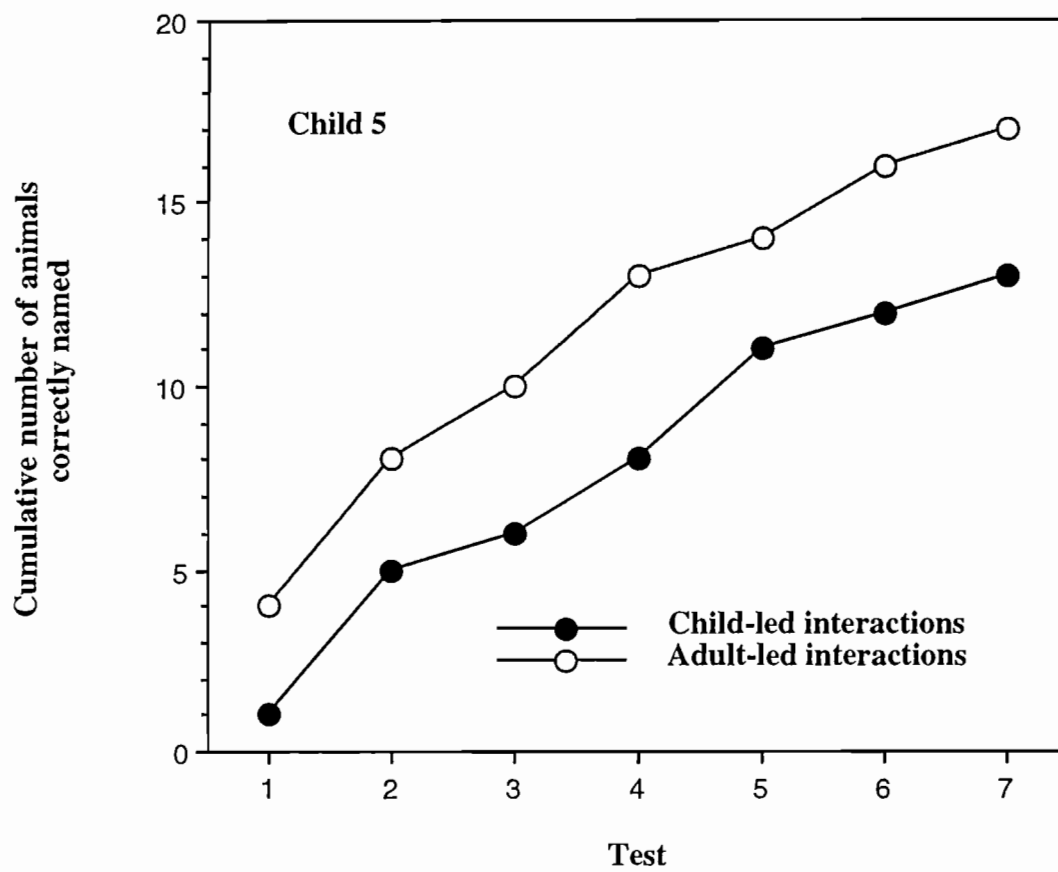


Figure 5. The cumulative number of animals correctly named by Child 5 during Child-led and Adult-led interaction lessons

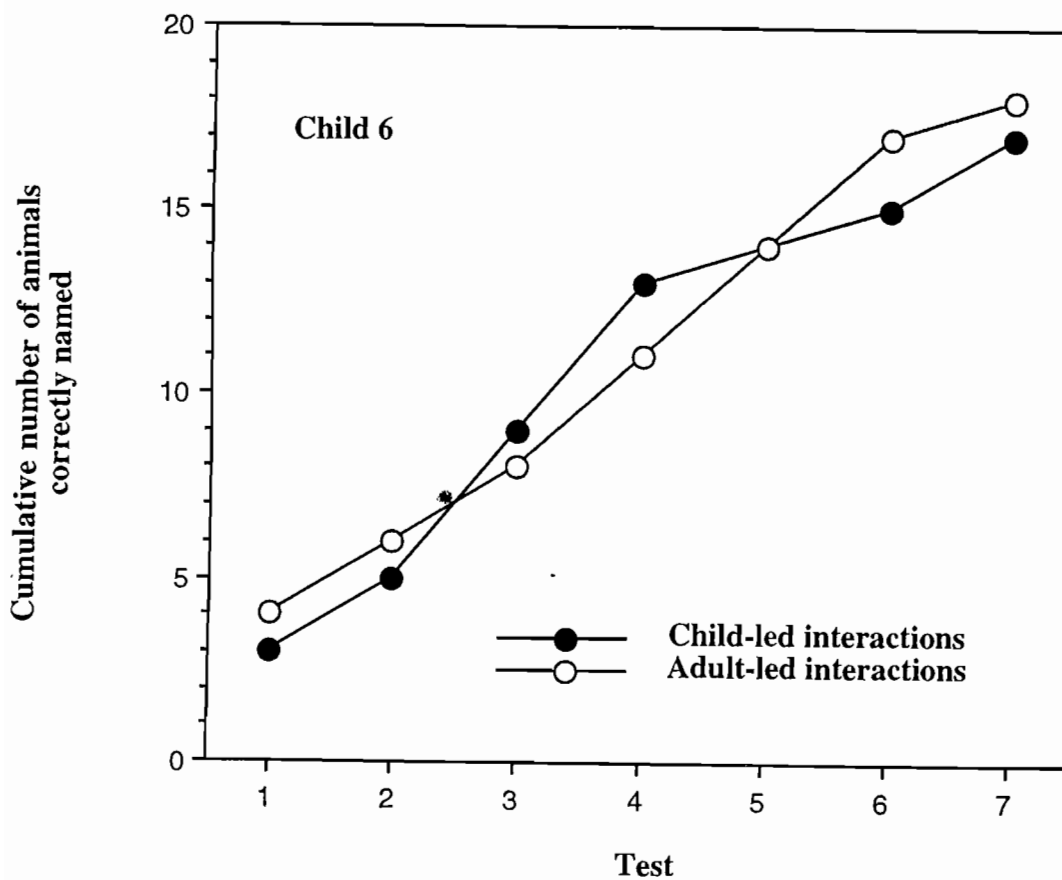


Figure 6. The cumulative number of animals correctly named by Child 6 during Child-led and Adult-led interaction lessons

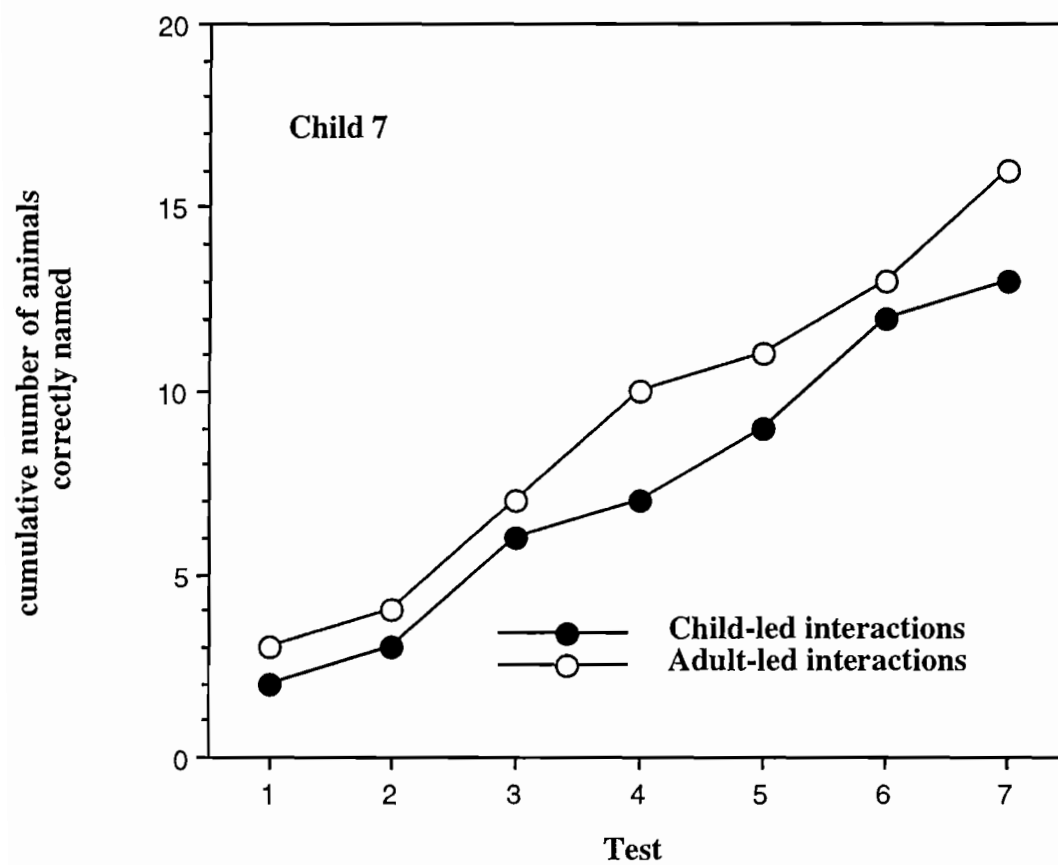


Figure 7. The cumulative number of animals correctly named by Child 7 during Child-led and Adult-led interaction lessons

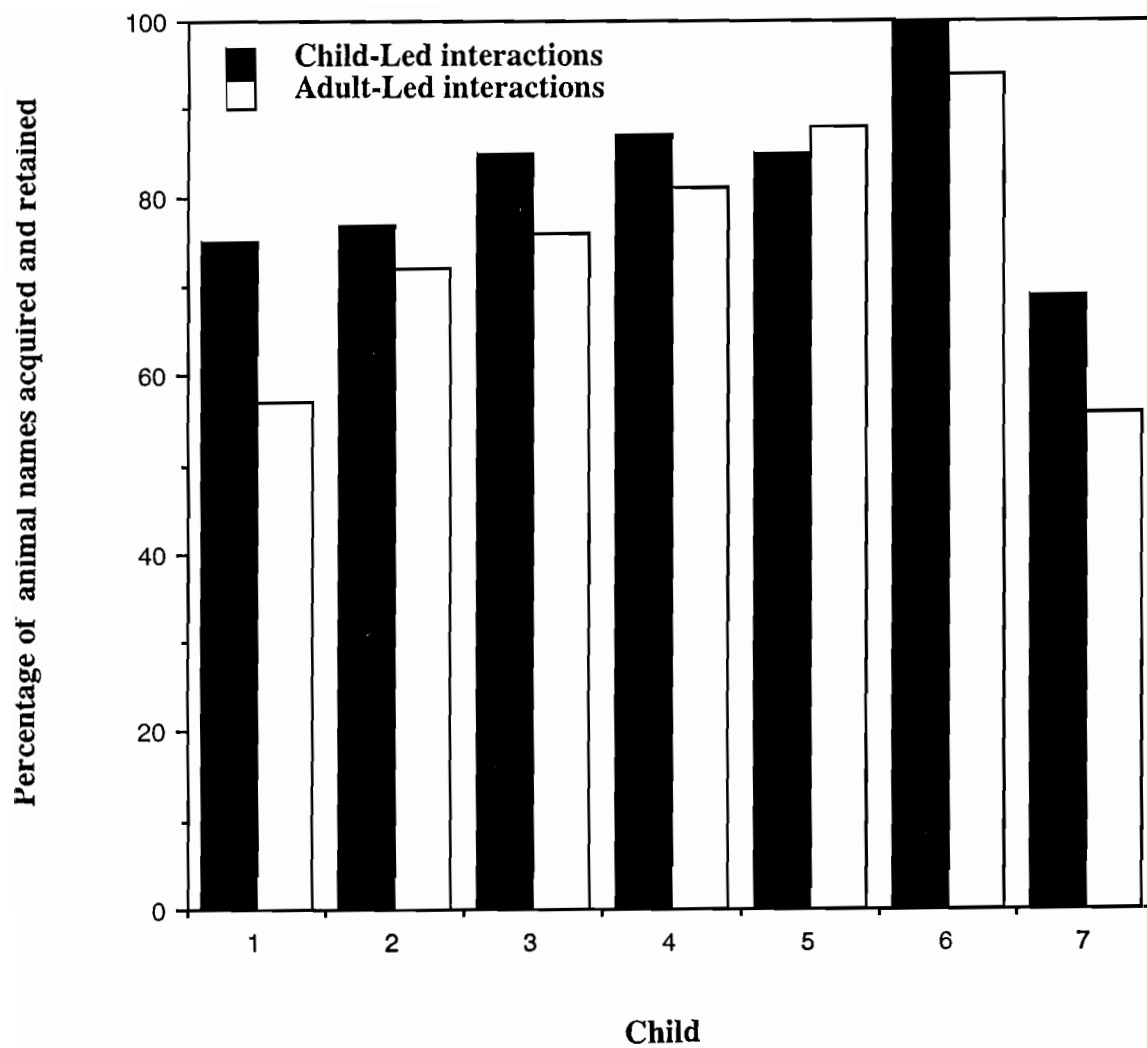


Figure 8. The total percentage of animals correctly retained for each child in the Child-Led and Adult-Led teaching interactions

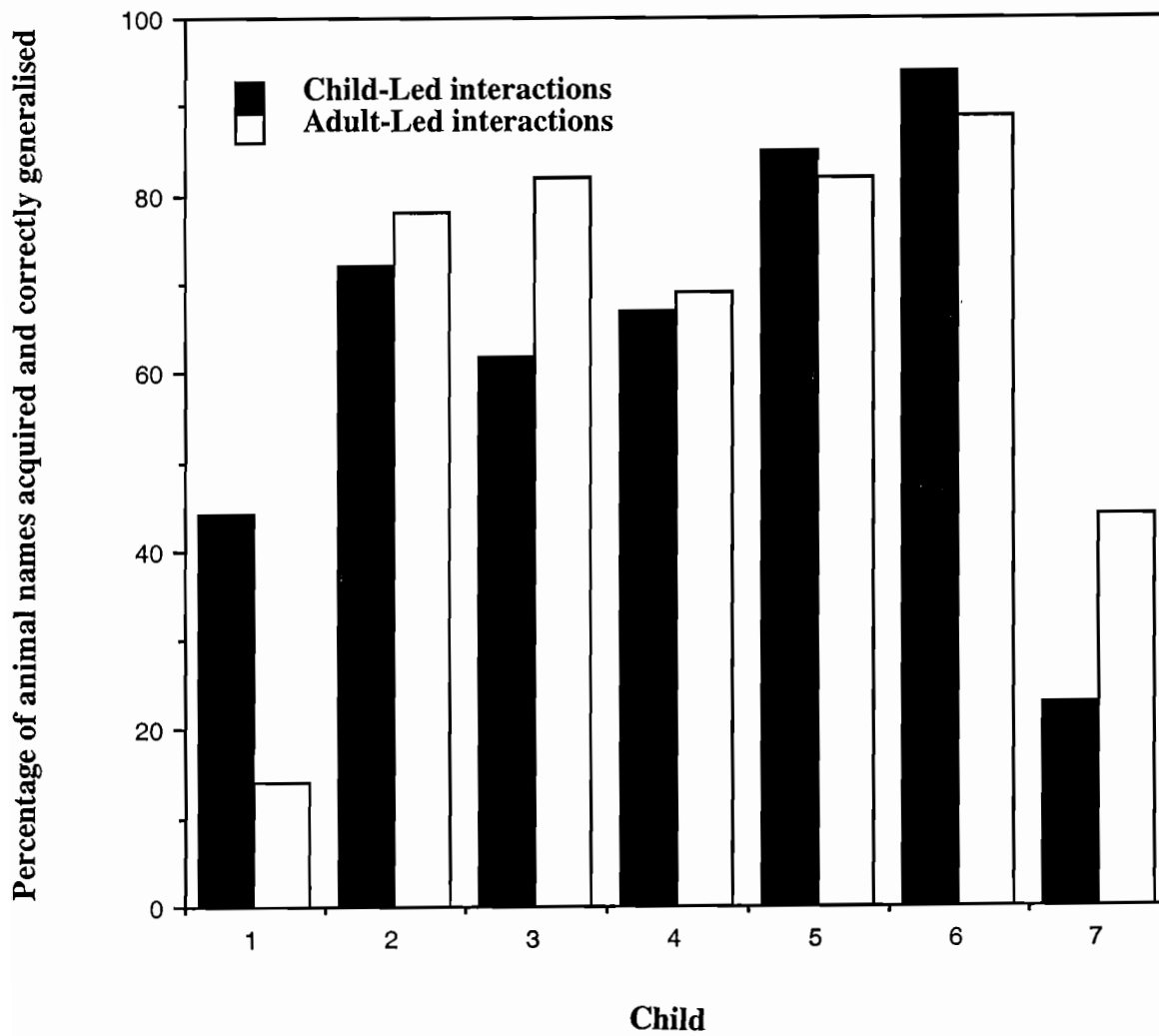


Figure 9. The total percentage of animals correctly generalised for each child in the Child-Led and Adult-Led teaching interactions

## **CHAPTER 5**

### **DISCUSSION**

The present experiment found that Child-Led and Adult-Led teaching interactions were equally effective methods for teaching object names to preschool children. In addition, neither Adult-Led nor Child-Led teaching interactions produced superior levels of retention or generalisation of these names.

While no significant difference was found in the rates of acquisition, the Adult-Led teaching interactions did produce slightly higher acquisition rates for Child 3, Child 5 and Child 7 and no children demonstrated a higher rate of acquisition in the Child-Led teaching condition.

There was no significant difference between the mean retention scores for the two conditions however the Child-Led teaching condition produced a slightly better level of retention for six of the seven children. While the rate of acquisition was slightly higher in the Adult-led teaching condition, for the majority of subjects the difference between the two conditions in terms of retention was very small.

There was no significant between-treatments difference in the mean generalisation test scores. The Child-Led condition resulted in higher generalisation test scores for Child 1, Child 5 and Child 6 but the Teacher-Led condition resulted in higher generalisation scores for the other four children. What seems to have happened is that those children who had higher rates of acquisition in the Adult-led condition also obtained superior generalisation scores for this condition, (Child 2, Child 3, Child 4 and Child 7).

There are a number of potential explanations for the higher rates of acquisition demonstrated by Child 3, Child 5 and Child 7 in the Adult-Led teaching condition.

Firstly, those children who had higher rates of acquisition in the Adult-Led group asked fewer questions per session, on average than the children for whom rates of acquisition were equal across the two teaching conditions..

Another difference between these three children and the other children in the study was that two of the three were not receiving any form of preschool education whereas all of the others were. It is therefore possible that these three children had little practice or had yet to learn how to profit from the non-directive/incidental teaching type of learning environment provided in most New Zealand early childhood centres.

Finally, the children who produced an overall lower rate of acquisition, and had an apparent difficulty acquiring noun-labels had far higher rates of learning in the Adult-Led teaching condition when compared to the Child-Led teaching condition (See Figure 3, Figure 4, Figure 5 and Figure 7).

These findings have a number of implications for the use of each of these teaching methods for specific children and specific teaching environments.

Firstly, the findings suggest that the subjects for whom Adult-Led teaching produced higher acquisition rates may have been less motivated, and thus when the interaction was led by them they were not as engaged in the learning process as they might have been. This lack of motivation was particularly apparent when these children were required to answer questions in the Adult-Led teaching condition. This suggests that a degree of motivation and desire to learn the names of the animals is required on the part of the child for Child-Led teaching methods to be effective and



ultimately, implies that this may have been an important variable lacking among some of the subjects.

Not only did these children (Child 3, Child 5 and Child 7) ask fewer questions they also asked fewer repeated questions about the same animal within a session, whereas, by comparison, the experimenter in the Adult-led condition targeted only four animals at a time and repeatedly targeted these animals until their names were learned. All children require repeated opportunities to practice new responses if they are to be acquired. If the child has not yet learned that this is necessary in order for learning to occur, they will be at a disadvantage under child-led teaching conditions.

Another apparent implication of these findings is that the conditions under which children learn most effectively may be determined in part by the type and level of preschool education they are currently receiving. In other words experienced in being responsible for one's learning may effect the child's ability to benefit from incidental teaching.

While the rate of acquisition was slightly higher in the Adult-Led teaching condition, for the majority of subjects the differences between the two conditions in terms of rate of acquisition, retention and generalisation to new stimuli was either small or non-existent. This lack of difference may well be due to the fact that the number of practice opportunities was kept constant across the two teaching conditions. This meant that the only difference between the two teaching conditions was in who asked and responded to the questions. The present results suggest that it may be differences in the amount of practice provided rather than differences in the nature of the teaching interaction that has produced the results reported in previous experiments.

The present results are consistent with the findings of McGee et al. (1985), who found no significant difference in the rates of acquisition or retention when comparing an incidental teaching condition against the discrete-trial teaching condition, with the number of learning opportunities controlled. Like the present study, the McGee et al. (1985) study controlled for the difficulty of stimulus material, it controlled for the number of teaching trials in each experimental condition, controlled the reinforcement values and schedule of reinforcement across both teaching conditions and provided for targeted practice of a specified set of new responses.

The results from these two experiments provide support for the notion that, if all external variables are controlled for and the number of learning opportunities are kept constant it may not be an issue of who leads and controls the learning interaction which is important but the level of practice provided that is the key to learning.

While the findings of this study were consistent with the McGee et al. results they were not consistent with the results of Cavallaro and Bambara (1982), or Miranda-Linne and Melin (1992). These two studies were somewhat inconsistent in their individual results in that Miranda-Linne and Melin (1992) found that discrete-trial teaching produced superior rates of acquisition while Cavallaro and Bambara (1982) found that incidental teaching produced higher rates of acquisition of two-word requests.

The reason for the discrepancy between the current study and previous research may be in part due to the fact that no instructions or prompts were used in the present study, as they were used in these two studies. In the two studies under examination a large number of different stimulus items were used within the

classroom environment and as a consequence the level of stimulus and response difficulty could not be controlled as it was in the current study. These two studies involved severely language delayed or autistic children whereas the present study used typically developing children. Finally, in the Miranda-Linne and Melin (1992) study, the children were reinforced during the incidental condition by gaining access to the item requested. For the discrete trial teaching condition however the reinforcement for responding correctly was to gain access to an item of the child's choice. The increased level of reinforcement for the discrete trial teaching condition in this study may be a reason for the higher rates of acquisition for this teaching condition.

With regard to generalisation, the results of the present study are consistent with the results obtained by McGee et al. (1985) but not with the results obtained by Cavallaro and Bambara (1982) and Miranda-Linne & Melin (1992). The most probable reason for the low level of generalisation observed in the two studies under examination is that in these studies the target responses were not produced reliably and without dependence on teacher prompts and instructions. As a result, when the prompts were absent the children's language use was not high and not present in different settings. As prompting was not used in the present study the children's use of the target names never became dependent on the experimenter's prompts or instructions. A second factor which differentiates these studies from the study by McGee et al. (1985) and the current study, both of which demonstrated relatively high levels of generalisation, is that in the latter studies an acquisition criteria had to be met before new stimuli were introduced. That is, the children needed to demonstrate independent and correct responding to a stimulus before moving on and if they did not, it was not included in the generalisation test. In the study by Cavallaro

and Bambara (1982) by comparison the language targets were extensive and not independently achieved before these language targets were tested for generalisation.

In all of the studies, including the current study no difference was found between the incidental teaching condition and the discrete-trial teaching condition with respect to retention of words learned. This consistency suggests that once the children have learned the material they are equally likely to retain this information regardless of the method through which they acquired this information initially.

The finding that incidental teaching produced a high rate of language acquisition are consistent with the previous studies by Hart and Risley (1968, 1974, 1975, 1980) and Hemmeter et al. (1996). In these studies preschool aged children from various backgrounds steadily acquired increasing numbers of noun, adjective-noun and colour-adjective-noun combinations using incidental teaching techniques. This steady acquisition was replicated in the current study in which the children learned between 13 and 20 new object names in seven teaching sessions involving approximately 67 learning interactions. This finding therefore provides further support for the use of incidental teaching as a means of acquiring new language in typically developing children.

The present study had a number of strengths in its design which contribute to the believability of the findings.

First, I controlled for the number of practice opportunities in each condition. This was particularly important as it ensured that there was an equal opportunity for the children in the study to learn the names of the animals in each condition.

Secondly, no prompting questions or contingent instructions were used. The use of prompting and contingent instructions in previous studies meant that the learning interactions in the incidental teaching condition were often controlled by the

experimenter rather than the child. This meant that there was often little difference between the two teaching conditions. In the current study, all practice opportunities in the Child-Led condition were controlled and led by the child and thus they were perhaps more compatible with developmentally appropriate practice.

A final strength of this study is that all external variables that could have influenced the findings were controlled. Both teaching conditions were conducted in the same room, the same level and schedule of reinforcement was used for both teaching conditions and the presentation of materials and testing procedure was identical for both teaching conditions.

The two main weaknesses of the study were that a high number of consecutive teaching trials were used during each session and the spontaneous use of names was not recorded.

The first weakness of this research is that the Child-Led teaching interactions were not entirely natural. As consecutive teaching trials were used that targeted very specific responses, the interaction for both conditions was quite formal. In a natural preschool learning environment it would be expected that the children would be presented with a number of learning opportunities and the nature and context of these interactions would vary throughout the day. The nature of the child's questions and the stimulus items would also differ. It can be seen that the teaching interactions in this study were somewhat dissimilar to those which would be expected in the home or the early childhood centre. The significance of this is that the results may be less generalisable to some aspects of a preschool environment.

A second weakness of this study is that I did not measure the children's spontaneous use of the animal names. In previous studies the spontaneous use of language has been measured and significant differences have been found between

incidental teaching and discrete trial teaching. The measure of spontaneous language use would have been difficult in the current study however as the animal names learned were not likely to be readily used in the home environment where there was no access to these materials.

Nevertheless, the results have important implications for the way in which children should be taught in a preschool environment. The results indicated that there is a place for both Child-Led and Adult-Led learning interactions in the preschool as both methods produced similar levels of acquisition, retention and generalisation in children. These findings provide support for the guidelines provided by the National Association for the Education of Young Children (NAEYC 1997) and also the Division of Early Childhood (DEC). Guidelines provided by each of these associations advocate use of both Child-Led and Adult-Led teaching methods at the preschool level and suggest that both of these methods are required to create an optimal learning environment.

In spite of the support for discrete trial teaching in the literature, and in the current study, incidental teaching is the preferred means for teaching preschool aged children and it remains the method that teachers are trained to use. However, the relative merits of the two procedures for different learning outcomes and for children of differing levels of ability has been little studied. These are questions which researchers now need to address.

## REFERENCES

- Burts, D., Hart, C., Fleege, P., Mosley, J. & Thomasson, R. (1992). Observed activities and stress behaviors of children in developmentally appropriate and inappropriate kindergarten classrooms. *Early Childhood Research Quarterly*, 7(2), 297-318.
- Cavallaro, C. & Bambara, L. (1982). Two strategies for teaching language during free play. *TASH Journal*, 7, 80-92
- Dunn, L. & Kontos, S. (1997). Developmentally appropriate practice: What does research tell us?. *ERIC Clearinghouse on Elementary and Early Childhood Education Campaign IL. (Online Article)*. Available: ERIC Digests. [ericfacility.net/ericdigests/ed413106.html](http://ericfacility.net/ericdigests/ed413106.html)
- Goldstein H. & Hockenberger, E. (1991). Significant progress in child language intervention: An 11-year retrospective. *Research in Developmental Disabilities* 12, 401-424.
- Golbeck, S. (2002). Instructional models for early childhood education. *ERIC Clearinghouse on Elementary and Early Childhood Education Campaign IL*. Available: ERIC Digests, [ericfacility.net/ericdigest/ed468565.html](http://ericfacility.net/ericdigest/ed468565.html)
- Hart, B. & Risley, T. (1968). Establishing use of descriptive adjectives in the spontaneous speech of disadvantaged preschool children. *Journal of Applied Behavior Analysis*, 1, 109-120.
- Hart, B. & Risley, T. (1974). Using preschool materials to modify the language of disadvantaged children. *Journal of Applied Behavior Analysis*, 7, 243-256.
- Hart, B. & Risley, T. (1975). Incidental teaching of language in the preschool setting. *Journal of Applied Behavior Analysis*, 8, 411-420.
- Hart, B. & Risley, T. (1978). Promoting productive language through incidental teaching. *Education and Urban Society*, 10(4), 407-429.
- Hart, B. & Risley, T. (1980). In-vivo language intervention: Unanticipated general effects. *Journal of Applied Behavior Analysis*, 13, 407-432.
- Hemmeter, M., Jones Ault, M., Collins, B. & Meyer, S. (1996). The effects of teacher-implemented language instruction within free time activities. *Education and Training in Mental Retardation and Developmental Disabilities*, 6, 203-212.
- Koegel, R. & Frea, W. (1993). Treatment of social behavior in autism through the modification of pivotal social skills. *Journal of Applied Behavior Analysis*, 26, 369-377.
- Lovaas, O.I. & Taubman, M.T. (1981). Language training and some mechanisms of social and internal control. *Analysis and Intervention in Developmental Disabilities*. 1, 363-372.

- Lovaas, O. (1996). The UCLA young autism model of service delivery. *Behavioral Interventions for Young Children with Autism*, Pro-Ed, Austin, TX , pp.241-248.
- Matson, J.L., Benavidez, D.A., Compton, L.S., Paclawskyj, T. & Baglio, C. (1996). Behavioral treatment of autistic persons: A review of research from 1980 to the present. *Research in Developmental Disabilities*. 17, 433-465.
- McEachin, J., Smith, T. & Lovaas, O.I. (1993). Long-term outcome for children with autism who received early intensive behavioral treatment. *American Journal on Mental Retardation*. 97, 359-372.
- Miranda-Linne, F. & Melin, L. (1992). Acquisition, generalisation and spontaneous use of color adjectives: A comparison of incidental teaching and traditional discrete-trial procedures for children with autism. *Research in Developmental Disabilities*, 13, 191-210.
- NAEYC Position Statement, (1996). Developmentally appropriate practice in early childhood programs serving children from birth through to age 8. 1997 National Association for the Education of Young Children. Available: [naeyc.org/resources/position\\_statements/](http://naeyc.org/resources/position_statements/). Available E-mail: [pubaff@naeyc.org](mailto:pubaff@naeyc.org)
- Schweinhart, L. (1997). Child-initiated learning activities for young children living in poverty. *ERIC Clearinghouse on Elementary and Early Childhood Education Campaign IL*. Available: [ericfacility.net/databases/ERIC-Digests/ed413105.html](http://ericfacility.net/databases/ERIC-Digests/ed413105.html)
- Stahmer, A. & Schreibmann, L. (1992). Teaching children with autism appropriate play in unsupervised environments using a self-management treatment package. *Journal of Applied Behavior Analysis*, 25, 447-459.
- Stipek, D., Daniels, D., Galluzo, D. & Milburn, S. (1992). Characterizing early childhood education programs for poor and middle-class children. *Early Childhood Research Quarterly*, 7(1), 1-19.
- Stone, J.E. (1996). Developmentalism: An obscure but pervasive restriction on educational improvement. *Educational Policy Analysis Archives*, 4(8), 1-13.
- Taubmann, M., Brierley, S., Wishner, J., Baker, D., McEachin, J. & Leaf, R. (2001). The effectiveness of a group discrete trial instructional approach for preschoolers with developmental disabilities. *Research in Developmental Disabilities*, 22(3), 205-219.
- Warger, C. (1999). Early childhood instruction in the natural environment. *ERIC Clearinghouse on Disabilities and Gifted Education Reston VA*. Available: [ericfacility.net/databases/ERIC-Digests/ed438671.html](http://ericfacility.net/databases/ERIC-Digests/ed438671.html)
- Warren, S.F. & Kaiser, A.P. (1986). Incidental language teaching: A critical review.



*Journal of Speech and Hearing Disorders*, 51, 291-299.

## **APPENDIX 1**

### **List of the 42 animals included in the pre-test.**

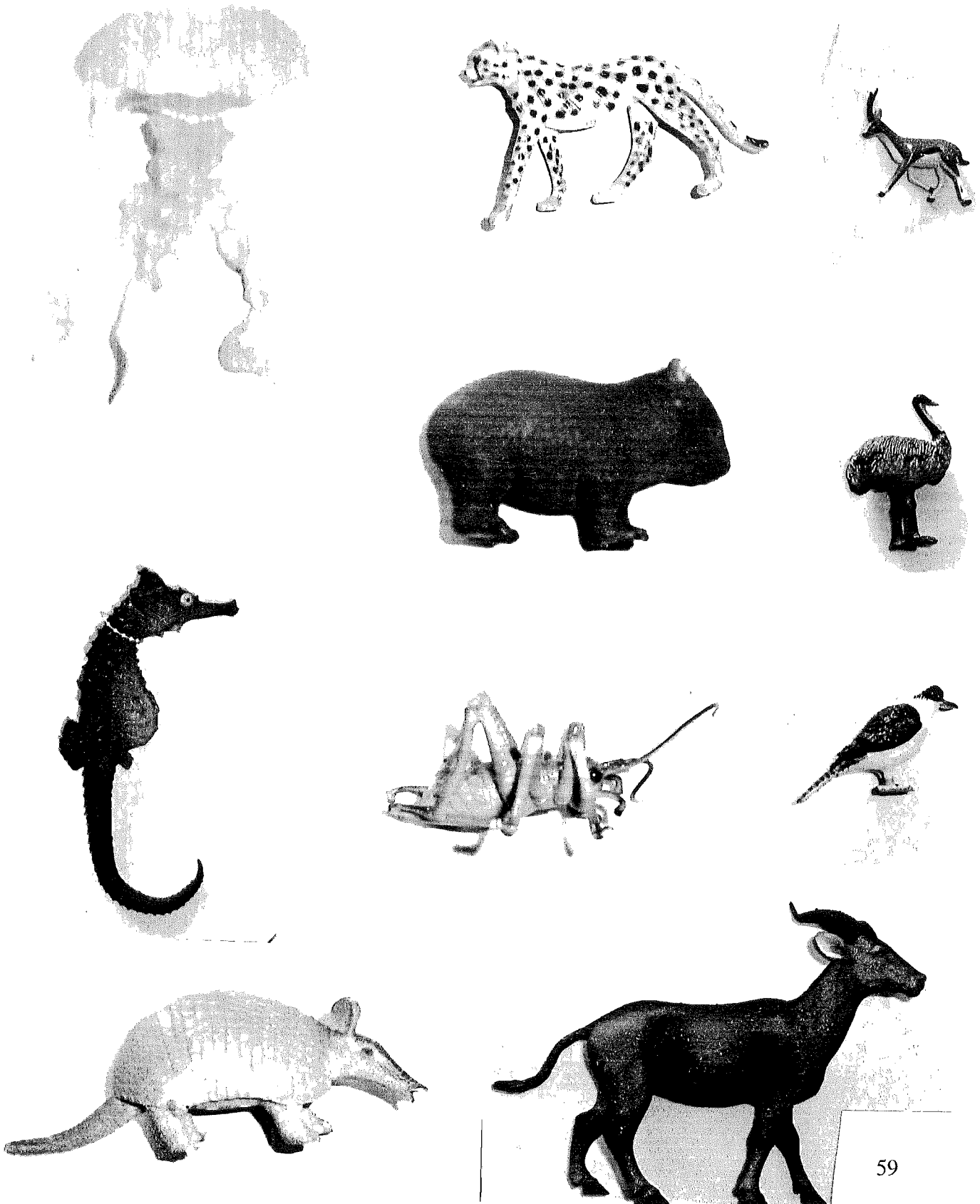
- |               |                |                |                     |
|---------------|----------------|----------------|---------------------|
| 1) Fox        | 12) Porcupine  | 23) Ostrich    | 34) Tasmanian Devil |
| 2) Okapi      | 13) Anteater   | 24) Lemur      | 35) Leopard         |
| 3) Emu        | 14) Kookaburra | 25) Wombat     | 36) Lobster         |
| 4) Possum     | 15) Tuatara    | 26) Baboon     | 37) Boar            |
| 5) Panther    | 16) Kangaroo   | 27) Bison      | 38) Bat             |
| 6) Springbok  | 17) Scorpion   | 28) Weta       | 39) Panda           |
| 7) Otter      | 18) Meerkat    | 29) Eagle      | 40) Gorilla         |
| 8) Mandrill   | 19) Wolf       | 30) Ox         | 41) Grasshopper     |
| 9) Seahorse   | 20) Skunk      | 31) Platypus   | 42) Scorpion        |
| 10) Chamois   | 21) Moose      | 32) Polar Bear |                     |
| 11) Jellyfish | 22) Stingray   | 33) Chameleon  |                     |

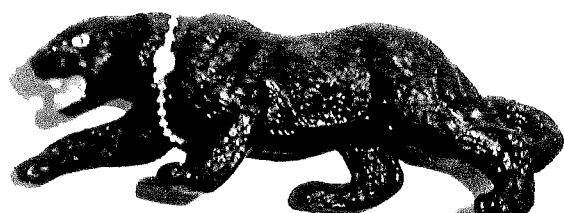
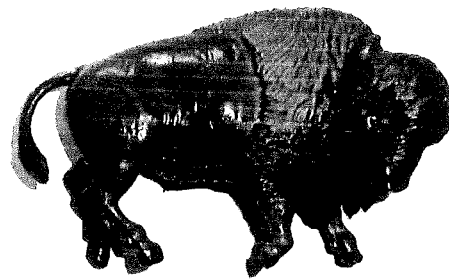
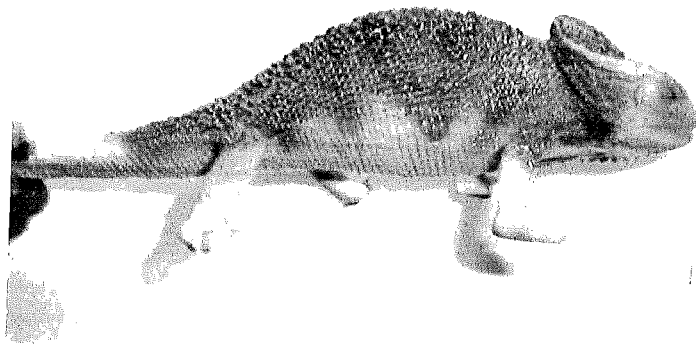
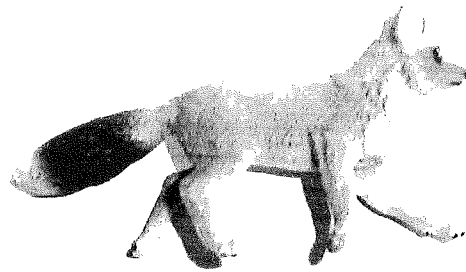
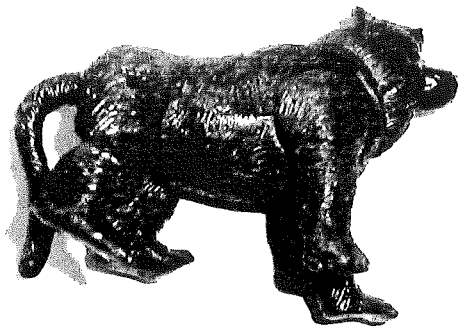
## **APPENDIX 2**

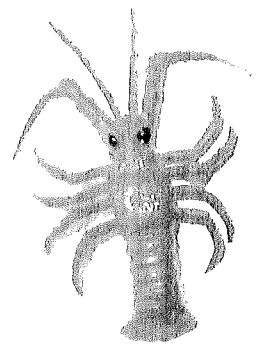
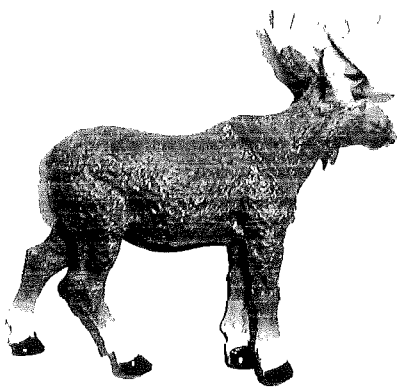
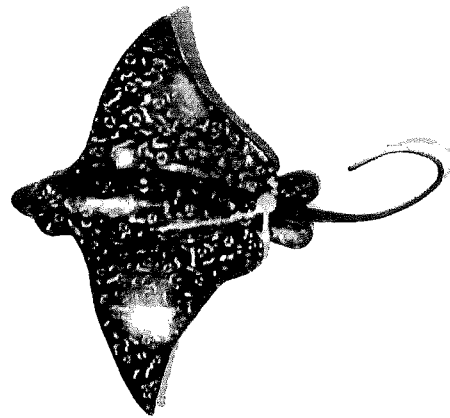
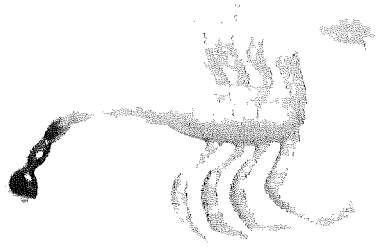
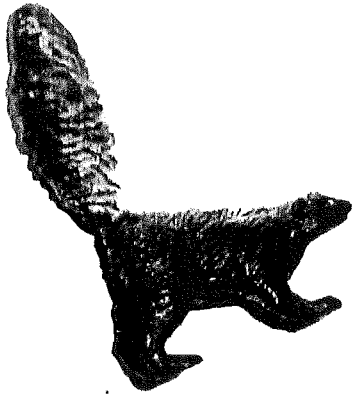
**Photographs of each of the 42 3-dimensional model animals**

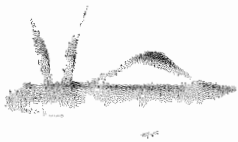
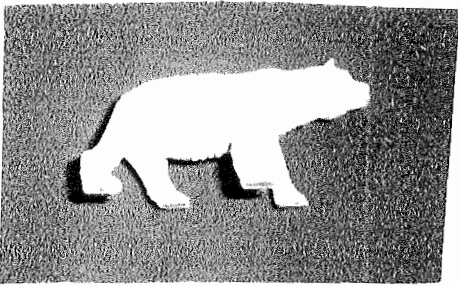
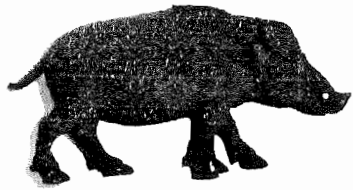
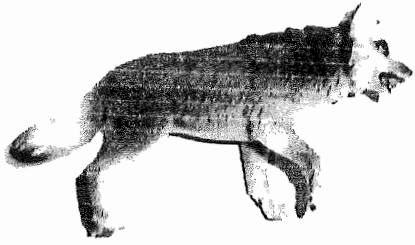
## APPENDIX 2

Photographs of each of the 42 3-dimensional model animals









## APPENDIX 3

The animals included in the practice sets for each child, for both the Child-Led and Adult-Led teaching conditions and the adjustments made to each group for each child.

Child 1	
Child-led condition	Adult-led condition
Okapi	Skunk
Emu	Moose
Possum	Leopard
Panther	Stingray
Springbok	Ostrich
Otter	Lemur
Mandrill	Wombat
Seahorse	Baboon
Chamois	Weta
Boar	Eagle
Porcupine	Ox
Anteater	Chameleon
Tuatara	Tasmanian Devil
Kookaburra	Scorpion
Meerkat	Fox
Bat	Lobster
Bison	Jellyfish
Wolf	Panda
Polar Bear	Platypus

Child 2	
Child-led condition	Adult-led condition
Okapi	Skunk
Emu	Moose
Possum	Stingray
Panther	Ostrich
Springbok	Lemur
Otter	Wombat
Mandrill	Baboon
Seahorse	Buffalo
Chamois	Eagle
Boar	Platypus
Porcupine	Chameleon
Anteater	Tasmanian Devil
Tuatara	Leopard
Kookaburra	Lobster
Meerkat	Jellyfish
Polar Bear	Ox
Weta	Panda
Fox	Scorpion



Child 3	
Child-led condition	Adult-led condition
Skunk	Okapi
Meerkat	Emu
Fox	Possum
Stingray	Panther
Ostrich	Springbok
Scorpion	Otter
Lemur	Mandrill
Wombat	Seahorse
Baboon	Porcupine
Eagle	Anteater
Kookaburra	Tuatara
Platypus	Ox
Chameleon	Moose
Tasmanian Devil	Chamois
Lobster	Kangaroo
Boar	Wolf
Bat	Weta
Panda	Buffalo

Child 4	
Child-led condition	Adult-led condition
Skunk	Fox
Moose	Okapi
Stingray	Emu
Ostrich	Possum
Scorpion	Panther
Lemur	Springbok
Wombat	Otter
Baboon	Mandrill
Buffalo	Seahorse
Eagle	Jellyfish
Ox	Anteater
Platypus	Tuatara
Chameleon	Kookaburra
Tasmanian Devil	Gorilla
Leopard	Meerkat
Lobster	Polar Bear
Panda	Chamois
Porcupine	Weta

<b>Child 5</b>	
<b>Child-led condition</b>	<b>Adult-led condition</b>
Okapi	Fox
Emu	Moose
Possum	Stingray
Panther	Ostrich
Springbok	Scorpion
Otter	Lemur
Mandrill	Wombat
Seahorse	Baboon
Jellyfish	Buffalo
Porcupine	Eagle
Anteater	Ox
Tuatara	Platypus
Kookaburra	Chameleon
Meerkat	Tasmanian Devil
Chamois	Leopard
Weta	Lobster
Boar	Panda
Skunk	Bat

<b>Child 6</b>	
<b>Child-led condition</b>	<b>Adult-led condition</b>
Skunk	Okapi
Moose	Possum
Stingray	Panther
Ostrich	Springbok
Scorpion	Otter
Lemur	Mandrill
Wombat	Jellyfish
Baboon	Porcupine
Buffalo	Anteater
Eagle	Tuatara
Kookaburra	Ox
Chameleon	Gorilla
Tasmanian Devil	Chamois
Lobster	Weta
Panda	Boar
Bat	Platypus
Fox	Emu
Polar Bear	Meerkat

<b>Child-led condition</b>	<b>Adult-led condition</b>
Skunk	Okapi
Moose	Emu
Stingray	Possum
Ostrich	Panther
Scorpion	Springbok
Lemur	Otter
Wombat	Mandrill
Baboon	Seahorse
Buffalo	Jellyfish
Eagle	Porcupine
Kookaburra	Anteater
Platypus	Tuatara
Chameleon	Ox
Tasmanian Devil	Gorilla
Leopard	Meerkat
Lobster	Chamois
Panda	Weta
Fox	Wolf
Polar Bear	Boar

### **Child 1:**

Child 1 was familiar with fox, gorilla and kangaroo and these items were removed from the stimulus set. Wolf and boar were removed from the Adult-Led set and put in the Child-Led set and jellyfish and fox were put in the Adult-Led set to keep the two sets equal in syllable and distinctiveness ratings and to keep the sets equal to 19.

### **Child 2:**

Child 2 was familiar with fox, kangaroo, wolf, bat and gorilla and these items were removed from the practice set. Jellyfish was removed from the Child-Led set and put in the Adult-Led set and boar was put in the Child-led group to keep stimulus items even with respect to pronunciation and distinctiveness.

### **Child 3:**

Child 3 was familiar with jellyfish, polar bear, leopard and gorilla and so these items did not remain in the practice set. Weta and bison were removed from the Child-Led practice set and put in the Adult-Led practice set to keep group numbers equal.

Meerkat and kookaburra were removed from the Adult-Led set and put in the Child-Led set and moose and jellyfish were put in the Adult-Led group to keep even levels with respect to pronunciation and distinctiveness.

**Child 4:**

Child 4 recognised the kangaroo, polar bear and bat and these items were removed. Stingray was removed from the Adult-Led practice set and put in the Child-Led practice set to keep the two groups even in size and in ratings.

**Child 5:**

Child 5 was familiar with wolf, leopard and gorilla so these items were removed from the stimulus set for this child. The skunk was removed from the Adult-Led set and put into the Child-led set and, to keep set numbers equal, kangaroo was removed from the Child-Led set.

**Child 6:**

Child 6 was familiar with the seahorse, kangaroo, wolf and leopard. The platypus was removed from the Child-Led set and put into the Adult-Led set to keep the set size and stimulus-distinctiveness ratings even.

**Child 7:**

Child 7 was not familiar with any of the animals in the stimulus set prior to beginning the experiment and so the Child-Led and Adult-Led sets remained unchanged.

## APPENDIX 4

The stimulus pronunciation ratings, Stimulus distinctiveness ratings and Species categorisation for each of the animals in Set A and Set B.

### Set A

Stimulus Pronunciation	Stimulus distinctiveness	Species
rating	rating	
Tuatara (4)	Okapi (3)	Tuatara (l)
Kookaburra (4)	Mandrill (3)	Kookaburra (b)
Okapi (3)	Seahorse (3)	Okapi (g)
Jellyfish (3)	Jellyfish (3)	Jellyfish (s)
Porcupine (3)	Porcupine (3)	Porcupine
Anteater (3)	Anteater (3)	Anteater
Kangaroo (3)	Tuatara (3)	Kangaroo
Emu (2)	Possum (2)	Emu (b)
Possum (2)	Springbok (2)	Possum
Panther (2)	Emu (2)	Panther
Springbok (2)	Chamois (2)	Springbok (g)
Otter (2)	Kookaburra (2)	Otter (s)
Mandrill (2)	Weta (2)	Mandrill (m)
Seahorse (2)	Leopard (2)	Seahorse (s)
Chamois (2)	Skunk (2)	Chamois (g)
Weta (2)	Panther (1)	Weta
Leopard (2)	Otter (1)	Leopard
Meerkat (2)	Kangaroo (1)	Meerkat
Skunk (1)	Meerkat (1)	Skunk

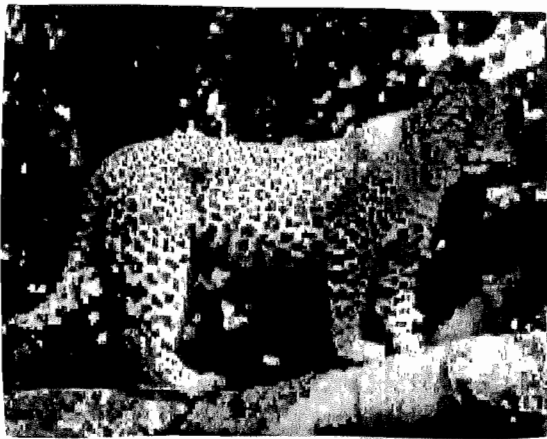
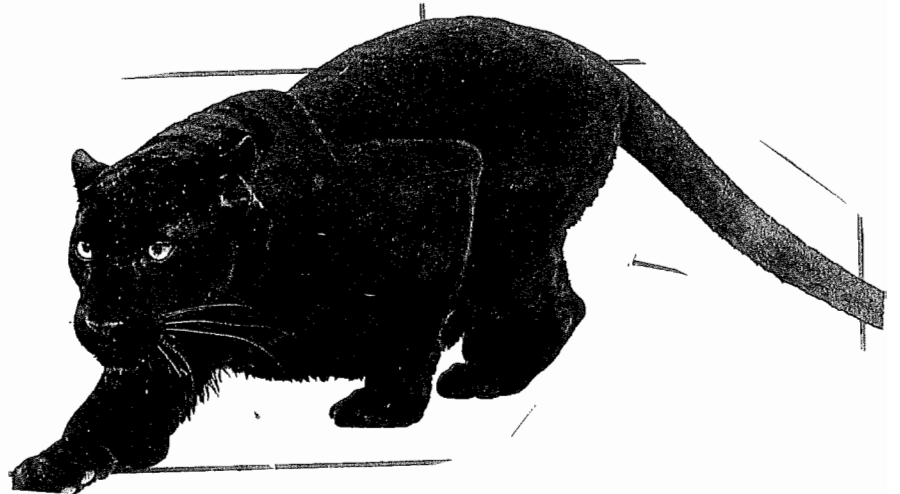
### Set B

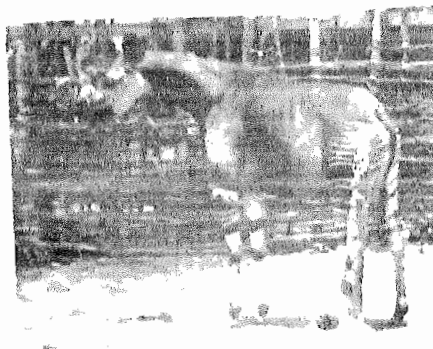
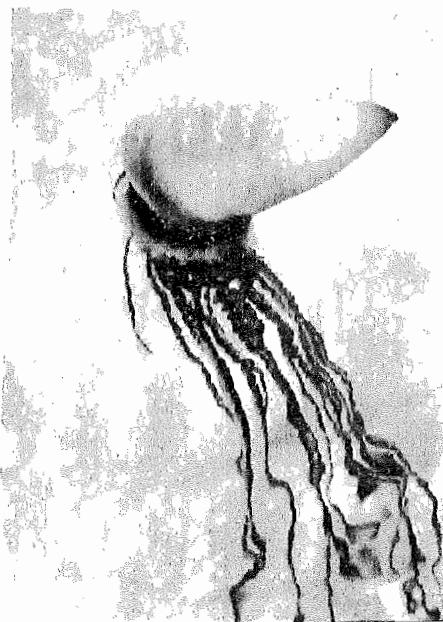
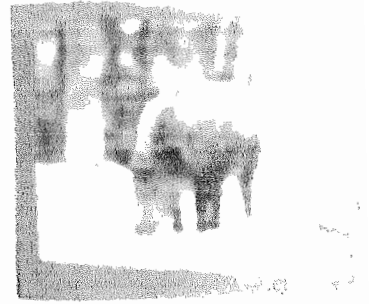
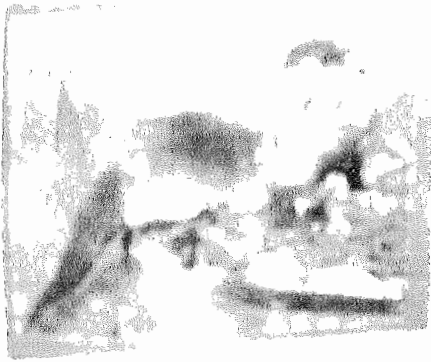
Stimulus Pronunciation	Stimulus distinctiveness	Species
rating	rating	
Tasmanian Devil (6)	Stingray (3)	Tasmanian Devil
Chameleon (4)	Ostrich (3)	Chameleon (l)
Polar Bear (3)	Lemur (3)	Polar Bear
Platypus (3)	Eagle (3)	Platypus
Scorpion (3)	Platypus (3)	Scorpion
Skunk (1)	Chameleon (3)	Stingray (s)
Stingray (2)	Skunk (3)	Ostrich (b)
Ostrich (2)	Tasmanian Devil (3)	Lemur (m)

Lemur (2)	Scorpion (3)	Wombat
Wombat (2)	Ox (2)	Baboon (m)
Baboon (2)	Panda (2)	Bison (g)
Bison (2)	Boar (2)	Eagle (b)
Eagle (2)	Bat (2)	Lobster (s)
Lobster (2)	Weta (2)	Panda
Panda (2)	Polar Bear (2)	Weta
Weta (2)	Baboon (2)	Wolf
Wolf (1)	Wombat (1)	Moose (g)
Moose (1)	Bison (1)	Ox (g)
Ox (1)	Wolf (1)	Bat
Bat (1)	Moose (1)	Skunk

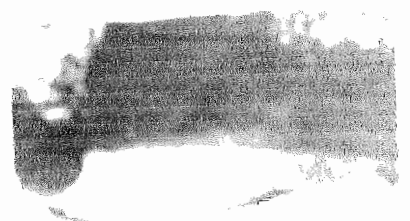
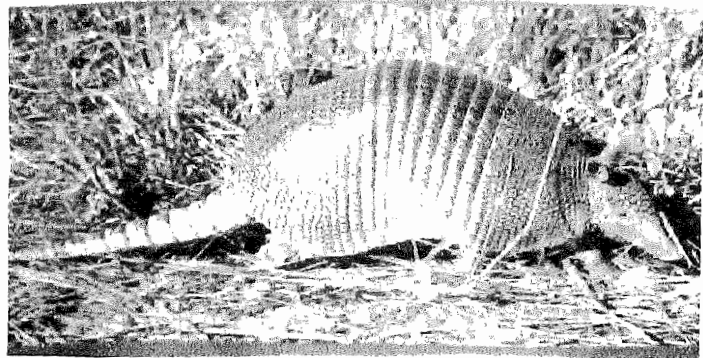
## APPENDIX 5

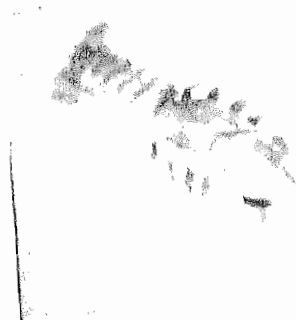
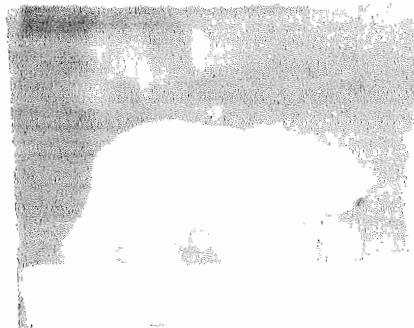
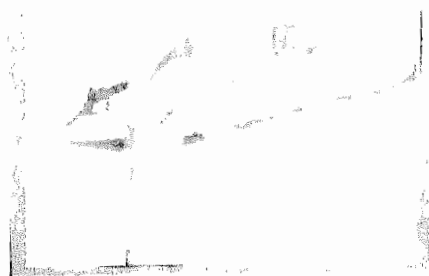
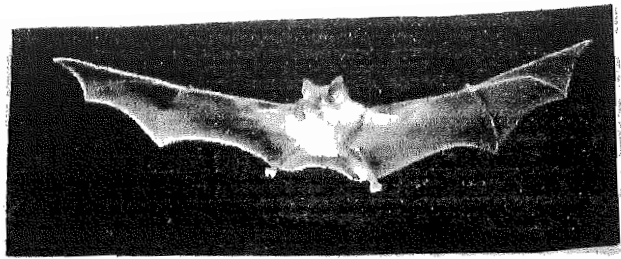
Photographs of each of the 2-dimensional stimulus items included in the generalisation test for Set A and Set B.











## APPENDIX 6

The daily test scores for acquisition, and the retention and generalisation scores for each of the seven subjects.

	<i>Child 1</i>		<i>Child 2</i>		<i>Child 3</i>		<i>Child 4</i>		<i>Child 5</i>		<i>Child 6</i>		<i>Child 7</i>	
	<i>C.L.</i>	<i>A.L.</i>	<i>C.L.</i>	<i>A.L.</i>	<i>C.L.</i>	<i>A.L.</i>	<i>C.L.</i>	<i>A.L.</i>	<i>C.L.</i>	<i>A.L.</i>	<i>C.L.</i>	<i>A.L.</i>	<i>C.L.</i>	<i>A.L.</i>
<i>Test 1</i>	3	2	2	5	2	4	3	1	1	4	3	4	2	3
<i>Test 2</i>	6	6	6	8	6	8	5	3	5	8	5	6	3	4
<i>Test 3</i>	8	7	8	10	7	9	6	7	6	10	9	8	6	7
<i>Test 4</i>	10	9	12	13	8	12	7	10	8	13	13	11	7	10
<i>Test 5</i>	11	10	16	14	9	15	9	12	11	14	14	14	9	11
<i>Test 6</i>	13	13	17	17	11	16	13	14	12	16	15	17	12	13
<i>Test 7</i>	16	14	18	18	13	17	15	16	13	17	18	18	13	16
<i>Retained</i>	12	8	14	13	11	13	13	13	11	15	18	17	9	9
<i>Generalised</i>	7	2	13	14	8	14	10	11	11	14	17	16	4	7