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SEMANTIC MEMORY ORGANIZATION IN YOUNG CHILDREN: 
DEVELOPMENTAL SHIFTS IN THE CATEGORIZATION 
OF EARLY WORDS

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE 
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MAY 1992

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ABSTRACT

Two studies tested the hypotheses that (a) "scripts" (types of event sequences) provide a basis for categorical structures in the semantic memories of preschool children and, (b) it is only later that children develop the use of more complex "taxonomic" categorical structures (types of hierarchical groupings) through interaction with expert language users.

Study One was a modification of Lucariello and Nelson's 1985 study (Experiment 1). Fifty 4-year-old children received either a taxonomic or a "slot-filler" list (objects of similar function and position in a given script) in a free or category-cued recall condition. The slot-filler list was also presented in a script-cued recall condition. The taxonomic list consisted of categories of items sharing the same function, but from different scripts. The slot-filler list consisted of categories of items sharing the same function within the same script. The category-cued recall condition facilitated greater recall of the slot-filler list than of the taxonomic list, and the slot-filler list/script-cued recall condition facilitated greatest recall of all the list/recall conditions, suggesting that script-based slot-filler categories closely correspond to young children's semantic memory structures.

Study Two examined shifts in classification strategies from script-based to taxonomy-based structures from an apprentice-expert perspective. One hundred and eight 4-year-old, 5-year-old, and 6-year-old children participated in a short longitudinal study involving a memory task, an experimentally designed picture book, two methods of book reading, and two card-sorting tasks. The book presented animal
exemplars in a heterogeneous arrangement and the reading conditions promoted either
taxonomy-based or script-based categorization. Support was found for the hypothesis
that older children display distinct patterns of taxonomy-based categorization, while
younger children display distinct patterns of script-based categorization, as assessed
by the memory and card sorting tasks. This finding suggests a developmental process
in the acquisition of taxonomic organizational strategies. Younger children assigned
to the taxonomic reading condition showed significant shifts from slot-filler
categorization to taxonomic categorization, and these shifts involved integration of
slot-filler exemplars into the core (taxonomic) categories. These results suggest that
learning the taxonomic status of slot-filler exemplars is a precursor to the
development of class inclusion reasoning and that this development is more obvious
once children have entered the formal schooling situation and received tutelage from
expert language users. Although older children assigned to the script-reading
condition showed some shifts from taxonomic categorization to slot-filler
categorization, such shifts were not statistically significant. These results suggest that
although elementary school-aged children use script-based categorization, they are
more likely to categorize according to taxonomic classification. Implications of the
results are discussed, and a case is made for the value of the apprenticeship
framework.
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CHAPTER I

INTRODUCTION

GENERAL BACKGROUND OF THE PROBLEM

Traditionally, researchers have tended to focus primarily on the development of taxonomic categories in their attempts to better understand how information is organized in children’s memories (Mandler, 1979; Markman, 1984). Recently, studies such as those conducted by Adams (1985), Adams and Bullock (1986), and Lucariello and Nelson (1985, 1986) have indicated the need for alternative explanations of categorization and related cognitive processes. In particular, the Lucariello and Nelson model calls for a more socially oriented perspective in which concept development and categorization are viewed as products of social acquisition processes. The essence of this model lies in the assertion that learning processes are embedded in human activities (scripts) and therefore, the ways of thinking and speaking therein, exist and have meaning only in relation to those scripts (also see Adams, 1985). If it is accepted that script-based structures form the basis for later taxonomic development, it becomes of interest to determine the processes involved which eventually enable the language user to determine the superset, basic set, and subset relations that characterize the hierarchical organization of category members (see Bauer & Mandler, 1989; Scott, Greenfield, & Urbano, 1985).

In proposing an apprenticeship framework for the domain of concept development and categorization, Adams and Bullock (1986) have reinforced
Lucariello and Nelson’s suggestion that context is a powerful tool for shaping cognitive growth and associated language development. Both models address two major issues: What are the patterns of growth and change which characterize children’s increasing mastery of language and associated categorization of concepts? And how does this change come about?

Adams and Bullock contended that through interaction with expert language users, apprentices become more and more skilled, to the extent that they eventually converge on full sets of culturally-shared categorization skills. This process is seen to be contingent upon the apprentice’s and expert’s participation and contribution within given contexts, their shared interests and talents, the instructional tools and materials at their disposal, and the receptivity of the apprentice to such tools and materials. These findings lend strength to Lucariello and Nelson’s argument that the development of a lexicon does not simply occur within the minds of individuals. Future research must examine the importance of interpersonal domains where language is used to guide the emerging thought processes of children.

OUTLINE OF THE CHAPTERS

In the first part of Chapter I, Lucariello and Nelson’s slot-filler model is described, and supporting studies are briefly reviewed. An argument is made for this model, based on consistent findings which indicate that script-based categories provide the foundation for the later development of taxonomy-based categories. In the second part of Chapter I, studies examining the nature of children’s classification skills are
reviewed, and support is lent to the notion of a developmental shift from script-based categorization to taxonomy-based categorization. In addition, studies advancing an apprentice-expert model of children's development of language and thought are discussed. It is proposed that this model is particularly relevant in attempting to explain how children acquire a level of socially prescribed competence in language use.

Chapter II presents a review of literature examining children's acquisition of word meaning and knowledge of word function. A general overview of the stages involved in lexical development is first presented, followed by a detailed discussion of three current and coherent positions on the issue. Each position has been chosen because it provides a unique perspective on the process and because it has direct relevance to the research hypotheses. Included in the discussion is the prototype theory of categorization (Bowerman, 1978; Rosch, 1978), the theory of concept and category derivation from event representations (Lucariello & Nelson, 1985; Nelson, 1983, 1987, 1989), and the social support position (Bruner, 1978; Vygotsky, 1963; Adams & Bullock, 1986).

Chapter III introduces the research method used in Study One. This study addresses the hypothesis that slot-filler categorical structures form children's initial categories and that developing hierarchical taxonomic categories are built on this foundation. Children from four kindergartens were administered a memory recall task designed to examine patterns of categorization and categorical skills. The chapter concludes with a detailed description of the statistical procedures employed,
followed by a discussion of the major results. Findings on some secondary issues are also reported.

Chapter IV introduces the research method used in Study Two. This study addresses the hypothesis that through shared activities and language-games directed by experts, children move from initial slot-filler strategies of classification to more complex taxonomy-based strategies of classification. Children from two kindergartens and three elementary schools were administered a memory recall task and two card sorting tasks designed to examine the nature of this shift and the agents involved. Detailed descriptions of the statistical analyses employed are presented and the major results, as well as findings on some secondary issues, are reported.

In Chapter V, the results are summarized, and a case is made for the acceptance of both Study One and Study Two hypotheses. A discussion of the nature of the two research studies, areas of concern, areas of insight, and an associated projected research agenda is also included. Finally, to gain further insight into the implications of Study One and Study Two, the following question is addressed; "If we accept both the slot-filler categorization theory and the apprenticeship model, what are the educational implications of these perspectives?" Some suggestions for the design of reading texts for children who are beginning to read are addressed as part of this discussion.
BACKGROUND OF THE PROBLEM

An Argument for the Theory of Slot-filler Categorization of Early Words

Developments in categorization literature have tended to concentrate on two contrasting types of knowledge organization. The most familiar type of organization in semantic memory is taxonomic categorization (see Figure 1), which is hierarchical in arrangement (see Collins & Quillian, 1969; Mandler, 1979; Markman, 1984). This type of organization determines class inclusion relationships among superordinate, basic, and subordinate level classes (Blewitt, 1983) and identifies category members (Adams, 1985). The effect of taxonomic knowledge structures on performance on verbal memory tasks by children and adults is well documented. Bousfield (1953) and Ornstein and Corsale (1979) found that when word lists contain several items from the same category, there is a tendency for these items to be recalled more often than unrelated items, as well as a tendency for related items to be clustered in recall. However, the argument has been proffered (see Adams, 1985; Bullock, 1987; Nelson, 1973a; Schmidt & Shatz, 1986) that there are developmental differences in both the degree to which such effects on recall tasks are found, with preschool children benefiting less from categorically related lists than older children, and developmental differences in the ability of young children to use hierarchical class relationships in some cognitive tasks (also see Markman, 1981; Nelson, 1977, 1982; Ricco, 1989; Sera & Reittinger, 1989). In accordance with this view, Adams and
Figure 1: Taxonomy-based Hierarchical Categorization

Taxonomic categories are organized on three levels: superordinate (e.g., ANIMAL), basic (e.g., cat), and subordinate (e.g., tabby, Siamese, lion). At the apex of the taxonomy, superordinate level categories encompass associated basic and subordinate level categories. Superordinate level categories are more inclusive and more abstract than the two other levels (e.g., the ANIMAL category that encompasses cat, dog, and bird differs greatly from the FURNITURE category that encompasses chair, table, bed). The difference between categories is greatest at this level.

The basic level of categorization represents a partitioning of the superordinate level. It is considered the level at which categories are first organized. Among basic level categories, members share similar qualities (e.g., in the ANIMAL category, cat shares similar qualities with dog).

Subordinate level categories represent a further partitioning of knowledge and differences between categories are even more distinct (e.g., the differences between CAT:tabby and FURNITURE:chair). The exemplars within each category range from typical (e.g., CAT:tabby), to atypical (e.g., CAT:Siamese), to peripheral (e.g., CAT:Lion). (See Rosch, 1978)
Bullock (1986) suggested that because preschool children have not been introduced to the formal school system and its associated language-games, such as the teaching of taxonomic lineages, they have not yet built up hierarchically and conventionally organized categories, assuming, of course, they are capable of it. One solution to these concerns has been the development of theoretical models and research strategies which emphasize the role of contextual experience in the growth of classification skills.

The second type of knowledge organization in semantic memory is schematic organization (see Figure 2), or what Nelson (1983; p. 272) referred to as a "part-whole organization of elements--for example, the temporal-spatial organization of scenes and events." Schematic organization enables children to predict what things will look like and the order in which actions may occur. Scripts or event representations are types of schemas which include actions, objects, persons, and person roles, and sequences of actions appropriate to the specific scene. Such scripts are generalized representations of activities that have occurred more than once, rather than a collection of particular experiences. If children understand to any degree what the on-going activities of their world are and what the roles they can play are, they must have formed some sort of representation of these activities (see Nelson, 1973a, 1983). Lucariello and Nelson's (1985) study was based on the theoretical framework that schemas are organized in terms of variables that fill "slots," which are instantiated in specific contexts (also see Rumelhart & Ortony, 1977). According to Nelson (1983), slot-filler categories are formed on the basis of shared function which
Children form mental representations of experienced events that specify relations among objects, participants, goals, temporal sequence, and causal relations. Although recurring events are not identical, nor do they always include the same items, objects may occur within the same functional slot (while varying in other dimensions) within similar recurrent events. In order to establish a general event representation that will apply across different occasions of the same event, children need to "open a slot" in the representation within which a variety of different objects can be specified (e.g., lion, tiger, elephant, and wolf are slot-fillers for the "animals I see at the ZOO" script). Initially, "objects" such as these animals are categorized according to a schematic form of organization involving a variety of scripts. Children learn that other animals occur in slots in other scripts (e.g., "animals I see on a farm" or "animals that I have as pets." (See Nelson, 1986).
enable substitution of objects within a given frame, and it is this essential relation which provides the basis for children’s early taxonomic growth.

Lucariello and Nelson (1985) posited that categorical relationships among items emerge from script-based representations, that is, from schematically organized knowledge. They hypothesized that young children understand the events they take part in within organized structures (e.g., at the beach) that include appropriate actions (e.g., swimming and sailing) and appropriate objects that are associated with these actions (e.g., swimsuit and sunhat). These objects share the same function and occur in the same position in a given script (e.g., I will wear my swimsuit/sunhat at the beach). They fill slots that complement the actions and later become taxonomically subcategorized as BEACH CLOTHES. The proposal, then, was that slot-fillers form children’s initial category structures and that the development of subsequent hierarchical taxonomic categories draws on members from different script contexts, usually representing different subcategories (see Figure 3). Objects that have similar functions, but occur in different scripts (e.g., wear swimsuit to the beach and wear pajamas to bed) come to be later taxonomically categorized as CLOTHES. Lucariello and Nelson suggested that because this process requires an "amalgamation" of slot-filler components from different scripts, it is a higher level of abstraction than simple slot-filler categorization and, therefore, more advanced development.

The results of Study One support Lucariello and Nelson’s argument that script-based categories derived from children’s experiences are combined to develop into larger taxonomic categories as children learn (or are taught) more about their
Figure 3: The Slot-filler - Taxonomic Shift in Categorization

1. I went to the ZOO and saw a LION in a cage.
2. I went to the ZOO and saw a TIGER in a cage.
3. I went to the ZOO and saw an ELEPHANT in a cage.
4. I went to the ZOO and saw a WOLF in a cage.

Children understand the events they take part in within organized structures (e.g., at the ZOO), that include appropriate actions (e.g., seeing the elephant and tiger) and appropriate objects associated with these actions (e.g., elephant and tiger). These objects share the same functions and occur in the same position in a given script (e.g., I will see the elephant/tiger at the zoo). They fill slots that complement the actions and later become taxonomically subcategorized as ZOO animals. These slot-fillers form children's initial category structures and the development of subsequent hierarchical taxonomic categories draws on members from different script contexts, usually representing different subcategories. Objects that have similar functions but occur in different scripts (e.g., seeing the elephant at the ZOO and seeing the sheep on the FARM) come to be later taxonomically categorized as ANIMALS. (See Lucariello & Nelson, 1985)
environment, especially once formal schooling begins (see Figure 4). The emphasis, however, should not be placed on viewing the slot-filler model in opposition to the taxonomic model, but rather, on acknowledging that slot-filler and taxonomic organization are elements of the same developmental process.

SIGNIFICANCE OF THE STUDY

The Lucariello and Nelson study deserved scrutiny because of its contribution to recent research on the derivation of concepts and categories from event representations. The settings, procedures, and findings of their study required re-examination if suggestions were to be made with regard to future research in the field. In short, the purposes of Study One were to re-examine the Lucariello and Nelson hypothesis by addressing identified methodological concerns, and, in association, confirm the theoretical foundation of Study Two.

Changes from the original Lucariello and Nelson study introduced in the present Study One included:

1. The use of pictures:

   In keeping with common practices in many studies involving preschoolers, this study used pictures, as well as words to facilitate remembering (see Adams, 1985; Adams & Bullock, 1986; Blewitt, 1983). Shepard (1967) stated that memory capacity was much greater for visual information than for verbal, suggesting therefore, that children's recall on the tasks should be enhanced. Although Lucariello and Nelson used only words to facilitate remembering, they commented that cuing effects, such as pictures, might be specific to particular types of lists. The expectation was that
Early Infancy Stage: Children's first words are thought to be preceded by concepts (prelinguistic concepts). At a later stage, concepts may be acquired through words and words through concepts. (See Nelson, 1974)

Preschool Stage: The nature of word meaning acquisition is evolutionary, that is, a dynamic, rather than static process that changes as children develop and experience a wider range of thought functions. Because children's learning processes are imbedded in human activities (scripts), their ways of speaking and thinking therein, exist and have meaning only in relation to those scripts. The script-based slot-filler structures developed during early lexical acquisition are thought to provide the foundation for later taxonomic development (see Lucariello & Nelson, 1985). Although slot-filler categories are thought to be most salient at this stage, children begin to develop a knowledge of taxonomies as their experience with language forms increases.

Elementary School Stage: Through interactions with expert language users, apprentices eventually converge on a full set of culturally shared taxonomic categorization skills (see Adams, 1985). From initial script-based structures, children learn to categorize their concepts according to more complex, abstract taxonomies inherent in language learning. Taxonomic categorization begins to emerge as the primary form of categorization with slot-filler forms of categorization taking a secondary role.
organizational patterns would be more evident if a combination of verbal and visual cues (photographs), as well as blocked lists (three clothes exemplars, followed by three food exemplars, followed by three animal exemplars), facilitated a greater level of recall, especially in the slot-filler list/script cued recall condition.

2. The compilation of new slot-filler and taxonomic lists, because of concerns regarding the initial selection of list items:

The Lucariello and Nelson slot-filler list was composed of the most frequent responses given to the subcategory questions. Although the items on this list were associated within categories, items that were less strongly associated to the subcategory than those on their taxonomic list were included (e.g., items were drawn from three different scripts, whereas, in the taxonomic list, items were drawn from one script). The taxonomic list was composed of the strongest responses.

In Study One, different criteria were used to construct the two lists. The decision to compose the slot-filler (and taxonomic) list of even less strongly associated items reflected this concern regarding the validity of the Lucariello and Nelson instrument. Essentially, Lucariello and Nelson's slot-filler list was constructed of responses that were considered "prototypical" exemplars. Rosch (1973) referred to "prototypes" as subcategory or category members that have special status, that of being the "best examples" (e.g., lion, tiger, and monkey are prototypical ZOO ANIMALS, whereas, a wombat is not). (See Adams & Bullock, 1986; Bransford, 1979; Rosch, Mervis, Gray, Johnson, & Boyes-Braem 1976.) Further, the script-cued recall prompts were very similar to those questions used to elicit responses
to compile the original list. This suggests that if children have prototypical concepts of zoo animals, they may in fact rely on prior "zoo animal" knowledge, rather than on immediate categorical organization of the slot-filler list, when asked to recall. In an attempt to nullify this effect, the slot-filler and taxonomic lists in Study One were constructed of items that varied in typicality; central and more peripheral items were chosen, although the latter were still considered "reasonably familiar" to preschool children. It was intended that this construction would ameliorate the problem of children resorting to guessing responses by relying on established prototypes.

3. A reanalysis of "intrusions" data:

Like the Lucariello and Nelson study, Study One included analyses of intrusions data. Intrusions are responses that are incorrect, although category appropriate (e.g., on the slot-filler recall list, the ZOO ANIMALS to be recalled were lion, giraffe, and bear; an intrusion would be elephant). In the original experiment the greatest incidence of intrusions were found in the taxonomic list/category-cued recall and the slot-filler list/script-cued recall conditions, suggesting that these conditions tended to elicit more guessed responses. Lucariello and Nelson made the claim that the high number of intrusions in the slot-filler list/script-cued recall condition supported the hypothesized effect of slot-filler semantic organization on children’s performances on this task. However, this conclusion may be unwarranted because the taxonomic list/category-cued recall condition had a total of 57 intrusions over trials, while the slot-filler list/script-cued recall condition had 54 intrusions over trials. While it may be argued that intrusions indicate that children derive slot-filler
categories on the basis of the association of items with their functional roles within
scripts and thus with each other, the data do not conclusively support this stance.
This study re-examined intrusions data as a function of list type (modified), recall
condition, and trial, with the intent of either corroborating Lucariello and Nelson's
findings or providing support for alternative explanations.

4. The intended increase of sample size:

An initial concern regarding the small sample size of the Lucariello and
Nelson study prompted a decision to increase the sample size to 100 subjects, with
twenty subjects in each list/recall condition. The larger sample was expected to
provide greater assurance that uncontrolled variables (e.g., children possessing
exceptional memory recall faculties or children having received formal instruction in
taxonomic categorization in some kindergartens) would be operating randomly and
would therefore not have systematic effects on the results. Unfortunately, a measles
epidemic in the school district limited the availability of subjects and necessitated a
decision to retain the smaller sample size. Because the results of Study One differ
somewhat from the results of the Lucariello and Nelson study, the effect of sample
size has received attention in the discussion of results.

In re-examining the Lucariello and Nelson's study, the following questions
were addressed:

1. If young children are thought to understand the events in which they
participate within organized structures which include not only appropriate actions, but
also appropriate objects that are associated with those actions, will the number of
words, categories, and words-per-categories recalled be greater on the slot-filler list in both the free recall and category-cued recall conditions?

In keeping with Lucariello and Nelson's results, it was expected that children receiving the slot-filler list would recall significantly greater numbers of words, categories, and words-within-categories than children receiving the taxonomic list.

2. Will different kinds of semantic cues facilitate recall more than others, or more precisely, will the slot-filler list/script-cued recall condition facilitate greater recall than all other conditions?

Again, based on Lucariello and Nelson's results, it was expected that of the three recall conditions, the script-cued recall procedure would facilitate the greatest recall, especially of the slot-filler list. More words, categories, and words per category were expected to be recalled in the slot-filler list/script-cued recall condition, than in all other list/recall conditions.

3. Will more evident patterns of memory organization result from a combination of verbal and visual cues, as well as "blocked" (i.e., items that are grouped and presented according to category/subcategory membership) lists?

In comparing the responses across trials of the Lucariello and Nelson subjects and Study One subjects, it was expected that the latter would display more evident patterns of memory organization because of a combined use of visual and verbal cues, along with blocked lists to facilitate memory recall (see Shepard, 1967).
4. In the free recall condition, will children who receive the slot-filler list display greater incidence of cluster organization of recalled items than children who receive the taxonomic list?

Because young children are thought to organize their worlds according to script-based categories, clustering patterns of recalled items were expected to be more evident in the responses of children who received the slot-filler list (see Bousfield, 1953; Hasselhorn, 1990; Ornstein & Corsale, 1979). Specifically, items were expected to be recalled in clusters, according to category membership.

5. Will the slot-filler list/script-cued recall condition facilitate a greater number of intrusions than all other list/recall conditions? Will there be a difference in the number of intrusions recalled over trials?

Although, as discussed, there were concerns with this aspect of Lucariello and Nelson’s study, it was expected that their results would be replicated, based on the rationale that intrusions indicate that children derive slot-filler categories from associations between items and their functional roles within scripts and thus with each other. A greater number of intrusions in the responses of children assigned to the slot-filler/script-cued recall condition was expected. In turn, more intrusions over trials were expected to be produced by children who received this list/recall condition.
BACKGROUND OF THE PROBLEM

An Argument for the Theory of a Slot-filler - Taxonomic Shift in the Categorization of Early Words.

Although much research in the field of developmental psychology has focused on the growth of children's classification skills, three very important questions require further attention:

1. What provides the basis for taxonomic categorization?

2. What is the nature of the slot-filler - taxonomic shift, and how do language users come to determine the hierarchical organization of category members according to superset, basic set, and subset relations? (See Glossary for definitions)

3. What is the nature of the apprentice-expert relationship that results in the apprentice being guided by the expert to a level of socially prescribed competence in language use? (See Adams, 1985; Mandler, 1983; Markman, 1984; Markman & Callanan, 1984; Markman & Hutchinson, 1984; Premack, 1990)

In examining the nature of the basic or prototypical level of abstraction, Rosch, Mervis, Gray, Johnson, and Boyes-Braem (1976) found that category exemplars share an optimal number of characteristics, be they physical, functional,
habitual, or the like (e.g., a BIRD has a beak and chirps, whereas a DOG has a muzzle and barks; beak and chirp are characteristics reserved for BIRD category members, while muzzle and bark are not). Adams (1985) proposed that this level appears to be the most useful and common level of abstraction for human thought and activities and, therefore, it is at this level that the expert language user begins to guide the apprentice towards language competence. Surprisingly, attempts to examine how children learn to process basic level abstraction have, until recently, tended to overlook the possible existence of an initial system of classification that may form the basis of taxonomic organization.

In their exploration of subordinate level categories, Adams (1985), and Adams and Bullock (1986) focused on the shared characteristics of category members (e.g., a robin is a small BIRD with beak and feathers, and a sparrow is a small BIRD with beak and feathers), and how these members tend to differ only slightly in characteristics (e.g., a robin is a small bird with beak, feathers, and is red-breasted, and a sparrow is a small bird with beak, and feathers, and is brownish-gray). In proposing her semantic feature model, Clark (1973) suggested that learning the adult meanings of words such as robin and sparrow involves a process of accumulating features associated with each exemplar, until initial overextensions are narrowed down from very general meanings to specific adult meanings (e.g., children eventually learn to differentiate between these two birds by observing that red-breasted can be associated with robin, but not sparrow).
It seems clear that any attempts to determine how children process subordinate level abstraction must first examine whether children begin with some basic form of classification and develop taxonomic skills as they develop expertise in language use and whether this development occurs as a result of children actively constructing their cognitive worlds, or as a result of parents and others structuring information, or as a result of both.

Research into superordinate level membership (see Adams & Bullock, 1986; Anglin, 1977; Rosch et al., 1976; Tversky, 1989; Waxman & Gelman, 1986; Waxman & Kosowski, 1990) has found that few characteristics are shared (e.g., the physical characteristics of ANIMAL:DOG have little in common with the physical characteristic of FURNITURE:TABLE, that is, muzzle, bark, tail, paws, and teeth are characteristics associated with ANIMAL:DOG, but not FURNITURE:TABLE). From a "top-down" perspective, Kuczaj (1982) proposed that reasoning at higher levels of the taxonomy is required for understanding class inclusion (e.g., the integration of two basic categories, like BIRD and CAT into the superordinate category ANIMAL requires a knowledge of the shared characteristics that determine their group membership, as well as, a knowledge of the characteristics that determine their differences.

In examining how children learn category membership at the superordinate level, it is first imperative to discover how children come to learn the multitude of basic level and subordinate level exemplars that the superordinate level encompasses, or more specifically, who or what determines that children will first learn basic level
exemplars, followed by subordinate level exemplars, then superordinate level exemplars (see Callanan, 1989; Gelman & O'Reilly, 1988).

In their early experience with basic level terms, there seem to be three types of consistent error that occur in the speech of young children (see Anglin, 1977; Barrett, 1978, 1982; Clark, 1983; Fremgen & Fay, 1980; Kay & Anglin, 1982; Kuczaj, 1982; Mervis, 1984; Mervis & Mervis, 1982; Rescorla, 1980).

Overextension errors are thought to occur when children attach too broad a meaning to a term (e.g., *DOG* might be used to refer to *dogs*, as well as *horses*, *bears*, and *goats*). Conversely, under-extension errors occur when children have a limited set of appropriate exemplar references (e.g., *DOG* might be used to refer to *all brown dogs*, but not to a *specific breed of dog*). Overlap errors combine both underextension and overextension errors (e.g., *DOG* might refer to *all brown dogs* and *calves*, but not to *Great Danes* and *cows*), indicating a partial overlap of children's meanings of *DOG* with adult meanings of *DOG* and *COW*. Such errors are of interest because they suggest that children's intensions (meanings) of terms are qualitatively different from those of adults (see Caplan & Barr, 1989).

It is, however, generally acknowledged that by the age of three, most children have developed an expertise concerning the standard rules of reference for typical members of basic level categories (see Adams, 1985; Adams & Bullock, 1986; Rosch et al., 1976). Markman (1989) noted that average three-year-olds possess a diverse classification of their world. They have formed hundreds of categories of vehicles, clothes, animals, games, food, and so on, and are quite capable of recognizing novel
members (e.g., a kiwifruit will be recognized as FOOD, rather than ANIMAL). In association, sometime around this age, children begin to "fine tune" their categorization skills by using subordinate level qualifier labels for basic level exemplars (e.g., the reference Collie-DOG is used instead of DOG). (See Adams & Bullock, 1986; Blewitt, 1983; Shipley, Kuhn & Madden, 1983.)

Interestingly, in their reference to peripheral members of taxonomically organized categories, children tend to apply subordinate labels from the start (e.g., the label ostrich is more likely to be applied than the label BIRD). Adams (1985) suggested that because this phenomenon is sensitive to discourse context, it makes developmental sense in that a distortion of the prototypical concept formation process would arise if unconventional characteristics were attached to the concept (e.g., BIRD in reference to an ostrich would distort the child's conventional extensional boundaries of BIRD, if flight is a necessary BIRD characteristic). It is understandable then, that young children tend not to view peripheral exemplars as members of the core category, primarily because such exemplars are not needed or are not a part of everyday cognitive activity (also see Bjorklund & Thompson, 1983; Lucariello & Nelson, 1985; Rogoff & Lave, 1984; Waxman, Shipley, & Shepperson, 1991).

Adams (1985) expounded further on the idea of the complexity of taxonomic family membership development and the role of context and activity in introducing children to typical, atypical, and peripheral exemplar class inclusion relations (also see Blewitt, 1983). As noted earlier, during the process of acquiring basic level categories, children tend to view peripheral exemplars as separate from the core
category (e.g., ostrich exists in a discrete category from BIRD and may be classified at the basic level of abstraction with the qualification ZOO BIRD). The relationship is more horizontal in that two seemingly separate basic level categories exist. It is logical to suggest then, that the creation of a separate basic level category of ZOO BIRDS rests upon children's knowledge of a zoo script. Through contextual language-games, children develop expertise that calls for a hierarchical organization of such separate, but related basic level categories under "aves" or the class of BIRDS. That is, the integration of peripheral members into core categories requires reasoning at lower levels of the taxonomy (e.g., an ostrich is a peripheral BIRD because it is large and flightless; however, it eventually becomes integrated into the core category because it shares similar features with typical BIRD exemplars, such as beak, and feathers).

Mervis and Mervis (1982) addressed the notion that children and adults do not have similar basic categories. They explained that because children's experiences are different from adults, they attend to different or fewer properties than adults do. This attention factor is responsible for the constraints placed on the categorization processes. Similarly, Callanan (1985) claimed that because the structure of knowledge of the world is based on perceptions of the similarity among concepts and on notions of the important relations among classes of concepts, young children, because of their relatively constrained experiences, have a less sophisticated organization of their world, in comparison to adult organization. Her research attempted to combine Piaget's (see Scholnick, 1983) stance that children actively
construct their cognitive worlds and Vygotsky’s (1978) stance that parents and others structure information for children. In essence, Callanan’s research focused on children’s expectations of what words mean and strategies adults use for introducing words associated with different hierarchical levels. Callanan (1989) identified the matches and mismatches in the systems that adults and children use to organize their conceptual knowledge, by exploring how adults speak to children and the effects of this input on children’s conceptual organization.

The Lucariello and Nelson (1985) script-based slot-filler theory provides a reasonable explanation of how, through the use of language-games, children learn to label or categorize typical exemplars (e.g., a sparrow [or a thrush] is a BIRD that can be found in my garden), atypical exemplars (e.g., a duck [or a chicken] is a BIRD that can be found on a farm), peripheral exemplars (e.g., an ostrich [or a penguin] is a BIRD that can be found at the zoo), and anomalous exemplars (e.g., a dodo [or a moa] is a BIRD that is extinct). Typicality depends on context, specifically, an OSTRICH is not a typical BIRD in the context of birds found in my garden, however, it is typical in the context of birds found at the zoo. This illustrates that although children are familiar with taxonomically peripheral exemplars, such as an ostrich being a zoo BIRD, it is only later that they become familiar with the inclusive relationship between an ostrich and the basic category of BIRD (i.e., they do not initially group ostrich with robin and duck). The explanation then, is that exemplars become typical, atypical, or peripheral only when they are placed or misplaced in cognitive slots normally reserved for typical exemplars.
With experience, children learn to relate to additional exemplars including those that are atypical, peripheral, and anomalous. The comparison of these exemplars with those already associated with labels causes the apprentice to broaden the intensional basis each word's meaning. According to Kuczaj (1986), with development, the intension of the word becomes independent of any single exemplar (even if the exemplar is the prototype). Interestingly, Rosch (1975) observed that although children reach this level of sophistication, their verification time for prototypical exemplars (e.g., a *robin* is a *BIRD*) is faster than for atypical and peripheral exemplars (e.g., an *ostrich* is a *BIRD*), suggesting that each category does have a "best-fit yardstick" as a central measure of comparison. (Also see Gardner, 1991; Rips, Shoben, & Smith, 1973)

Two reasons given for later acquisition of such knowledge include the proposition that typicality of objects is defined by their roles in different human activities or language-games (see Adams & Bullock, 1986; Wittgenstein, 1953), and, in association, the proposition that adult labeling practices may help guide children into learning typical basic level category exemplars, partly because of the distinctiveness of categories at that level (see Anglin, 1977; Blewitt, 1983). Adams and Bullock (1986) restated this position by suggesting that young children do not organize these concepts taxonomically, primarily because in the early stages of language use they are not apprenticed into the activities upon which taxonomic relations depend and from which they are derived. (Also see Vygotsky, 1962)
If, as stated, child-basic categories differ from corresponding adult-basic categories, it follows that children face major problems of induction in trying to learn the conventional categories encoded by their language. Adams (1985) and Adams and Bullock (1986) echoed Callanan's view by noting the importance of contextual experience in the evolution of classification skills. The role of the parent is therefore seen as one of guaranteeing that children conform to socially prescribed naming practices and ways of thinking. It is from this perspective that has grown the interest in the apprentice-expert (or apprenticeship) model of children's acquisition of culturally shared ways of thinking and knowing (see Adams & Bullock, 1986; Banigan & Mervis, 1988).

**SIGNIFICANCE OF THE STUDY**

Research has indicated that through shared activities and language-games directed by experts, children move from simple expert-apprentice games (Bruner, 1983) to highly complex intellectual activities (Bullock, 1987). These activities shape the apprentice's class inclusion relations, beginning with learning family membership of typical, atypical, and peripheral category members in the context of activities.

In this study, the following questions were addressed:

1. If, as research suggests, script-based slot-filler categorization enters into semantic organization as the first and most salient memory structure, will younger children who have had limited exposure to the formal education system be more inclined to think according to scripts and display slot-filler patterns of organization than older children?
The results of the Triad Card Sorting Task and the Multiple Card Sorting Task were expected to show that 4-year-old children display significantly different patterns of card sorting behavior than 6-year-old children. Because 5-year-old children are thought to be in a transitional stage of categorization, no significant differences were expected between this age group and the two others.

In keeping with the findings of Study One, the results of the Memory Task were expected to indicate that 4-year-old children would display significant patterns of slot-filler organization, while 6-year-old children would display significant patterns of taxonomic organization. The results for the 5-year-old group would again indicate a transitional stage of development (see Bauer & Mandler, 1989; Gelman, 1988; Lucariello & Nelson, 1985; Ricco, 1989; Watson, 1989).

2. If children's classification skills are defined by the cognitive and communicative context, do expert language users play a significant role in guiding children from a very constrained, naive set of categories to a sophisticated, ordered, hierarchical organization of the world?

In accordance with the apprenticeship model, the prediction was made that children assigned to the taxonomic reading group would display greater incidence of transition from apprenticeship into expert (conventional) forms of classification than would children assigned to the script reading group and the control group, as assessed by the Triad Card Sorting Task and the Multiple Card Sorting Task. It was also expected that there would be a lesser incidence of regression from taxonomy-based to script-based card sorting behavior in 5-year-old and 6-year-old children assigned to
the script reading group, suggesting that taxonomy-based structures are more salient for older children.

3. Similarly, what part do early language-games play in preparing children for participation in more advanced, sophisticated language-games? Or specifically, what part do early language-games play in helping young children learn to categorize members (especially, taxonomically peripheral members) of category scripts according to more sophisticated hierarchical, taxonomic structures?

It was predicted that children’s willingness to include peripheral slot-filler members in taxonomically organized categories would be influenced by the linguistic forms used by adults to mark the peripheral or context-specific nature of member relationships to those classes. Those children assigned to the taxonomic reading group were expected to display greater incidence of classifying peripheral slot-filler members taxonomically, as assessed by the Triad Card Sorting Task and the Multiple Card Sorting Task.
CHAPTER II

REVIEW OF THE LITERATURE

GENERAL INTRODUCTION

Commonplace and yet miraculous. What better way to describe children’s acquisition of language?

Children all over the world, in markedly differing circumstances, learn to talk. They have something to say and the means to express their thoughts. Even before children begin to talk, their first primitive communication is about things in their world. They tug on their parents’ clothes to attract full attention as they point and grunt to indicate the object of their desire.

Children’s first words are typically about objects. They comment on the existence of things, the disappearance and reoccurrence of objects, the location and ownership and actions of objects. These early linguistic meanings are evident in different languages and different cultures. When children learn to talk, they talk about what they know, and what they know centers around the things in their world. (Rice & Kemper, 1984, p. 1)

The development of a philosophy of "language," especially concerning children’s acquisition of word meaning and knowledge of word function, has long been the subject of much challenge and controversy for philosophers, psycholinguists, educators, and the like. Yet, despite the seemingly infinite number of postulations, theories, and disputes, that philosophy appears to remain undefined and even less in
possession of a clear principle of unity. The paradoxical nature of language acquisition research is best illustrated by Kuczaj and Barrett's (1986) call, in one instance, for the advancement, evaluation, reformulation, and acceptance of a comprehensive theory of language acquisition and development, and presentation in the next, of their "jigsaw puzzle" analogy that stresses the complex nature of the phenomenon:

Researchers will have to struggle along trying to fit pieces of the puzzle together. It is a formidable task in that we lack many of the pieces, but we must continue to add pieces until we have the complete puzzle. Of course, once we have all the pieces, we will still have to put them together. (p. xii)

Despite a past where there has been this tendency for word meaning acquisition to be studied from discrepant methodological approaches and conceptual positions, recent studies have indicated a concerted attempt by researchers to seek out empirical techniques that will provide both credible accounts and descriptions and more common bases from which to evaluate these theories. Research focusing on the development of concepts and concept categorical structures in the semantic memory of children is one such area that has provided a wealth of information. Forerunners in the field, Clark (1973) and Nelson (1974) have been the impetus for more recent researchers such as Anglin (1977), Bowerman (1978a), Mervis and Pani (1980), and Rosch (1978) to seek a better, more plausible understanding of word-meaning acquisition.
INTRODUCTION

The study of lexical development focuses on children's acquisition of word forms and the associated conventional meanings as agreed upon by members of a language community. While this may appear to be a "straight-forward" process, it is only when the establishment of the relations between words and meanings of specific kinds within a lexical system is considered (e.g., superordinate, basic level, and subordinate terms) that the complex nature of lexical acquisition becomes most apparent. Within the language community, children become aware of the different uses of words by observing the ways in which they are displayed. In order to develop "expertise," children must learn to infer conventional meanings from the ways the words are used in context.

In tracking the course of the acquisition of a lexicon, Nelson (1988) suggested that research points to three distinctly successive stages. Each stage is seen as having specific features and procedures culminating in the eventual establishment of lexical relations. Such distinctions indicate that the process of acquiring a lexicon is a developmental one, during which time the nature of word meanings and their relations undergo varying degrees of change. Because the stages outlined by Nelson emphasize actual word production and related cognitive processes, it is pertinent to precede this discussion with an examination of the existence and importance of a prelinguistic concepts stage. An overview of pertinent research will provide for a greater understanding of later lexical development.
THE PRELINGUISTIC CONCEPTS STAGE

When word-referent pairing is first achieved for a particular word, what does that word mean? According to Mervis (1983), attempts to address this question have given rise to three differing stances regarding the existence of prelinguistic concepts: that thought precedes and determines language, that language precedes and determines thought, and that the developmental of language and thought is an interactive process.

Does Thought Precede and Determine Language?

"Are we born with predispositions that not only endow us with the capacity for language, but also determine what we can learn and how we perceive the world around us"? (De Cuevas, 1990, p. 63)

The cognition-precedes-language stance argues that cognitive development precedes, paces, and guides language development. Essentially, this view holds that a word immediately labels a prelinguistic concept. In countering Piaget's assertion that children's minds are structurally different from those of adults, Fodor (1979) argued the "logically implausible accomplishment" of children developing stronger cognitive structures from weaker ones, as a function of experience. Fodor opined that if Piaget's view acknowledges that children's minds must initially include ready-made cognitive structures, it is reasonable to assume that these structures are like those of adults. In essence, this view holds that by the time the child first utters the word "cat," for example, while attending to the referent object, there is an already established innate concept of CAT or CATness (also see Macnamara, 1982; Macnamara, Baker, & Olson, 1976). In support of this view, Macnamara (1972)
stated that children use meaning as a clue to language, rather than language as a clue to meaning; that is, cognition is both a prerequisite and accounts for children’s lexical acquisition.

This model of language and cognitive acquisition that grants adult intellectual structures to children’s minds, is compatible with the idea of innate, language-specific intellectual mechanisms. Language acquisition is viewed as an unfolding of predetermined levels, involving a principled and orderly emergence with respect to specialization and restriction of maturing competencies (see Rice & Kemper, 1984). Further, children’s cognitive abilities are believed to be independent of experience and each child calls upon innate categories and linguistic processing principles powerful enough not to construct idiosyncratic linguistic structures (see Chomsky, 1980).

**Does Language Precede and Determine Thought?**

"Are we born with empty minds and is everything we know, including language, the result of learning and experience"? (De Cuevas, 1990, p. 63)

In contrast to the naturist position, there is the opposing belief that children are socialized into the locally prevailing system of categorizing largely through their acquisition of language. Thus, language acquisition precedes and guides cognitive development. This view is held by those who question the existence of established prelinguistic concepts, primarily because of the complexity involved in categorization, or what Schlesinger (1977) referred to as the "delimitation of verbal concepts." Schlesinger (1982) proposed that initially, a word serves as a label for only the referent (i.e., a specific object, event, person, or the like), while the concept
corresponding to the word develops gradually. He posited a single acquisition process, the formation of a concept being concomitant to the acquisition of a word. This view does not assume that children come to the language learning experience equipped with certain concepts for which they have to find verbal labels. It assumes that the regularities of the language and language learning experiences establish specific concepts and associated category membership (also see Bowerman, 1977).

Whorf (1956) was specific in his claim that language determines thought. On the basis of his studies of children's first language learning experiences, he argued that the differences in semantic and grammatical distinctions lead to differences in thought or intellectual development. Similarly, Anglin (1977, 1986) stated that the acquisition of words is not based on previously formed concepts, but on the ability of children to abstract from particular sets of instances, a prototype or schema which represents the central tendency of the particular instances (e.g., the prototype DOG would be accordingly, the "average" dog derived from a set of experiences with dogs). However, he did not rule out the possibility that experiences during the prelinguistic stage may influence the formation of some concepts.

Is the Development of Thought and Language an Interactive Process?

The conceptual system develops from infancy as a general knowledge system based on the child's experience in the world, including knowledge of its people, objects, spaces, and usual events. This knowledge becomes differentiated into packets that we call concepts. How and when these packets emerge from a possibly undifferentiated "presentation" is at present unknown,
although there is some evidence that when the child first begins to learn words, the packets are more global, less well articulated, than the words units of language require. It may indeed be that learning a language facilitates, perhaps is causal to, the articulation and stabilization of the naturally dynamic and highly relational conceptualization system. (Nelson, 1989, p. 5)

This view acknowledges that words may sometimes become labels for prelinguistic concepts or alternatively, words may initially label only the paired referents. The process of acquiring words is thought to trigger searches for new concepts to match those words (see Bowerman, 1976; Brown, 1965, 1990; Clark, 1983; and Nelson, 1973a; 1979). Bowerman (1976) claimed that although children's early words are not all based on prelinguistic concepts, some words may be tags for previously formed concepts, whereas others serve as a "lure to cognition," and lead to the formation of a concept (also see Brown, 1958).

Piaget's (1954) notion that cognitive structures are shaped by children's actions upon objects has been particularly salient for researchers focusing on the early stages of language acquisition. Piaget argued that children begin to learn the conventional uses of objects during the fifth stage of the sensorimotor period and by twelve months, most children know the conventional functions of a variety of objects. Thus a functional basis for many prelinguistic concepts is available (also see Belsky, Goode, Most, & Farel, 1980). Although Piaget was not concerned with an explanation of language acquisition, his account of the nature of cognitive
development suggests a parallel process, that is, concepts and associated labels evolve as children act upon their environments.

A developmental trend is obvious in Nelson's (1974, 1978) suggestion that children's first words are preceded by concepts and that at a later stage, concepts may be acquired through words. Nelson (1974) proposed that children's first words reflect what they have observed or experienced nonlinguistically; a word like "ball" is preceded by some knowledge of BALLness, which has been derived from active experience (e.g., rolling the ball, bouncing the ball) and relationships (e.g., mother rolled the ball).

For Clark (1973, 1974) words serve to evoke concepts. Learning the meanings of words is a matter of learning which concept each word conventionally picks out within a specific language community. Children have to work out which device, that is, which word or expression "maps" onto which concept before they can acquire a greater knowledge of which devices in particular, draw up instances of associated or mapped concepts. Finding the right words for pointing to conceptual categories and particular members of categories becomes the concern. Clark (1973) stated that children have not only to learn what the conventional meaning is for each word they acquire, they must also realize that each word contrasts with its fellow words and that contrasts among words reflect contrasts among concepts. Developmentally, children begin to form concepts before they look for new words, and in turn, hearing new words prompts them to form further concepts.
For Vygotsky (1962), the prelinguistic concepts postulation does nothing to clarify how children go about delimiting verbal concepts; especially if the belief is held that explanations do not require the assumption of the link between a word and a previously established concept. Instead, Vygotsky argued that a word may be linked to a paired referent, and the boundaries of its applicability may be established subsequently through further experience with the word. More specifically, this interactionist stance proposes that the nature of word meanings is evolutionary, that is, a dynamic rather than static process, that changes as children develop and experience wider ranges of thought functions. The relation of thought to word is seen as a process, a continual movement back and forth from thought to word and from word to thought. Cognitive development in children is the development of a differentiation of wholes into parts by a process of hanging finer meanings on to words; meanings that are already embodied in the words used by adults (see Sera & Reittinger, 1989).

The dispute is obvious: Does cognition account for all of language? Or does language account for all of cognition? Or does each account for the other? Bowerman (1977) provided the most sophisticated perspective by suggesting that the relationship between thought and cognition in early development is more complex than either the cognition-precedes-language theory or the language-precedes-cognition theory can account for. She insisted that theory should account for more complex interactions in word learning among such factors as children's prelinguistic conceptual activity in particular semantic domains, the nature of the input (linguistic or
otherwise) provided, and children's attempts to make sense of this input.

Bowerman's call should be heeded; future attempts to explain the nature of prelinguistic concepts and their role in the development of a lexicon should consider a multifaceted approach.

**THE FIRST STAGE**

Somewhere between the ages of nine months and twenty-four months, children face the challenges, rewards, and problems of entering a course of lexical development that continues throughout the life span. According to Nelson (1988), this introductory stage lasts from six to twelve months, during which the focus is on establishing word reference, or more specifically on acquiring single word forms and knowledge of associated word meanings agreed upon by proficient users in a language community. By observing adults using words in context, children learn to infer the conventional meanings that provide the foundation for the development of more sophisticated systems of lexical relations among words and meanings of specific kinds. In a broader sense, children are confronted with concerns such as establishing what words are, what words do, what words refer to, and whether single words refer to more than one category of things or events. Research indicates that several characteristics mark this stage of development which culminates in the production of some thirty or more single words.

Bloom (1973) suggested, that the initial "words" that children produce are nonsymbolic because they function primarily as responses to specific stimulus contexts, that is, these words are emitted automatically. Therefore, "dada" is an
automatic response to a familiar referent, rather than the label for the concept
*FATHER* (also see Greenfield & Smith, 1976). The production of first symbolic word
forms is thought to relate to those things that children find most interesting or
exciting. Guillaume (1927) found that children are more likely to talk about and
apply labels to objects they can manipulate, and that it is only later, that they learn
and use relational terms, action words, and social phrases. Similarly, Nelson (1973a,
1979) discovered that the manipulability of an object, the "salient properties of
change" of an object (whether dependent or independent of the child), and the number
of specific action schemes evoked by the object, were most likely to influence
whether a 20-month-old learns to name that object (also see Bohn, 1914; Clark, 1979;
Mervis, 1983). This attending and labelling penchant was thought to account for
individual differences in early vocabularies (see Baldwin & Markman, 1989;
Whitehurst, Kedesdy, & White, 1982).

In keeping with this theory, Clark (1979) found that the initial subset
categories children acquire are comprised of nouns that are easily observed and
manipulated (viz., food, clothes, animals, people, vehicles, toys, body parts, and
household items). Research concerning the growth of vocabulary within the domains
which have been identified as salient to children, supports Clark’s view (see
Merriman & Schuster, 1990). Rescorla (1980) noted that by the age of 20 months,
most children have identified at least one member of each of the major animal,
vehicle, and food subdivisions (e.g., in the animal category, children have identified
cat, dog, one small animal, one large mammal, bird, fish, and bug). Despite the
limited nature of children’s vocabularies, Rescorla found that they are adequate for covering a variety of domain members. In their examination of the development of categories in young children, Rosch, Mervis, Gray, Johnson, and Boyes-Braem (1976) postulated that children first learn to categorize and label objects at the basic level and the words they produce are remarkably consistent. This development is best described as horizontal because young children have neither the experience nor the expertise to formulate the vertical networks of relationships between concepts and associated labels that mark taxonomic organization (see Markman, 1989, for review).

During this stage, children are thought to understand more words than they produce; many words that are initially productive, later drop out of use after a brief period. Dromi (1987) found that some words that are part of the attrition process are generic names applied to both object and action categories (e.g., "hot" may be used as a name for fires and ovens, as well as for the property of heat). The attrition rate and shifting uses of words are thought to be attributable to growing sensitivity, not only to language forms but to the context in which they are used (see Mervis & Canada, 1983). Similarly, Greenfield and Smith (1976) suggested that once children begin to experience a wider variety of language situations, they begin to realize that words not only have a referential function, they also have a communicative one.

Research has indicated that children’s linguistic development is "peppered" with different types of errors in word usage and that these errors are the result of limited experiences within the language community. Bloom (1973) found that children tend to restrict the use of terms and that this restriction is context bound
(e.g., the term "car" may refer to the situation of watching a car moving along outside, but not to riding in one). (Also see Anisfeld, 1984; Barrett, 1986) Similarly Rescorla (1980) observed that children use words that refer to an associative complex of features, rather than to a particular type of category object (e.g., the familiar object "clock" may be the initial referent, but later, "clock" will be used to refer to objects that are perceived to have similar physical attributes or functions, such as a radio or a dial on a dishwasher).

Another common error emerges around the age of 18 months. Overextension of word use occurs when children refer to a broader category than is appropriate in the corresponding adult language (e.g., a child might extend the word "dog" to all other four-legged animals). Schlesinger (1982) posited that because children may not possess certain concepts, they resort to generalizations on the basis of perceived similarities and in turn, apply inappropriate labels to objects. Such generalizations are subject to children's broadening experiences; as they acquire more knowledge, concepts are "fine tuned" and generalizations and overextended references are less likely to occur (see Sera & Reittinger, 1989).

Although the applicability of the prototype model of category structure to children under two years of age has been relatively little explored, Bowerman (1977) proposed that the prototype was usually the child's first referent for a word and that it was invariably the referent to which the word was most frequently or exclusively applied in parental speech. Implicit in this proposal is the notion that children learn and use words in connection with frequently modelled category exemplars and that
they are capable of using essentially the same principles in categorizing objects as adults (see Caplan, 1989; Rosch et al., 1976).

The role of the expert language user in the establishment of initial word-referent relationships is elaborated upon by Markman and Hutchinson (1984). They remarked that young children beginning to acquire language continually face the problem of narrowing down the meaning of a term from an indefinite number of possibilities. Of interest to Markman and Hutchinson, was the process involved that allows children to watch adults point in some direction and utter a word and then conclude that a new unfamiliar word such as "dog" refers to DOGS. Markman and Hutchinson explored the possible constraints preventing children from concluding that "dog" means four-legged object, or black object, or any number of other characteristics that dogs share, and the constraints that prevent children from concluding that "dog" might refer to the bone the dog is chewing on or to the tree the dog is lying under (also see Mervis, 1984; Nelson, 1988; Sera & Reittinger, 1989). They concluded with the suggestion that children place abstract constraints on the possible meanings of words and that these constraints are innate.

Mervis (1984) was also interested in the possible existence of constraints in the relationship between the apprentice and expert language user. She stated that in order for a child to comprehend words, the relationship between word and referent must be clear (for debate, see Au & Glusman, 1990; Gardner, 1991; MacWhinney, 1991; Markman & Wachtel, 1988; Merriman, 1991; Merriman & Bowman, 1989; Woodward & Markman, 1991). Mervis observed mothers referring to objects in such
ways that no other information other than the referent labels were given (e.g., here is a ball). The observation was also made that mothers produced the utterances at the same time the child attended to the referent objects and that there appeared to be a tacit agreement between mother and child that the referent labels referred to whole objects rather than to parts or other objects in the field of vision. Similarly, Seidenberg and Pettito (1987), proposed the idea of a "whole object constraint," which is based on the assumption that children interpret object labels as referring to categories of whole objects and not to parts or attributes of objects, nor to objects and actions together (e.g., ball bouncing) or to objects in events (e.g., ball in a game) or objects from one class and from another class (e.g., ball and bat).

In concluding the discussion for this stage, it is pertinent to acknowledge a major problem that pervades research concerned with attempting to define and discuss this earliest period of lexical development. Nelson (1985) stated that it is not easy to give single definitive interpretations of verbal behavior during the single word stage because it concerns the ability to correctly infer children’s word meaning from children’s word use. However, she was quick to clarify that, despite this problem, attempts to examine how children learn the functions of words, cannot simply dismiss anomalous uses of words.

THE SECOND STAGE

Sometime around two years of age, children begin to realize that words name categories of objects and events. Whereas the first stage is characterized by a horizontal development, this second stage heralds the beginning of vertical structuring
in knowledge organization. This structuring later leads to more sophisticated categorization according to superordinate, basic, and subordinate levels. At first, this may appear to contradict the research hypothesis that script-based slot-filler categorization is the more salient type of semantic organization for young children; however, this is not so. Markman and Callanan (1984) observed that although children at this age are able to understand simple taxonomies, they prefer thematic or script-based organizations (also see Bauer & Mandler, 1989; Waxman & Kosowski, 1990). This preference is thought to partially conceal any taxonomic knowledge they have, as evidenced by performances on memory recall and card sorting tasks. The developmental nature of word acquisition is obvious, with experience comes a rapid increase in the number of scripts and associated slot-fillers in children's repertoires. In attempting to bring some form of order to this "lexical explosion," children gradually begin to apply hierarchical structuring to their knowledge.

In examining the nature of this naming explosion, Nelson (1988) explained that because children have already formed conceptual categories for things and events in the world, they now come to realize that words can be used to refer to them. An inquisitive need to name everything in sight characterizes this second stage (see Dore 1978; Nelson 1973a). Nelson (1983, 1985) further elaborated that children tend to assume that words and concepts are in one-to-one correspondence, that is, there is a word for every concept and a concept for every word. From her observations she proposed the emergence of a two-way process; children look for words for established concepts and at times, form concepts from words. Implicit in this, is the problem of
having to find the words for conceptual categories that represent their world of things, people, actions, and events. Markman (1989) and Mervis (1983) opined that because children's concepts differ from adults, the real problem is one of finding appropriate words for their child-basic concepts and categories. The incidence of overextensions of words, supports the suggestion that vocabularies are too limited and cannot accommodate attempts to make statements about their experiences (see Clark, 1978; Greenfield & Smith, 1976; Rescorla, 1980).

Rosch et al., (1976) and Waxman et al., (1991) showed that children tend to organize their worlds according to clusters of information-rich perceptual and functional attributes. They explained that this organization initially takes place at the basic level of categorization because similarity in overall characteristics of category members dictates it to be the most fundamental and cognitively efficient level. That is, the similarity of members of the same category is maximized relative to the similarity of items from different categories. The primacy of the basic level is also evident in the fact that this is where expert language users first guide children (see Callanan, 1989a). Anglin (1977) found that mothers were more likely to label pictures with basic level names when talking to their preschoolers and that comprehension of adult-basic names is the first step in the evolution of children's categories conforming to adult categories.

**THE THIRD STAGE**

This stage encompasses the period of growth that begins around 3 to 4 years of age and continues through to early elementary school (and its more established
lexical system). During the gathering of research reference material for this overview, it became obvious that the characteristics of this period are less well studied than the earlier periods.

As children become more proficient language users, problems that marked the second stage of development are addressed. Macnamara (1982) noted that the most important characteristic of the third stage concerns children’s abilities to overcome limitations in word usage as they become more competent in organizing their lexicons according to new relations between words and concepts (also see Hasselhorn, 1990; Markman, 1983; Nelson, 1985). The initial taxonomies that were established during the second stage undergo further development as children acquire the skills and strategies to categorize items according to superordinate and subordinate level membership. Nelson (1987) illustrated the complexities of this process in her discussion of the differences between terms in the language and terms in the world. For example, in learning superordinate category terms, children must learn that they are terms that dominate other terms (i.e., the taxonomic relation is a relation among words), not terms that denote actual things (e.g., there is no animal called animal, rather, it is a collective term that stands as an abstract hierarchical category and encompasses terms such as cat, dog, and horse). Adams (1985) suggested that as language becomes more abstract and complex, the roles of experts-as-guides become more obvious and important. Her view supports the research hypothesis that the shift from script-based slot-filler categorization to taxonomy-based categorization is significantly directed by competent language users (also see Callanan, 1989a).
Nelson (1985) also suggested that the intricate nature of the construction of taxonomies by the language community, children’s piecemeal acquisition of categories, and their idiosyncratic development of organizational skills adds some degree of confusion, especially for children entering this stage of development (see Gelman & O’Reilly, 1988; Ricco, 1989). Similarly, Barsalou (1982) noted that personal experiences and preferences lead to individual language users disagreeing about category membership or varying in themselves in attributing category membership to instances depending on context.

For Nelson (1987), it is the intricate hierarchical relation among terms that poses the biggest problem for young children. She claimed that children overcome this obstacle by relying on a natural mechanism that constructs categories and helps to discern the hierarchical relations among terms as defined in the language. The mechanism referred to is based on children’s general event representations and associated slot-filler category knowledge. This theory is described and a discussion of its importance, with reference to the research hypothesis, is presented in a later section of this chapter.

It is apparent then, that this third stage not only involves a rapid and voluminous acquisition of words and associated concepts, it also involves a continual process of organization in order to establish and re-establish new semantic relations within a number of different domains (see Watson, 1989). Implicit in this cognitive reorganization is the idea of a progression from the use of terms in undifferentiated ways, to the restriction of use of words to one function, to the use of words in a
multifunctional adult way. Karmiloff-Smith (1979) proposed that children spend an initial period experimenting with words and concepts and that it is only when revision, reorganization, and consolidation in terms of relations between lexical items begins, that new insights into the networks of the linguistic and conceptual systems become apparent.

THEORIES OF EARLY LEXICAL DEVELOPMENT

INTRODUCTION

Nelson (1983, p. 129) commented that a basic problem encountered in psychological research is attempting to describe the "interface between the external world of physical and cultural reality and the individual's internal representation of that reality, and how that internal representation changes with development." The problem is apparent; research concerned with assessment of "what goes on in the head" is dependent upon inferences based on children's behaviors. Despite this, there have been many attempts to trace lexical development from the preverbal stage of infants to the more "adult" stage in middle childhood.

In general, researchers have addressed, and continue to address central issues of lexical development within a seemingly boundless contextual framework: What are we to call a concept? When does a child have a concept? What is the conceptual context, and how does it change? and, What cognitive processes are involved in conceptual acquisition and development? As stated in the general introduction, the problem that continues to pervade much of the current literature is that of an inability
of researchers to come to any agreement on the meanings of central terms such as, "words," "language," "cognition," "concepts," "thought," "categorization," "speech," "semantics," "meaning," and the like. Although researchers such as Flavell (1970) despaired over this situation two decades ago, the problem still exists; many crucial research questions cannot be adequately answered, because definitions of specific terms have not been determined and agreed upon. The consequence of this problem is the incredible diversity in conflicting research hypotheses, which has emerged because of the different shades of interpretation given, depending on the theoretical persuasions of the investigators. Unfortunately, as Nelson (1983) clarifies, obstacles exist in any attempt to arrive at comprehensive definitions, mainly because of the nature of the study and the incapacity of many researchers to deal adequately with the complex phenomena of the mind.

Regardless of the individual persuasions and theoretical perspectives of researchers, the unified concern has been one of attempting to provide both theoretical and empirical solutions to two most intriguing phenomena: children's acquisition of language and the relation between language and cognition. The existence of this common concern is evident in the questions that researchers have sought to address: How do children first learn to say words and use them to express themselves? What is it that makes a linguistic expression "meaningful"? What is the relationship between children's linguistic and cognitive processes? How are linguistic rules structured and made functional? And even more specifically, How is semantic information acquired and organized by children? How do children learn to link words
with certain referents or categories of referents? How do children distinguish which words belong to which categories and which do not? What merits the use of a word and what does not? What organizational strategies do children bring to language learning (i.e., prelinguistic knowledge)? What is involved in the transition from child (apprentice) to adult (expert) organizational strategies? What is the relationship between the external environment and children's internal processing or representation of those external experiences (and how do researchers examine this)? How does the internal representation develop as children's experiences broaden? And so on.

To better appreciate some of the trends that have taken place and how they relate to Study One and Two, it is appropriate to present an overview of three significant research contributions to the study of the lexical development of young children:

1. The prototype hypothesis (Bowerman, 1978; Rosch, 1978).

At some stage, each approach has been heralded as making a feasible and convincing contribution to the greater understanding of language acquisition and concept development, and each has in turn, been roundly criticized for failing to address crucial aspects of the phenomena. Before embarking on any discussion, it is necessary to acknowledge that delimiting the research to these approaches is
restrictive in the sense that other viable approaches are overlooked (see Rice & Kemper, 1984, for review). This overview will also include an introductory discussion of the classical theory of categorization.

**A CLASSICAL THEORY OF CATEGORIZATION**

For centuries, the Classical Aristotelian Theory of Categorization was the foundation of most scholarly disciplines. It was taught not as an empirical hypothesis, but as an unquestionable, definitional truth (see Lakoff, 1987). From the age of Aristotle to the more recent age of Wittgenstein, categories were thought to be well understood and unproblematic. A category was thought of as an abstract container of "things." Things were assumed to belong in this container or category if they had certain properties in common, while things that did not share these properties, fell outside and into other containers. The category, in turn, became defined by the members and their common properties; thus, in possessing wings, beak, feathers, and hollow bones, a BIRD is distinguished from other non-BIRDS. Theoretically, a perfect definition of BIRD could be constructed which would resolve all ambiguities, allowing no non-BIRDS to be confused with BIRDS. Researchers such as Rosch (1973) and Wittgenstein (1953) have successfully undermined the classical theory and there is now general acceptance that no one true concept or category exists, but that different people might have different concepts for the same purported category (see Nelson, 1989).
**THE PROTOTYPE THEORY OF CATEGORIZATION**

In refuting the Classical Theory, Rosch (see 1978, for review) focused on two implicit implications: if categories are defined by the common properties of members, no member should be a better or best example of that category, and second, if categories are defined only by common properties inherent in the members, then categories should be independent of the idiosyncracies of the individuals doing the categorizing. To the contrary, Rosch's work has demonstrated that categories do have best examples or prototypes and that human capacities play a role in categorization. Because of this, the classical notion of equal membership of exemplars and category organization based on universal definition has been weakened considerably (also see Bowerman, 1973, 1976; Rips, Shoben, & Smith, 1973; Rosch & Mervis, 1975).

For the purpose of this dissertation, a brief overview of the most pertinent aspects of Rosch's model, along with a discussion of the contributing research will be presented. It is expected that this will clarify the notion of typicality of category membership and illustrate how this pertains to Lucariello and Nelson's theory of slot-filler categorization. To begin, it is important to understand that Rosch proposed two dimensions of development in the acquisition of an object word vocabulary: horizontal and vertical.

*Horizontal Development*

This development refers to the acquisition of words at a single taxonomic level; for example, the acquisition of names for basic level objects categories.
Categories at this level are thought to be composed of members that embody a "core meaning" of the category; these "most typical" members are referred to as prototypes. Surrounding these prototypes are members of decreasing degrees of membership (see Rosch, 1975). Category membership is determined according to a comparative relationship of all other exemplars to the prototype, or in the absence of a prototype, to an abstraction which best typifies the category. This suggests that the determination of category membership is not an "all or nothing" process as classical theorists would have us believe, but rather, a process whereby members are assigned varying degrees of typicality (e.g., if cat is assigned prototypical membership of the MAMMAL family, based on common characteristics such as warm blooded, vertebrate, legs, and terrestrial habitat, a whale will be assigned atypical status because of its absence of limbs and ocean habitat). In order for a member to be assigned prototypicality, there must be agreement by language users on what should be included in the category and the degrees of typicality and atypicality of other members. It is apparent, then, that context greatly determines the process of categorization.

Researchers (Bjorklund & Thompson, 1983; Rosch, 1975) examining the notion of family resemblance found that adult subjects could provide a wide range of category members varying in degrees of typicality, as well as being able to judge a "best example" or prototypical member of a category. These findings suggest that categories should be viewed as internally structured, having members that fall somewhere on a "least fit" to "best fit" scale of belonging. Rosch, Mervis, Gray,
Johnson, and Boyes-Braem (1976) argued that prototypes may play a role in explaining aspects of children's choices and usage of early words. Because basic level category members share an optimal number of characteristics and because it is the most common level of abstraction for human thought and activities, it appears that young children acquire this information first. It is not surprising then, that "potential" exemplars that deviate too greatly from the category prototype are not incorporated when children first begin to structure their categorical knowledge.

Anglin (1977) suggested that prototypes arise initially from information retained by children from first experiences with an object named in their presence, and from previous experiences with the object (thereby allowing for the influence of prelinguistic concept formation). As children are exposed to more and more instances, the prototype becomes more the core instance, which children use as a "yardstick" to classify instances and noninstances of the object concept. Anglin's theory incorporates the notion of a multimodal prototype that reflects properties such as sound, texture, movement, and shape, supplemented by the information gleaned from specific instances of the concept. These attributes and associated information assist children in establishing the boundaries in regard to the concept's field of application (see Kuczaj, 1982a).

**Vertical Development**

Vertical categorization of information corresponds to later taxonomic development of lexical categories. According to Rosch's model, taxonomic categories are organized on three levels: superordinate, basic, and subordinate. At the apex of
the taxonomy, superordinate level categories encompass associated basic level and subordinate level categories. Superordinate level categories are more inclusive and more abstract than basic and subordinate level categories (e.g., the *ANIMAL* category that encompasses *people*, *worms*, *birds*, and *fish*, etc., differs greatly from the *FURNITURE* category that encompasses *chairs*, *tables*, *beds*, etc.). Each member within a category shares a common core of qualities that denotes group membership, and each member possesses distinctly different qualities that sets it apart. As illustrated, the differences between categories is greatest at this level.

The basic level represents a partitioning of the superordinate level, and as previously discussed, is considered the level at which categories are first organized (also see Daehler, Lonardo, & Bukatko, 1979; Horton & Markman, 1980; Mervis & Cristafi, 1982). Among categories of concrete objects, basic level members (e.g., in the category of *ANIMAL:*CAT and category of *ANIMAL:*BIRD) share similar qualities and are experienced by children in specific ways. The primacy of the basic level of abstraction suggests that in the absence of fully or even partially developed taxonomies, children may tend to categorize exemplars according to the experiences they have with them (e.g., an *apple* may be categorized as *something to eat when I'm hungry* or *something to eat for lunch*). The theoretical premise of Study One rests on the assumption that it is part of a developmental progression that this initial script-based categorization of *apple*, will later become *lunch FOOD*, and, still later, become *FOOD*. 

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Subordinate level categories represent a further partitioning of knowledge and differences between categories are even more distinct (e.g., CAT:tabby and BIRD:eagle). The Study Two card sorting tasks found that four-year-old children could quite easily identify typical members of hierarchical categories, but had difficulty identifying peripheral members (see Ricco, 1989). Older children were more able to recognize atypical or peripheral members and categorize them taxonomically.

The theory of slot-filler categorization may help to explain what happens to atypical category members when, because of a limited set of experiences, young children omit them from their respective taxonomic categories. The developmental notion of children initially categorizing their world according to script-based slot-filler organization (which form the foundation of developing taxonomies) may suggest that some exemplars are retained as part of a script-based categorical structure for longer periods of time than others, until children develop the expertise necessary to accommodate these exemplars that deviate greatly from the prototype. For example, because a lion deviates too greatly from the taxonomy-based prototype of the CAT family, it is retained as a prototypical member in the script-based structure of ZOO ANIMALS. Only later when children have experienced greater and more varied instances of CAT, will the lion be assigned to the CAT family.

Rather than view the Prototype Model of categorization in opposition to the Slot-filler Model, it is more appropriate to view them as complementary, in that both attempt to explain specific stages along the continuum of lexical development.
Nelson's contributions to the field of language development research have been considerable. Her functional core hypothesis (1973, 1974) offered a viable explanation for the acquisition of concepts and word labels in young children. Her latest work on the derivation of concepts and categories from event representation has been the impetus for more recent research in the field (including this research).

Because of the impact of the functional core hypothesis, it is appropriate to briefly overview her position in order to provide a foundation for her later work. Nelson proposed that the functional relationships of an object to other objects and/or people in a certain context determined the concept, and further, that the formation of a concept could result from a single experience of an object in a context. Nelson was clear in her emphasis that the child's perspective on the physical attributes, actions and uses of the object is paramount in this process. She proposed that, after initial experience with the object, the child is confronted with a great deal of specific information as part of the concept. Gradually, a core of functional characteristics is synthesized, until eventually, the child abstracts perceptual features (especially shape) that have appropriate functional characteristics and uses these features to identify new instances of the concept. Originally, Nelson proposed that words are matched to previously learned concepts, later, she suggested that words may be linked to concepts at any stage of the formation process (Nelson, Rescorla, Gruendel & Benedict, 1978).
Thus for Nelson the process of concept formation is equivalent to the process of word meaning acquisition.

Although she has modified her original model in response to subsequent criticism, her present model still retains much of the original. Its influence on her later work is obvious:

The child's "initial" mental representations are in the form of scripts for familiar events involving social interaction and communication. A script, like a concept, is a structured whole. It represents sequential activity involving roles that people play and objects that they interact with in the course of the activity. It is a "generalized" representation of an activity that has occurred more than once, rather than a collection of particular experiences. Because of the generalized, holistic quality, we could say that the child's first "concepts" are of events. However, in order to keep the terminology straight, I speak of event representations as scripts and of concepts as derived from scripts by a further process of analysis or partitioning (Nelson, 1983, p. 135).

The essence of Nelson's proposal is that it is not objects per se, but events or "social scripts," which involve a level of awareness that static objects do not, that are the foundation of children's language concepts, as represented in terms of events (see Seiler & Wannemacher, 1982). This focus on the context of concepts is based on the premise that all pieces of our experience exist within some context and that "what happens," or our direct experiences of the world around us, are interpreted in terms of prior conceptual context.
In examining the nature of a concept, Nelson referred to the problem of mentally stabilizing an ongoing dynamic reality. Interestingly, this view stands in contradiction to that held by Piaget (1962), who saw the problem as one of moving from static to dynamic representation, he stated; "Sensorimotor intelligence thus functions like a slow motion film representing one static image after another instead of achieving a fusion of images." (Nelson, 1983, p. 131) Implicit in Nelson’s view, however, is the assumption that, "experience is first represented in the head holistically; concept formation and language, then, are the result of processes that reify certain aspects of the whole and make them separately accessible to mental manipulation as if they were objects." (Nelson, 1983, p. 131)

Where then, do taxonomies come from? How children formulate concepts and how these formulations relate to the language used to refer to them, are fundamental questions that have given rise to two general positions in current discussions of children's concepts. Keil (1979, 1989) and Markman and Hutchinson (1984) claimed that innate constraints on the minds of children determine concept formation, while Rosch and Mervis (1976) claimed that constraints in the world determine how children’s concepts are constituted. For Nelson (1987), the situation is clear, rather than rejecting both positions entirely, a stronger stance would be to accept the influential factors of both.

It is generally accepted that although young children are capable of categorizing objects on the basis of similarity, they are slow to acquire superordinate and subordinate terms and seem to have some confusions with the ones they do use.
(see Markman, 1989, for review). In rejecting all other suggestions why this might be so, Nelson argued that it is the hierarchical relation among terms that poses the problems for young children. To elaborate on what was alluded to earlier in the chapter, Nelson claimed that children possess a natural mechanism that facilitates the construction of categories and assists with the discernment of hierarchical relations among terms. This mechanism is based on the children's general event representations. In an earlier study, Nelson (1986) argued that children form mental representations of experienced events that specify relations among objects and participants, as well as, goals, temporal sequence, and causal relations. Although recurring events are not identical, nor do they always include the same items, objects may occur within the same functional slot (while varying on other dimensions) within similar recurrent events. In order to establish a general event representation that will apply across different occasions of the same event, a child needs to "open a slot" in the representation within which a variety of different objects can be specified. In keeping with the example in Chapter I, swimsuit and sunhat are considered slot-fillers for the "putting on a _____ and going to the BEACH" script. Nelson elaborated that these items may or may not share characteristics, such as perceptual similarity, but what is important is that the child considers that they are alternative possibilities for the slot in this particular script. Specifically, the insertion of items into certain slots is based on context definition rather than on general or abstract relationships.

Naming practices of those who participate in the scripts add a further dimension to the process. Through their conversation with adults, children come to
learn that there are general references for the items that fall in these slots (e.g., adults may say, "don't forget your BEACH CLOTHES," or "have you packed your CLOTHES for the beach"). In time, children come to refer to these items in the same way. But how does this come about? Although young children may build up slot-filler categories, and learn to use superordinate terms, such as CLOTHES, to refer to possible slot-fillers, Nelson (1987) proposed that there are still three further developments that need to take place. First, the child needs to be able to extend the representation of a category to more than one context; second, the relationship between the names of the object classes and the name of the category subsuming those classes must be established on a semantic basis; and, third, a semantic relation between members of the general taxonomic category must be established. As previously mentioned, these moves depend upon children's experience with language use. The learning of hierarchical relationships, then, comes from children's experiences with language forms, rather than directly from their experiences in the world. These experiences eventually result in the formation of a different type of cognitive representation, one based on hierarchies (taxonomy) and not simply contextually-based (scripts). (Also see Gardner, 1991)

Nelson (1987) described four areas of evidence that support her theory:

1. When children first begin to use superordinate categories, they derive these from established slot-filler categories. Nelson (1978) found that preschool children display some knowledge of superordinate categories, although these are restricted to a few types, such as FOOD, ANIMALS, and CLOTHES.
2. In apprentice-expert interactions, experts use superordinate terms in the context of slot-filler categories to a greater extent than to refer to more general categories. Lucariello and Nelson (1986) argued that because basic level and superordinate terms can be used in the same slot in a script (e.g., "take your swimsuit to the BEACH" and "take your CLOTHES to the beach"), mothers were observed to emphasize the relationship between slot-fillers and superordinates when talking to young children.

3. Children use slot-filler category knowledge in both verbal and nonverbal contexts, but use general taxonomic categories only in verbal tasks. Kyratzis, Lucariello, Nelson, & Greenstein (1987) found that when 4-year-old children were asked to produce category instances in response to superordinate terms food, clothes, and animals, they were more likely to produce slot-filler responses, while 7-year-old children were more likely to produce taxonomy-based instances. The results of Studies One and Two and Lucariello and Nelson’s (1985) memory tasks, also support this stance.

4. Once children begin the formal education system (and have been exposed to curriculum-based taxonomic knowledge), they are more likely to extend slot-filler categories to broader taxonomic categories, if they have not been established prior to this time. As previously mentioned, Nelson (1989) showed that preschool children’s categorical knowledge is derived from use in particular contexts, and that these categories are usually context restricted. She argued that because slot-filler categories are derived from underlying conceptual organizations, while taxonomies are
defined in the language, it is reasonable to accept the notion that taxonomic structures are based on these initial restricted structures.

In essence, Nelson argues that the categories that are formulated on the basis of children's experience in the world, and in turn, on the basis of their experiences with slot-filler categories emerge early and are matched to the more abstract taxonomic categories early in the development sequence. Once the basic knowledge structures and conceptualizations are established, children begin to see new relationships and to acquire further knowledge from new and varying experiences, including formal schooling experiences. To accommodate this broadening of experiences, children begin to reorganize the conceptual base in order to provide a better foundation for newly established relations and to better explain them. The general conceptual developmental scheme proposed here can be summarized as follows:

An undifferentiated event representation yields to the cognitive analysis of its parts, forming concepts that are related to one another syntagmatically. Syntagmatic relations are revealed in the events that are represented as well as in the speech that is used in connection with those events. Further cognitive analysis reveals paradigmatic relations between the concepts, thus setting up conceptual systems of related elements. Learning hierarchical language terms in turn sets up semantic hierarchies that may operate semi-independently of the conceptual system. (Nelson, 1983, p. 141)
THE SOCIAL SUPPORT POSITION

What is the nature of the apprentice-expert relationship that results in the apprentice being guided by the expert to a level of socially prescribed competence in language use?

Bruner (1978) emphasized that language is a set of communicative procedures designed to fulfill specific functions. He proposed that preverbal children engage in "conversations" with others through actions and gestures and that these interchanges may be viewed as a preparatory stage for the acquisition of language. For example, infants cry when they want to be picked up; they later learn that stretching out their arms and calling "ma" will also result in their mothers picking them up. In his more recent studies, Bruner (1981, 1983) stated that because young children do not possess adult devices (either linguistic or nonlinguistic) for establishing the joint attention necessary for communication, "recurrent interactive episodes" help infants determine the attentional focus of adults and, thus, the intended referent of their language. In this way, repeated "formats" support early communication interactions and so facilitate early child language development (see Tomasello & Farrar, 1986).

As they grow older and begin to acquire labels and associated concepts, children are able to communicate more complicated messages. For Bruner, it is crucial that in the language learning process, children and adults must have shared views of the world. In examining what they referred to as caretaker-child interactions, Ninio and Bruner (1978) and Ratner and Bruner (1978) found that these are predictable in form, with respect to the content of individual verbal exchanges,
physical interactions, and sequencing of interactions (also see Peters, 1983). Although the children in these studies were much younger than the subjects in Studies One and Two, being able to trace the origins of apprentice-expert interactions to very early childhood suggests that these interactions are firmly established by the time children enter preschool. Ratner and Bruner’s study of the "scaffolding" effect of mother-child interactions observed mothers leading their children to higher levels of competence through joint participation in language games (Also see Tomasello and Farrar (1986). The parallels to Study Two are obvious; apprentice-expert interactions in a series of book reading language-games appeared to greatly influence the ways in which preschool and early elementary school children performed on two card sorting tasks. The findings of these studies lend strong support to the hypothesis that expert language users are primarily responsible for guiding young children towards convergence with adult usage.

Vygotsky (1962) stated that the indispensable component of a word is "meaning;" for him, a word without meaning is an empty sound. Vygotskian theory rests firmly on the premise that the nature of word meaning is evolutionary. That is, it is a dynamic rather than static phenomenon that changes as children develop and experience wider ranges of thought functions: "A child’s thought, precisely because it is born a dim amorphous whole, must find expression in a single word. As his thoughts become more differentiated, the child is less apt to express them in single words but constructs a composite whole" (Vygotsky, 1962, p. 126).
Having established that the process is a dynamic one, the question of what agents facilitate this process is posed. Vygotsky argued that higher mental functions, such as language development, first take form on an "interpsychological" (between the minds of language users) plane. Essentially, this describes the social interactions of participants within a language community and explains the specific roles individuals are thought to play in transmitting the culture from one person to the next and from one generation to the next. The acquisition of concepts, categories, and word labels particular to a language community usually begins within the interpersonal or interpsychological context of parent-child joint activities, such as language-games. With the broadening of children's experiences there develops an expertise that results in an internalizing of lexical forms and the skills necessary for manipulation. Later, other social units, such as teacher-student interactions contribute to this process of internalizing. As children achieve independent control over the activities involved, the social origins of what were initially shared mental functions are masked. This masking marks completion of what Vygotsky called transition from the interpsychological to the "intrapsychological" (within the mind of the language user) plane of human activity (see Adams and Bullock, 1986).

In emphasizing the social processes by which culture is shared and perpetuated, Vygotskian theory reinforces the theory that interactions between apprentices and experts are an integral part of lexical development. Adams and Bullock (1986) were more specific in their examination of lexical development and the role of apprentice-expert interactions. They saw the process of word meaning
acquisition as a "socially distributed process." That is, word meaning acquisition is a
dynamic process, greatly facilitated by social processes. In giving support to the
notion of the social acquisition of language, they argued that because parents, or other
collaborators are pivotal figures in word meaning acquisition, the process cannot be
wholly localized within the child as much as the earlier research on language
acquisition and development suggests. Adams and Bullock observed that the
Vygotskian tradition provides researchers with the following:

   A rich heritage for elaborating our understanding of the development of all
   higher mental functions, including symbolic activity. The framework
   encourages us to look simultaneously at the contributions of both parent and
   child to the remarkable personal and cultural achievement manifested in the
   individual child's cognitive structures. The temporally extended process of
   convergence toward adult forms and levels of performance provides a natural
   arena for examining the real-time cognitive and social processes that enable
   transitions from the interpsychological to the intrapsychological plane for each
   new generation of speakers (p. 158).

   In her research on novice-expert interactions, Adams (1985) found that as
   apprentices learn the skills of the expert, they converge on a full sets of
   culturally-shared categorization skills. She described this process as one of joint
   cooperation that is facilitated by the interests and talents of both apprentice and
   expert, as well as by the instructional tools at the masters disposal. Adams concluded
   her study appositely:
When these social uses of language are appreciated, the traditional debate concerning the relationship between language and thought is given new life. The influence of language on thought does not simply occur within the mind of the individual. It first occurs in the interpersonal domain, where language is used to guide the emerging thought processes of the child (p. 38).
CHAPTER III

STUDY ONE: SEMANTIC MEMORY ORGANIZATION IN YOUNG CHILDREN: THE SLOT-FILLER CATEGORIZATION OF EARLY WORDS

INTRODUCTION

Study One examines the hypothesis that scripts (event schemas) provide the basis for the categorical structures in the semantic memories of young children. It is comprised of a memory task performed by 50 four-year-old children.

MEMORY TASK

METHOD

Setting

Four kindergartens from a cross section of a community in Hawkes Bay, New Zealand were selected as the participating institutions for this study. Information from respective charters on educational policy provided the bases for the following descriptions of each kindergarten and the community it serves.

1. Mary Richmond Kindergarten is situated in a suburb of Napier city. This is a high density housing area and most of the dwellings are state-owned rental accommodations. Many of the adults are currently unemployed, on welfare benefits, or solo caregivers. Maori and Pacific Island people account for a high proportion of the population. A special feature of the kindergarten is the development of programs and provision of services that cater to the needs of physically and mentally disabled
students. There is also a heavy emphasis on the teaching of Maori culture and language.

2. Pirimai Kindergarten community is a maturing suburb, populated by people from a diversity of backgrounds. Generally, the children are from dual income and single income families, although some are from families relying on welfare benefits. The kindergarten employs professional teachers and encourages voluntary parental participation in order to provide a preschool service available to all children for sessional attendance.

3. Eskview Kindergarten community consists of rural and semirural families involved with mixed farming, horticulture, fishing, small businesses, and the local pulp and paper mill. The community is very supportive of the kindergarten. A preschool service is available to all children for sessional and all day attendance. Rural children living 12 kilometers or more from the kindergarten may attend for two full days each week.

4. Taradale Kindergarten is situated on local park land and is close to a shopping center. The children come from new, rural and established housing areas. They are from families in the middle to higher socioeconomic groups and approximately 10 percent are from single-parent families. The kindergarten program provides experiences which foster the development of active exploration, creativity, and problem solving. Emphasis is also placed on the development of personal skills such as the growth of self-confidence and cooperation with others.
Subjects

Fifty preschool children, 25 boys and 25 girls, served as subjects. Their ages ranged from 4 years and 0 months to 4 years and 11 months and the mean age of the sample was 4 years and 6 months. From the fifty children, ten (5 boys and 5 girls) were randomly assigned to each of the five list/recall conditions as follows:

1. 10 subjects in the taxonomic list/free recall condition (mean age was 4 years and 6 months).
2. 10 subjects in the taxonomic list/category-cued condition (mean age was 4 years and 6 months).
3. 10 subjects in the slot-filler list/free recall condition (mean age was 4 years and 6 months).
4. 10 subjects in the slot-filler list/category-cued recall condition (mean age was 4 years and 5 months).
5. 10 subjects in the slot-filler list/script-cued recall condition (mean age was 4 years and 6 months).

From the random assignment schedule, it was observed that all conditions had children from the four kindergartens. Parents were told that this study examined "how children learn about things."

Materials

In an earlier pilot study, two nine-word recall lists were constructed from responses elicited from twenty children (ages ranged from 4 years and 0 months to 4 years and 11 months) from preschools similar to those participating in Study One. In
keeping with the Lucariello and Nelson study, questions were asked about objects associated with a single action in a given script (in the categories of clothes, food, and animals):

**Clothes:**
(a) What is a piece of clothing you would wear to bed?
(b) What is a piece of clothing you would put on to go outside?
(c) What is a piece of clothing you would put on in the morning?

**Animals:**
(a) What is an animal you would see at the zoo?
(b) What is an animal you would have as a pet?
(c) What is an animal you would see on a farm?

**Food:**
(a) What is something you would eat for breakfast?
(b) What is something you would eat for lunch?
(c) What is something you would eat for dessert?

From each subcategory question, the five most common responses were collected.

In compiling the taxonomic list, the most common responses to questions (a) were selected (viz., pajamas, lion, cereal), the second most common responses to questions (b) were selected (viz., jeans, cat, cheese), and the third most common responses to questions (c) were selected (viz., shirt, horse, apple). Hence, this list was composed of the more familiar and typical associates for each subcategory, although, not the strongest (see Appendix A).
In compiling the slot-filler list, words were selected from a range of responses given to the following subcategory questions on (a) clothes worn outside, (b) zoo animals, and (c) lunch food:

Outside clothes: What is a piece of clothing you would put on to go outside?

Zoo animals: What is an animal you would see at the zoo?

Lunch food: What is a piece of food you would eat for lunch?

From the responses given to each question, the most common responses were selected (viz., jeans, lion, sandwich), the third most common responses were selected (viz., jacket, giraffe, cheese), and the fifth most common responses were selected (viz., socks, bear, apple). This was in keeping with the composition of the taxonomic list, where members less strongly associated to the subcategories, although still considered typical exemplars, were chosen (see Appendix A).

Five recall conditions were composed as follows:

1. Taxonomic list/free recall.
2. Taxonomic list/category-cued recall.
3. Slot-filler list/free recall.
4. Slot-filler list/category-cued recall.
5. Slot-filler list/script-cued recall.

Procedure

Two experimenters (E1 and E2) administered this task. Each experimenter was assigned a group consisting of children randomly selected from all list/recall
conditions. Children were tested individually by the same experimenter who gave the following instructions: "We are going to play a game. We are going to say some words and look at some pictures. First, I'll say a word, show you a picture, and then you say the word. When we have said all the words and looked at all the pictures, I'm going to ask you how many of the words you can remember."

A warm-up session of three card presentations preceded the main task. The experimenter then read the words and presented the picture cards at a rate of one approximately every 3 seconds, allowing the child to repeat each word before going on to the next. The cards were realistic, colored photographs, approximately 3" x 5" in size. Each card was removed after the child said the corresponding word. After all the words/cards were presented, the child was immediately asked what he or she could remember.

In the free recall condition, when a child appeared to have difficulty remembering, the following retrieval prompt was given: "Are there any other words you can remember"? The trial ended when the child indicated that he or she was unable to remember any more items. In the category-cued recall condition, the child was asked to remember all the items he or she could from one category before moving on to the next. The following retrieval cues were used: "What are all the (clothes, food, animals) we just said"? In the script-cued recall condition, the following retrieval cues were used: "What (clothes, food, animals) would you (put on to go outside, eat for lunch, see at the zoo)"?
As in the Lucariello and Nelson study, all children received three trials. There was a small break of approximately 30 seconds between each trial. The words on each list were presented in a blocked order (clothes, animals, food) and list order was constant across trials.

**RESULTS**

**Measures**

The Memory Task yielded one assessment for each child and involved:

1. A comparison of memory performance on the taxonomic and slot-filler lists as a function of free or category-cued recall condition.


3. A comparison of intrusions data on the taxonomic and slot-filler lists as a function of list/recall condition.

4. A comparison of recall organization (clustering) on the taxonomic and slot-filler lists as a function of list/recall condition.

5. As part of the above discussion, a comparison of these data with the Lucariello and Nelson (1985) Study data.

*Recall of the Taxonomic and Slot-filler Lists in the Free and Category-Cued Recall Conditions*

The data from the free recall and category-cued recall conditions were analyzed in a 2 (list type: taxonomic and slot-filler) x 2 (recall condition: free and
category-cued) x 3 (trial: 1, 2, 3) mixed model ANOVA with repeated measures over three trials. This analysis provided for direct comparison of memory performance on the taxonomic and slot-filler lists in the free recall condition and category-cued recall condition. The overall measure of total words (W), a component measure of categories recalled (C) and a component measure of words per category recalled (W/C) were entered into separate analyses.

**Words (W) Recalled.**

The mean numbers of words recalled (W) as a function of list type, recall condition and trial is presented in Table 1.

<table>
<thead>
<tr>
<th>List Type</th>
<th>Recall Condition</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxonomic</td>
<td>Free</td>
<td>4.7</td>
<td>5.2</td>
<td>4.7</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>Free</td>
<td>4.8</td>
<td>5.9</td>
<td>6.2</td>
</tr>
<tr>
<td>Taxonomic</td>
<td>Cat-cued</td>
<td>5.2</td>
<td>6.5</td>
<td>6.7</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>Cat-cued</td>
<td>6.2</td>
<td>6.7</td>
<td>7.4</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>Script-cued</td>
<td>6.4</td>
<td>7.0</td>
<td>7.9</td>
</tr>
</tbody>
</table>

The greatest number of items were recalled in the slot-filler list/category-cued recall condition and the least number of items were recalled in the taxonomic list/free recall condition.
recall condition. Scores in the slot-filler list/both recall conditions and in the taxonomic list/category-cued condition improved over trials, while scores in the taxonomic list/free recall condition decreased on the third trial.

From the ANOVA performed on the W measure (see Table 2), it was found that the number of words recalled, as a function of list condition, barely fell short of the .05 level of statistical significance. Because of initial concerns regarding sample size and the effects of exceptional performance, the borderline nature of this result merited a re-examination of data. The findings are reported later in this chapter. There was a significant difference in the number of words elicited by the free recall condition and the number of words elicited by the category-cued recall condition ($p < .01$). Subject performance was significantly different on each administration of the memory task ($p < .01$).

Table 2: Analysis of Variance for Words (W) Recalled as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between Ss</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>List (A)</td>
<td>1</td>
<td>14.70</td>
<td>14.70</td>
<td>3.68</td>
<td>0.0631</td>
</tr>
<tr>
<td>Recall (B)</td>
<td>1</td>
<td>43.20</td>
<td>43.20</td>
<td>10.81</td>
<td>0.0023</td>
</tr>
<tr>
<td>A X B</td>
<td>1</td>
<td>0.13</td>
<td>0.13</td>
<td>0.03</td>
<td>0.8561</td>
</tr>
<tr>
<td>Error (b)</td>
<td>36</td>
<td>143.93</td>
<td>4.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Within Ss</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial (C)</td>
<td>2</td>
<td>24.05</td>
<td>12.03</td>
<td>8.30</td>
<td>0.0006</td>
</tr>
<tr>
<td>C X A</td>
<td>2</td>
<td>2.45</td>
<td>1.23</td>
<td>0.85</td>
<td>0.4334</td>
</tr>
<tr>
<td>C X B</td>
<td>2</td>
<td>2.45</td>
<td>1.23</td>
<td>0.85</td>
<td>0.4334</td>
</tr>
<tr>
<td>C X A X B</td>
<td>2</td>
<td>4.12</td>
<td>2.06</td>
<td>1.42</td>
<td>0.2481</td>
</tr>
<tr>
<td>Error (w)</td>
<td>72</td>
<td>104.27</td>
<td>1.45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
A Newman-Keuls test applied to the means indicated that although there were more words recalled on the slot-filler list than on the taxonomic list in all trials, only the third trial results were statistically significant ($p < .05$). Although more words were recalled in the category-cued recall condition than in the free recall condition in all trials, only the second and third trial results were significant ($p < .05$, in each case).

**Categories (C) Recalled.**

The mean number of categories (C) recalled are presented in Table 3.

Table 3: Mean Number of Categories (C) and Words Per Category (W/C) Recalled as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>List</th>
<th>Recall Condition</th>
<th>Trial 1</th>
<th>W/C</th>
<th>Trial 2</th>
<th>W/C</th>
<th>Trial 3</th>
<th>W/C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax</td>
<td>Free</td>
<td>2.5</td>
<td>1.57</td>
<td>2.7</td>
<td>1.70</td>
<td>2.6</td>
<td>1.57</td>
</tr>
<tr>
<td>Slot</td>
<td>Free</td>
<td>2.3</td>
<td>1.60</td>
<td>2.8</td>
<td>1.97</td>
<td>2.8</td>
<td>2.07</td>
</tr>
<tr>
<td>Tax</td>
<td>Cat-cued</td>
<td>2.8</td>
<td>1.73</td>
<td>2.9</td>
<td>2.17</td>
<td>2.9</td>
<td>2.23</td>
</tr>
<tr>
<td>Slot</td>
<td>Cat-cued</td>
<td>3.0</td>
<td>2.07</td>
<td>2.9</td>
<td>2.23</td>
<td>3.0</td>
<td>2.43</td>
</tr>
<tr>
<td>Slot</td>
<td>Script-cued</td>
<td>3.0</td>
<td>2.13</td>
<td>3.0</td>
<td>2.33</td>
<td>3.0</td>
<td>2.63</td>
</tr>
</tbody>
</table>

More categories were recalled in the slot-filler list/category-cued recall condition than in all other list type/recall conditions, and the number of categories recalled across trials tended to increase. Results of the ANOVA performed on the C
measure (see Table 4) revealed that there were no significant differences in the number of categories recalled, as a function of list or trial conditions. However, memory performance, as a function of trial, only barely fell short of the .05 level of statistical significance. Again, the borderline nature of this result merited a reanalysis of data. The findings are reported later in this chapter. There were significantly fewer categories elicited by the free recall condition than by category-cued recall condition ($p < .01$).

Table 4: Analysis of Variance for Categories (C) Recalled as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>List (A)</td>
<td>1</td>
<td>0.13</td>
<td>0.13</td>
<td>0.33</td>
<td>0.5700</td>
</tr>
<tr>
<td>Recall (B)</td>
<td>1</td>
<td>2.70</td>
<td>2.70</td>
<td>6.66</td>
<td>0.0141</td>
</tr>
<tr>
<td>A X B</td>
<td>1</td>
<td>0.03</td>
<td>0.03</td>
<td>0.08</td>
<td>0.7760</td>
</tr>
<tr>
<td>Error (b)</td>
<td>36</td>
<td>14.60</td>
<td>0.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial (C)</td>
<td>2</td>
<td>0.82</td>
<td>0.41</td>
<td>2.94</td>
<td>0.0592</td>
</tr>
<tr>
<td>C X A</td>
<td>2</td>
<td>0.12</td>
<td>0.06</td>
<td>0.42</td>
<td>0.6586</td>
</tr>
<tr>
<td>C X B</td>
<td>2</td>
<td>0.65</td>
<td>0.33</td>
<td>2.34</td>
<td>0.1036</td>
</tr>
<tr>
<td>C X A X B</td>
<td>2</td>
<td>0.42</td>
<td>0.21</td>
<td>1.50</td>
<td>0.2300</td>
</tr>
<tr>
<td>Error (w)</td>
<td>72</td>
<td>10.00</td>
<td>0.14</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Newman-Keuls test applied to the means indicated that although there were more categories recalled on the slot-filler list than on the taxonomic list in all trials, these results were short of statistical significance. In the first and third trials, significantly more categories were recalled as a function of the category-cued recall
condition \((p < .05, \text{in each case})\), and although more words were recalled in the second trial, the difference was not statistically significant.

**Words Per Category (W/C) Recalled.**

The mean number of words per category (W/C) recalled are presented in Table 3. More words per category were recalled in the slot-filler list/category-cued recall condition than in any other list type/recall conditions, and apart from the taxonomic list/free recall condition, all other list type/recall conditions showed an increase in recall.

The ANOVA performed on the W/C measure (see Table 5) revealed information that was contrary to prediction. There were no significant differences in the number of words per category recalled as a function of list condition; however, because the result only just failed to meet the .05 level of statistical significance, a re-examination of data was conducted. The results are reported later in this chapter. There were significantly fewer words per category elicited by the free recall condition than by the category-cued recall condition \((p < .01)\), and subject performance was found to be significantly different on each administration of the memory task \((p < .01)\). A Newman-Keuls test applied to the means indicated that although there were more words per category recalled on the slot-filler list than on the taxonomic list in all trials, these results did not reach statistical significance. More words per category were recalled as a function of the category-cued recall condition in all trials; however, only the second and third trial results were statistically significant \((p < .05, \text{in each case})\).
Table 5: Analysis of Variance for Words Per Category (W/C) Recalled as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>List (A)</td>
<td>1</td>
<td>1.63</td>
<td>1.63</td>
<td>3.56</td>
<td>0.0671</td>
</tr>
<tr>
<td>Recall (B)</td>
<td>1</td>
<td>4.80</td>
<td>4.80</td>
<td>10.48</td>
<td>0.0026</td>
</tr>
<tr>
<td>A X B</td>
<td>1</td>
<td>0.03</td>
<td>0.03</td>
<td>0.07</td>
<td>0.7889</td>
</tr>
<tr>
<td>Error (b)</td>
<td>36</td>
<td>16.50</td>
<td>0.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial (C)</td>
<td>2</td>
<td>2.54</td>
<td>1.27</td>
<td>7.70</td>
<td>0.0009</td>
</tr>
<tr>
<td>C X A</td>
<td>2</td>
<td>0.21</td>
<td>0.10</td>
<td>0.62</td>
<td>0.5387</td>
</tr>
<tr>
<td>C X B</td>
<td>2</td>
<td>0.22</td>
<td>0.11</td>
<td>0.66</td>
<td>0.5211</td>
</tr>
<tr>
<td>C X A X B</td>
<td>2</td>
<td>0.52</td>
<td>0.26</td>
<td>1.57</td>
<td>0.2154</td>
</tr>
<tr>
<td>Error (w)</td>
<td>72</td>
<td>11.86</td>
<td>0.16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Reanalysis of Data: Recall of the Taxonomic and Slot-filler Lists in the Free and Category-Cued Recall Conditions

The lack of statistical significance for list type resulted in a re-examination of the raw data. In order to determine if extraneous variables were influencing the results, three of the fifty subjects were targeted as exceptional performers. On the basis that their scores deviated at least three responses from the overall mean of their respective group (e.g., one subject in the taxonomic list/free recall condition scored at least four responses more than the mean for the group on each trial), these three subjects were deleted from the data set. One subject each was deleted from the taxonomic list/free recall condition, the taxonomic list/category-cued recall condition, and the slot-filler list/free recall condition. These "new" data were reanalyzed in the
2 (list type) x 2 (recall condition) x 3 (trial) mixed model ANOVA. Interestingly, although, not surprisingly, quite different results arose.

**Words (W) Recalled.**

The mean number of words recalled (W) as a function of list type, recall condition and trial is presented in Table 6.

<table>
<thead>
<tr>
<th>List Type</th>
<th>Recall Condition</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxonomic</td>
<td>Free</td>
<td>4.4</td>
<td>5.0</td>
<td>4.7</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>Free</td>
<td>5.0</td>
<td>6.3</td>
<td>6.4</td>
</tr>
<tr>
<td>Taxonomic</td>
<td>Cat-cued</td>
<td>5.1</td>
<td>6.2</td>
<td>6.4</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>Cat-cued</td>
<td>6.2</td>
<td>6.7</td>
<td>7.4</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>Script-cued</td>
<td>6.4</td>
<td>7.0</td>
<td>7.9</td>
</tr>
</tbody>
</table>

The ANOVA performed on the W measure, again revealed significant main effects for recall, $F(1, 32) = 11.29, p < .01$, and trial, $F(2, 64) = 9.53, p < .01$. However, as hypothesized, there was also a significant main effect for list, $F(1, 32) = 11.29, p < .01$. A Newman-Keuls test applied to the means indicated that there were more words recalled on the slot-filler list than on the taxonomic list in all trials.
and that these findings were statistically significant for the second and third trials ($p < .05$, in each case).

**Categories (C) Recalled.**

The mean number of categories (C) recalled are presented in Table 7.

Table 7: Reanalysis: Mean Number of Categories (C) and Words Per Category (W/C) Recalled as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>List</th>
<th>Recall Condition</th>
<th>Trial 1</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Trial 2</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th>Trial 3</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>W/C</td>
<td>C</td>
<td>W/C</td>
<td>C</td>
<td>W/C</td>
<td>C</td>
<td>W/C</td>
<td>C</td>
<td>W/C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax</td>
<td>Free</td>
<td>2.4</td>
<td>1.48</td>
<td>2.6</td>
<td>1.63</td>
<td>2.7</td>
<td>1.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slot</td>
<td>Free</td>
<td>2.4</td>
<td>1.67</td>
<td>3.0</td>
<td>2.11</td>
<td>2.9</td>
<td>2.14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tax</td>
<td>Cat-cued</td>
<td>2.7</td>
<td>1.70</td>
<td>2.9</td>
<td>2.07</td>
<td>2.9</td>
<td>2.14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slot</td>
<td>Cat-cued</td>
<td>3.0</td>
<td>2.07</td>
<td>2.9</td>
<td>2.23</td>
<td>3.0</td>
<td>2.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slot</td>
<td>Script-cued</td>
<td>3.0</td>
<td>2.13</td>
<td>3.0</td>
<td>2.33</td>
<td>3.0</td>
<td>2.63</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The ANOVA performed on the C measure, again revealed a significant main effect for recall, $F(1, 32) = 5.83, p < .05$, as well as a significant main effect for trial, $F(2, 64) = 4.18, (p < .05)$. Contrary to expectation, there was no main effect for list. A Newman-Keuls test applied to the means indicated that, in the first trial, there were significantly more categories recalled as a function of the category-cued recall condition ($p < .05$).
Words Per Category (W/C) Recalled.

The mean number of words per categories (W/C) recalled are presented in Table 7. The ANOVA performed on the W/C measure, again revealed significant main effects for recall, $F(1, 32) = 10.75, p < .01$, and trial, $F(2, 64) = 8.80, p < .01$, as well as a significant main effect for list, $F(1, 32) = 10.75, p < .01$. A Newman-Keuls test applied to the means indicated that there were significantly more words per category recalled on the slot-filler list than on the taxonomic list in the second and third trials ($p < .05$, in each case).

Recall of the Taxonomic and Slot-filler Lists in the Free, Category-cued, and Script-cued Recall Condition

A 5 (list/recall condition) x 3 (trial) mixed model ANOVA with list/recall condition as a between-subjects factor and trial as a within-subjects factor was performed on the data from all five conditions. This analysis allowed a comparison of memory performance in the slot-filler list/script-cued recall condition with memory performance in the slot-filler list/free recall and slot-filler list/category-cued recall conditions, as well as a comparison of memory performance in the slot-filler list/script-cued recall condition with memory performance in the taxonomic list/free recall and taxonomic list/category-cued recall conditions. The overall measure of total words (W), the component measure of categories recalled (C), and a component measure of words per category recalled (W/C) were entered into separate analyses.
Words (W) Recalled.

From the ANOVA performed on the W measure (see Table 8) it was revealed that, as predicted, there was a significant difference in the number of words recalled among the five list type/recall conditions ($p < .01$), and the number of words recalled each time the task was administered ($p < .01$).

Table 8: Analysis of Variance for Words (W) Recalled as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listrec (A)</td>
<td>4</td>
<td>95.53</td>
<td>23.88</td>
<td>6.80</td>
<td>0.0002</td>
</tr>
<tr>
<td>Error (b)</td>
<td>45</td>
<td>157.97</td>
<td>3.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial (B)</td>
<td>2</td>
<td>33.28</td>
<td>16.64</td>
<td>13.19</td>
<td>0.0001</td>
</tr>
<tr>
<td>A X B</td>
<td>8</td>
<td>11.19</td>
<td>1.40</td>
<td>1.11</td>
<td>0.3651</td>
</tr>
<tr>
<td>Error (w)</td>
<td>90</td>
<td>113.53</td>
<td>1.26</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Newman-Keuls test applied to the means (see Table 1) indicated that although there were more words recalled in the first trial in the slot-filler list/script-cued recall condition than in any other list type/recall condition, these results were short of statistical significance. However, in the second trial, memory performance was greatest in the slot-filler list/script-cued recall condition, followed by performance in the slot-filler list/category-cued recall condition, and there was a significant difference between responses in the slot-filler list/script-cued recall condition and responses in the taxonomic list/free recall condition ($p < .05$). In the third trial,
significantly more words were recalled in the slot-filler list/script-cued recall condition than in the slot-filler/free recall condition and taxonomic/free recall condition ($p < .05$, in each case). Similarly, significantly more words were recalled in the slot-filler list/category-cued recall condition than in the taxonomic list/free recall condition ($p < .05$).

A pattern in the number of words recalled across trials according to list/recall condition emerged in these data. In descending order, the greatest number of words were recalled in the slot-filler list/script-cued recall condition, followed by the slot-filler/category-cued recall condition, the taxonomic list/category-cued recall condition, the slot-filler list/free recall condition, and finally, the taxonomic list/free recall condition.

**Categories (C) Recalled.**

The ANOVA performed on the C measure (see Table 9) confirmed the prediction that there would be a significant difference in the number of categories recalled among the five list type/recall conditions ($p < .05$). However, memory performance, as a function of trial, only barely fell short of the .05 level of statistical significance. Again, the borderline nature of this result merited closer examination in a later reanalysis. A Newman-Keuls test applied to the means (see Table 3) indicated that in all trials, more categories were recalled in the slot-filler list/script-cued recall condition than in any other list type/recall condition. The only significant difference was found in the first trial, where memory performance was significantly greater in the slot-filler list/script-cued recall condition and in the slot-filler list/category-cued
recall condition than in the slot-filler list/free recall condition ($p < .05$, in each case).

Apart from the first trial where the number of responses in the taxonomic list/free recall condition and the slot-filler list/free recall condition lead to a reversal of positions, the hierarchical pattern evident in the data on word responses was replicated in these data.

Table 9: Analysis of Variance for Categories (C) Recalled as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listrec (A)</td>
<td>4</td>
<td>4.17</td>
<td>1.04</td>
<td>3.22</td>
<td>0.0210</td>
</tr>
<tr>
<td>Error (b)</td>
<td>45</td>
<td>14.60</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial (B)</td>
<td>2</td>
<td>0.65</td>
<td>0.33</td>
<td>2.94</td>
<td>0.0580</td>
</tr>
<tr>
<td>A X B</td>
<td>8</td>
<td>1.35</td>
<td>0.17</td>
<td>1.52</td>
<td>0.1631</td>
</tr>
<tr>
<td>Error (w)</td>
<td>90</td>
<td>10.00</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Words Per Category (W/C) Recalled.**

The results from the ANOVA performed on the W/C measure (see Table 10) supported the prediction that there would be a significant difference in the number of words per category recalled among the five list type/recall conditions ($p < .01$), and in the number of words per category recalled each time the task was administered ($p < .01$). A Newman-Keuls test applied to the means (see Table 3) indicated that, in all trials, more words per category were recalled in the slot-filler list/script-cued recall condition than in any other list type/recall condition. In the second trial, the
number of words per category recalled was significantly fewer in the taxonomic list/free recall than in the other list type/recall conditions \((p < .05)\). In the third trial, a significantly greater number of words per category were recalled in the slot-filler list/script recall condition and in the slot-filler list/category-cued recall condition than in the slot-filler list/free recall condition and in the taxonomic list/free recall condition \((p < .05, \text{in each case})\). In keeping with the data on words recalled and categories recalled, the same hierarchical pattern in the number of responses according to list/recall condition and trial was evident in these data.

Table 10: Analysis of Variance for Words per Category (W/C) Recalled as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listrec (A)</td>
<td>4</td>
<td>10.75</td>
<td>2.67</td>
<td>6.70</td>
<td>0.0003</td>
</tr>
<tr>
<td>Error (b)</td>
<td>45</td>
<td>18.06</td>
<td>0.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial (B)</td>
<td>2</td>
<td>3.56</td>
<td>1.78</td>
<td>12.42</td>
<td>0.0001</td>
</tr>
<tr>
<td>A X B</td>
<td>8</td>
<td>1.18</td>
<td>0.15</td>
<td>1.03</td>
<td>0.4173</td>
</tr>
<tr>
<td>Error (w)</td>
<td>90</td>
<td>12.89</td>
<td>0.15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Reanalysis of Data: Recall of the Taxonomic and Slot-filler Lists in the Free, Category-cued, and Script-cued Recall Condition

After removal of the three outliers, these data were reanalyzed in the 5 (list/recall condition) x 3 (trial) mixed model ANOVA. The results confirmed statistically significant interaction effects for the list/recall and trial conditions.
Intrusions on the Taxonomic and Slot-filler Lists in the Free, Category-cued, and Script-cued Recall Conditions

From the ANOVA performed on category-appropriate intrusions there appeared to be no significant difference in the number of intrusions recalled among the five list type/recall conditions, nor in the number of intrusions recalled each time the task was administered. Table 11 indicates the absence of any patterns of recall, and it is apparent that these data do not support Lucariello and Nelson's findings on intrusions.

Table 11: Total Number of Intrusions as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>List Type</th>
<th>Recall Condition</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxonomic</td>
<td>Free</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>Free</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Taxonomic</td>
<td>Category-cued</td>
<td>6</td>
<td>3</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>Category-cued</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>Script-cued</td>
<td>3</td>
<td>6</td>
<td>2</td>
<td>11</td>
</tr>
</tbody>
</table>

A Reanalysis of Data: Intrusions on the Taxonomic and Slot-filler Lists in the Free, Category-cued, and Script-cued Recall Conditions

The data from category-appropriate intrusions were reanalyzed, and no significant main or interaction effects were evident.
**Organization in Free Recall**

Recalled items in the slot-filler list/free recall and taxonomic list/free recall conditions were examined for incidence of clusters of items per category. Two points were awarded for each clustered pair of category-appropriate items, and three points were awarded for each clustered treble of category-appropriate items. A maximum of nine points was awarded for a perfect clustered recall performance. Mean clustering scores are shown in Table 12.

Table 12: Mean Clustering Scores as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>List</th>
<th>Recall Condition</th>
<th>N</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxonomic</td>
<td>Free</td>
<td>10</td>
<td>3.1</td>
<td>4.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>Free</td>
<td>10</td>
<td>3.9</td>
<td>4.2</td>
<td>4.7</td>
</tr>
</tbody>
</table>

A 2 (list type) x 3 (trial) mixed model ANOVA with list type as a between subjects factor and trial as a within subjects factor revealed that children receiving the slot-filler list showed a significantly higher level of clustering than children receiving the taxonomic list, $F(1, 58) = 6.28, p < .05$. These results also revealed a significant main effect for trial, $F(2, 116) = 6.31, p < .01$, and a significant interaction effect, $F(2, 116) = 5.06, p < .01$.
DISCUSSION

Introduction

Although Study One shares the same theoretical and a similar methodological foundation with Lucariello and Nelson's study, it is appropriate to caution that variations in sampling, measurement instruments, and setting preclude it from being considered a direct or systematic replication. This preclusion weakens a strict comparison of results. However, with these precautions in mind, an informal comparison of results is valuable in order to gauge the contributions of both studies.

Memory Performance on the Taxonomic and Slot-filler Lists in the Free and Category-Cued Recall Conditions

The Effects of List Type Condition.

In keeping with the theory that young children are thought to understand the events in which they participate within script-based organizational structures, it was expected that the number of words, categories, and words per category recalled would be significantly greater on the slot-filler list in both the free recall and category-cued recall conditions. Although the mean number of words, words per category, and categories recalled were greater in the slot-filler list/category-cued recall condition than in the three other list/recall conditions, these results were not statistically significant. Furthermore, memory recall was found to be greater in the taxonomic list/category-cued recall condition than in the slot-filler list/free recall condition, although, again, this result was not statistically significant. Not only do these results run contrary to expectation, but they also contradict those of the Lucariello and
Nelson study. Lucariello and Nelson's data indicated that memory organization was better for the slot-filler list than for the taxonomic list in both recall conditions. From these findings they concluded that script-based slot-filler categories represent a closer "match" with the categorical structures of young children's semantic memories than do hierarchically composed taxonomy-based categories.

Explanations for the lack of statistical significance in the Study One data do not necessarily point to shortcomings in the theoretical underpinnings. They may, instead, point to two concerns with the research method. First, a decision to compose new slot-filler and taxonomic lists of items less strongly associated within categories reflected a concern regarding the validity of the Lucariello and Nelson instrument. In an attempt to nullify the presumed effect of guessing based on established prototypical knowledge, both lists in Study One were constructed of items that were more varied in typicality, but still considered familiar to preschool children. Although this reconstruction of lists may explain the differences in the findings of the two studies, it cannot be assumed that it explains the lack of statistically significant support for the research hypothesis, since the items were familiar to the children.

Second, and more pertinent, a limited availability of subjects necessitated the reversal of an initial decision to increase the sample size of Study One to 100 subjects, with twenty subjects in each list/recall condition. The larger sample was expected to provide greater assurance that uncontrolled variables (e.g., children possessing exceptional memory recall faculties or children having received formal instruction in taxonomic categorization in some kindergartens) would be operating
randomly and would therefore not have systematic effects on the results. The results of this study indicate that the smaller sample size was not immune to such effects.

*The Effects of List Type Condition: A Reanalysis of Data.*

After the removal of outlier scores of three subjects, the data were reanalyzed. As expected, the results were more in keeping with Lucariello and Nelson’s results and lent significant support to the research hypothesis.

The ANOVAs performed on the W (words recalled) and W/C (words per category) measures indicated a main effect for list type. More words and words per category were recalled as a function of the slot-filler list than as a function of the taxonomic list and this was statistically significant for the second and third trials. The ANOVA performed on the C (categories recalled) indicated no significant effect for list type. From these new findings, it can be concluded that slot-fillers are an integral part of script-based categories and that young children are more likely to organize their worlds according to script-based categories than taxonomy-based categories.

The results of the W and W/C measures corroborated the initial concern that despite the fact that Study One was a repeated measures design, the sample size of ten subjects per list/recall condition was still not large enough to ameliorate any systematic effects of uncontrolled variables on the data. This knowledge is valuable in that future research intending to employ this type of measure will have to consider working with larger samples.
The Effects of Recall Condition.

Researchers involved with preschool subjects commonly believe that memory capacity is much greater for visual information than for verbal. This suggests that children's recall on memory tasks should be enhanced if pictures, as well as verbal cues, are used to facilitate remembering (see Adams, 1985; Adams & Bullock, 1986; Blewitt, 1983; Shepard, 1967). Lucariello and Nelson used only words to facilitate remembering and found that the category-cued recall procedure did not significantly facilitate greater memory performance on either list. They commented that cuing effects, such as pictures, might be specific to particular types of lists.

In keeping with this view, Study One used a combination of verbal cues, visual encoding procedures, and blocked lists to facilitate memory recall. Bearing in mind the theory that categorical structures of young children are script-based, it was expected that organizational patterns would be more evident, especially in the slot-filler list/category-cued recall condition. As predicted, the data showed significant differences in cuing effects. The category-cued recall procedure facilitated greatest recall of words, categories, and words per category on the slot-filler list. These findings were consistent with the results of previous studies that indicated that cuing by category names enhances recall for young children (see Kobasigawa, 1977; Perlmutter & Myers, 1979; Perlmutter, Sophian, Mitchell, & Cavanaugh, 1981). That the next greatest memory performance was on the taxonomic list/category-cued recall condition and not on the slot-filler list/free recall condition might suggest that in this case, recall factor and not list type was the stronger determinant of performance.
Hasselhorn (1990) suggested that on some memory sort/recall tasks, where both sorting during encoding (e.g., input organization of blocked lists) and clustering during recall (e.g., output organization of recall condition) were examined, output organization was a better predictor of young children’s recall.

In discussing their findings on the effects of cuing procedures, Lucariello and Nelson argued that because both lists were presented in blocked form the procedure may have depressed the effect of category cues because the salience of the categories may have already been raised during the encoding process. They cited Perlmutter and Myers (1979) who found that recall was significantly higher on blocked than unblocked lists in free recall, but in cued recall, the difference between blocked and unblocked lists was only marginally significant. However, the results of Study One suggests that the specific combination of photographic encoding devices, category-cued verbal prompts, as well as a blocked slot-filler list significantly facilitated the greatest recall, thus supporting the hypothesis that young children assimilate, organize, retrieve, and recall information according to script-based structures in their semantic memories.

*The Effects of Trial Condition.*

The data showed that over trials, a greater number of words, categories (reanalysis of data section), and words per category were recalled on each administration of the task, except in the taxonomic list/free recall condition. Because the greatest increase was in the slot-filler list/category-cued recall condition, this suggests that script-based categorical structures are more salient in young children’s
semantic memories. It would not be unreasonable to suggest that the practice effect of a repeated measures design facilitated greater memory recall on the list type that best matched children’s categorical structures.

*Memory Performance on the Taxonomic and Slot-filler Lists in the Free Recall, Category-cued Recall, and Script-cued Recall Conditions*

*The Effects of List Type/Recall Condition (Listrec)*.

In keeping with Lucariello and Nelson’s results, it was found that of the three recall conditions, script-cued semantic prompts facilitated the greatest recall, especially of the slot-filler list. Interestingly, a pattern again emerged in the order of list type/recall conditions according to the number of words, categories and words per category recalled. Recall was greatest in the slot-filler list/script-cued recall condition, followed by the slot-filler/category-cued recall condition, the taxonomic list/category-cued recall condition, the slot-filler list/free recall condition, and the taxonomic list/free recall condition. Clearly, the varying facilitative strengths of different combinations of list type and recall condition determined this hierarchy. Free recall did not greatly facilitate memory performance on either the taxonomic or slot-filler lists, but list type determined a difference within the free recall condition. Category-cued recall facilitated greater recall than the free recall condition, and list again type determined the difference within the category-cued condition. A combination of list/type and recall condition determined performance in the slot-filler/script-cued recall condition.
These findings are important because research has shown that retrieval cues are effective in recovering stored items to the extent that they match the organization imposed when the items were stored originally (Bower, 1970). Study One and Lucariello and Nelson's study support the stance that when young children are given a script-frame as a cue for retrieval, it has a facilitative effect on recall. It can be assumed that because recall was greatest in the slot-filler list/script-cued recall condition, children are more likely to organize information according to scripts and more likely to retrieve that information in response to script-based prompts. In the category-cued recall condition, subjects were forced to make more exhaustive searches within a constrained field and it appears that of the two lists, the slot-filler list was more effective in directing those searches (see Kobasigawa, 1977). It is not surprising that the taxonomic list/free recall condition did not improve over trials and this may be the result of subjects having to make even more exhaustive searches in an unconstrained field with little direction from the list type.

The Effects of List/Recall (ListRec) Condition: A Reanalysis of Data.

The most interesting aspect of these reanalysis was the general reversal of positions of the taxonomic list/category-cued recall condition and the slot-filler list/free recall condition based on the number of words, categories, and words per category recalled across trials. Not surprisingly, these new results were more in keeping with Lucariello and Nelson's results. This reversal suggests that the strength of the list condition is enough to compensate for the lack of direction inherent in the free recall prompt. These data lend considerable support to the stance that the
process of item storage is directed by script-based structures in the semantic memory.

**The Significance of Intrusions.**

The analysis of intrusions data was approached with as much interest as guarded speculation. Lucariello and Nelson made the claim that the great number of intrusions in their slot-filler list/script-cued recall condition supported the hypothesized effect of slot-filler semantic organization on children’s performances on this task. However, when their data from the taxonomic list/category-cued recall condition were found to have a total of 57 intrusions over trials in comparison to 54 intrusions over trials for the slot-filler list/script-cued recall condition, conclusive support for this claim became questionable.

Although there were concerns with this aspect of Lucariello and Nelson’s study, their argument for the hypothetical support of intrusions data was convincing. Based on their rationale that intrusions indicate that children derive slot-filler categories from associations between items and their functional roles within scripts and thus with each other, it was expected that their results would be supported by Study One. In keeping with Lucariello and Nelson’s results, a greater number of intrusions in the responses of children assigned to the slot-filler/script-cued recall condition, as well as an increase in this number across trials, was expected.

Study One data analysis yielded no statistically significant differences in the number of intrusions recalled among the five list type/recall conditions, nor were there statistically significant differences in the number of intrusions recalled across trials, nor were there significant differences in the number of intrusions recalled
across trials for the five list type/recall conditions. The only consistent result between
the two studies was that the taxonomic list/category-cued recall condition was found
to have the greatest total number of intrusions; of course, this result does not support
Lucariello and Nelson’s argument. One explanation for the different results, might
concern the use of pictures to facilitate remembering. If children have vivid internal
representations to assist with recall, they may be more likely to discard as
inappropriate, items that are not an exact match with the cued image. This discarding
process may also explain the smaller total number of intrusions in Study One, as
compared with the total number of intrusions in Lucariello and Nelson’s study.

These intrusions data do not support the hypothesized effect of slot-filler
semantic organization on children’s performances on this task any more than they
support an effect of taxonomic semantic organization. Because of the initial concern
regarding intrusions data, this result does not cast doubt on the research hypothesis,
as much as it questions the significance and interpretation of intrusions data.

Cluster Organization in Free Recall.

Hasselhorn (1990) recently explained that young children’s free recall
clustering is thought to be an automatic by-product of their knowledge base. He also
stated that although a knowledge base is a necessary condition for taxonomic category
organization, the development of strategic competencies in knowledge activation is
what sets older children apart from younger. With regard to the results of Study
One, this claim suggests that, not only does the recall clustering of 4-year-old
children’s stem from a script-based knowledge foundation, but, at this age, strategic
recall competencies associated with the development of taxonomic knowledge may have not yet developed. (Also see Bjorklund & de Marchena, 1984; Bjorklund & Jacobs, 1985; Murphy, 1979).

SUMMARY

Study One examined two possible alternatives to describe the semantic organization in the memories of young children. The first type was slot-filler categorization, which is thought to involve categories that are derived on the basis of association of items with their functional roles within scripts and thus with each other. The second type was taxonomic categorization, which is thought to involve categories that are derived on the basis of association of items from different scripts. Based on numerous studies (Bruner et al., 1966; Inhelder & Piaget, 1964; Lucariello et al., 1986; Mandler, 1979, 1983; Markman, 1981; Nelson, 1983; Nelson et al., 1983) which have found that young children tend to organize their knowledge according to scripts and themes, it was hypothesized that slot-filler categorical structures would be the most salient form of organization in the semantic memories of 4-year-old children.

From these results, strong support was found for the proposal that slot-filler categories provide young children with a more familiar type of categorical organization, leading to greater recall in the category-cued recall condition, to higher levels of recall organization in free recall, to superior recall when script cues are presented. However, that hierarchical taxonomic categories are recognizable by children in this experiment is evidenced by the fact that although more words, categories and words per category were recalled in the slot-filler list/category-cued
recall condition than in the taxonomic list/category-cued recall condition, these results were not statistically significant. Although the results of this study indicate that slot-filler categories represent a closer match to 4-year-old children's semantic memory structures, the increasing ability to categorize some knowledge taxonomically lends support to the notion that both these forms of categorization are part of a developmental process.
CHAPTER IV

STUDY TWO: SEMANTIC MEMORY ORGANIZATION IN YOUNG CHILDREN: THE SLOT-FILLER - TAXONOMIC SHIFT IN THE CATEGORIZATION OF EARLY WORDS

INTRODUCTION

Study Two examined the developmental premise of Lucariello and Nelson's theoretical foundation. A memory task and two card sorting tasks were employed to examine the basis for taxonomic categorization, specifically, how language users come to determine the hierarchical organization of category members, and the nature of the expert-apprentice relationship that results in the guidance of the apprentice to a level of socially prescribed competence in language usage.

SETTING FOR ALL TASKS

The sample for this study was drawn from the same population as the sample for Study One. Two kindergartens and three elementary schools were selected from Hawkes Bay, New Zealand as the contributing institutions for this study. The charter on educational policy of each kindergarten and elementary school served as the source for the following descriptions.

1. The Hunter Park Kindergarten community population is 95 percent Caucasian and 5 percent Maori, with most families falling in the middle income bracket. Parents are involved in the following occupations; farming, rural servicing
companies, banking, teaching, legal profession, self-employment, and local industry. The kindergarten encourages mainstreaming of children with disabilities.

2. The Lakeview Kindergarten caters to children from both rural and urban families. Many parents are employed in farming, part-time seasonal work on farms, and at the local meat works. There is a high percentage of dual income and one-parent families and an even mix of children of Caucasian and Maori ethnicity. The kindergarten places great emphasis on the special needs of children and on providing support for parents who need assistance with the health and care of their children.

3. Waipukurau Primary (Elementary) School is a coeducational school catering to the needs of children from a wide range of backgrounds. The student population is 80 percent Caucasian and 20 per cent Maori. Most parents are employed in the local township, while 20 percent of parents work in the surrounding farming area. There is a high level of parental involvement in the school program. The school aims to provide as wide and meaningful an education as possible, with an emphasis on developing positive learning attitudes.

4. Takapau Primary (Elementary) School services a small township and a large farming community. The two major employers of the town's people are the nearby meat works and work related to the district's farming community. The community is very supportive of the school and a Maori language and cultural program is a feature of the curriculum. The ethnic background of the school is approximately 28 percent Maori and 72 percent Caucasian.
5. Terrace Primary (Elementary) School services a small township and a large farming area. The ethnic grouping is 39 percent Maori and 61 percent Caucasian. Many families fall in the lower socioeconomic employment group or are welfare benefit dependents. A proportion of the students are in need of special assistance including extra tuition in language arts, specifically reading.

One hundred and eight children, 36 four-year olds (18 boys and 18 girls), 36 five-year-olds (18 boys and 18 girls), and 36 six-year-olds (18 boys and 18 girls) served as subjects. The age range and mean age for each group was as follows:

1. The 4-year-old group age range was 4 years and 0 months to 4 years and 11 months, with a mean age of 4 years and 5 months.
2. The 5-year-old group age range was 5 years and 0 months to 5 years and 11 months, with a mean age of 5 years and 5 months.
3. The 6-year-old group age range was 6 years and 0 months to 6 years and 11 months, with a mean age of 6 years and 4 months.

MEMORY TASK

METHOD

Subjects

From the thirty-six children in each age group, eighteen (9 boys and 9 girls) were randomly assigned to each of the two list/recall conditions as follows:

1. 18 subjects in the taxonomic list/category-cued recall condition.
2. 18 subjects in the slot-filler list/category-cued recall condition.
It was observed from the random assignment schedule that both conditions in each age group had children from the different institutions. Parents were told that this study examined "how children learn about things."

**Materials**

This task was a simplified version of the Memory Task in Study One. In an earlier pilot test, two nine-word recall lists were constructed from responses elicited from twenty children (ranging from 4 years and 0 months to 6 years and 11 months) from kindergarten and elementary schools similar to those participating in Study Two.

The taxonomic list was comprised of animals associated with each of the taxonomy-based families of *CAT, BIRD* and *DOG*. For each subcategory, one typical, one newborn, and one atypical exemplar was selected based on the following questions:

- **Cats:**
  (a) Can you tell me a kind of cat?
  (b) What do you call a baby cat?

- **Dogs:**
  (a) Can you tell me a kind of dog?
  (b) What do you call a baby dog?

- **Birds:**
  (a) Can you tell me a kind of bird?
  (b) What do you call a baby bird?

From each question (a), the most common responses were selected (viz., tabby, sheepdog, budgie) Since all children knew the references to the young of each family (b), these were included (viz., kitten, puppy, chick). The selection of appropriate atypical, although still considered reasonably familiar, animal exemplars (viz.,
Siamese cat, duck, Afghan hound) was made with the assistance of teachers. These exemplars were considered atypical in that they deviated somewhat from central category members (prototypes), but were still recognized by most children as belonging to specific categories. In keeping with Study One, this list was composed of associates for each subcategory that varied in degrees of typicality (see Appendix B).

The script-based slot-filler list was comprised of words associated with a single animal slot in a given script, in subcategories (a) FARM animals, (b) PET animals, and (c) ZOO animals. The exemplars for each subcategory included two typical exemplars and one atypical exemplar (e.g., in the ZOO script, elephant and monkey were considered typical exemplars and camel was considered an atypical exemplar). Pilot test questions were used to elicit information:

Farm: What is an animal you would see on a farm?
Zoo: What is an animal you would see at the zoo?
Home: What is an animal you would have living at home as your pet?

From the responses, the first and second most common animals were selected (viz., horse, sheepdog; elephant, monkey; tabby, budgie). Teachers were consulted for the selection of less typical, although, still familiar exemplars (viz., camel, Afghan hound, duck). As with the taxonomic list, this selection ensured the inclusion of familiar associates for each subcategory, although not the strongest (see Appendix B).

Two recall conditions were composed as follows:

1. Slot-filler list/category-cued recall condition.
2. Taxonomic list/category-cued recall condition.

Procedure

The Memory Task testing took place in the same pretest session as the Triad Card Sorting Task and the Multiple Card Sorting Task. Two experimenters participated in the data collection, Experimenter 1 (researcher) and Experimenter 2 (volunteer), hereafter referred to as E1 and E2. Both experimenters took part in administering the Memory Task, Multiple Card Sorting Task, and the Triad Card Sorting Task. The order remained the same for all children.

The instructions for this task were the same as those for Study One. Each child was tested individually by the same experimenter who gave the following instructions: "We are going to play a game. We are going to say some words and look at some pictures. First, I’ll say a word, show you a picture, and then you say the word. When we have said all the words and looked at all the pictures, I’m going to ask you how many of the words you can remember." A warm-up session of three card presentations preceded the main task. The experimenter then read the words and presented the picture cards at a rate of one approximately every 3 seconds, allowing the child to repeat each word before going on to the next. The cards were realistic, colored photographs, approximately 3" x 5" in size. Each card was removed after the child said the corresponding word. After all the words and cards were presented, the child was immediately asked what he or she could remember. The following retrieval cue was used: "What are all the animals we just said"?
The nine exemplars on each list belonged to the animal family and, depending on taxonomic or script membership, to specific categories of the animal family. This composition differed from that of Study One, where three unrelated subcategories formed the basis of each list. As in the Lucariello and Nelson study, all children received three trials. The words on each list were presented in a blocked order (i.e., taxonomic list: *CATS, BIRDS, DOGS* and slot-filler list: *FARM, HOME, ZOO*) and were constant across trials.

**RESULTS**

**Measures**

The Memory Task yielded one assessment for each child and involved:

1. A comparison of memory performance on the taxonomic and slot-filler lists as a function of age group.

2. A comparison of the number of intrusions recalled as a function of list type and age group.

3. A comparison of recall organization (clustering) on the taxonomic and slot-filler lists as a function of age group.

4. As part of the above discussion, a comparison of these data with the Study One and Lucariello and Nelson (1985) Study data.
Recall as a Function of List Type/Age Group Condition

A 6 (list type: taxonomic, slot-filler/age group: 4-year-old, 5-year-old, 6-year-old) x 3 (trial: 1, 2, 3) mixed model ANOVA with list type/age group condition as a between-subjects factor and trial as a within-subjects factor was performed on the data. These analysis allowed a comparison of memory performance of 4-year-old, 5-year-old, and 6-year-old children in the taxonomic list condition with memory performance in the slot-filler list condition. The overall measure of total words (\(W\)), the component measure of categories recalled (\(C\)), and a component measure of words per category recalled (\(W/C\)) were entered into separate analyses.

Words (\(W\)) Recalled.

As predicted, the ANOVA performed on the \(W\) measure (see Table 13) revealed a significant difference in the number of words recalled among the six list type/age group (Listgrp) conditions \((p < .01)\), and the number of words recalled each time the task was administered \((p < .01)\).

| Table 13: Analysis of Variance for Words (\(W\)) Recalled as a Function of List Type, Age Group, and Trial. |
|-----------------|-------|-------|------|-------|-------|
| Source          | df    | SS    | MS   | F     | pr > F |
| Between Ss      |       |       |      |       |       |
| Listgrp (A)     | 5     | 81.99 | 16.40| 4.86  | 0.0005 |
| Error (b)       | 102   | 344.07| 3.37 |       |       |
| Within Ss       |       |       |      |       |       |
| Trial (B)       | 2     | 198.41| 99.21| 132.92| 0.0001 |
| A X B           | 10    | 10.66 | 1.07 | 1.43  | 0.1697 |
| Error (w)       | 204   | 152.26| 0.75 |       |       |
A Newman-Keuls test applied to the means showed the following order in list type/age group condition, ranging from greatest to least mean number of words recalled, for the first trial and second trials:

1. Taxonomic list/6-year-old group.
2. Slot-filler list/4-year-old group.
3. Slot-filler list/6-year-old group.
4. Slot-filler list/5-year-old group.
5. Taxonomic list/5-year-old group.
6. Taxonomic list/4-year-old group.

There was a significant difference between memory performance in the taxonomic list/4-year-old group condition and all other conditions in the both trials ($p < .05$, in each case). In the third trial, children in the taxonomic list/6-year-old group condition scored significantly higher than children in the taxonomic list/5-year-old, slot-filler list/4-year-old, and taxonomic list/4-year-old group conditions ($p < .05$, in each case). There were no significant differences among memory performances in the slot-filler list/6-year-old, slot-filler list/5-year-old, taxonomic list/5-year-old, and slot-filler list/4-year-old group conditions.

*Categories (C) Recalled.*

The ANOVA performed on the C measure (see Table 14) confirmed the prediction that there would be significant differences in the number of categories recalled among the six list type/age group conditions ($p < .01$). It was also revealed
that the number of categories recalled did not remain constant each time the task was administered ($p < .01$).

Table 14: Analysis of Variance for Categories (C) Recalled as a Function of List Type, Age Group, and Trial.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listgrp (A)</td>
<td>5</td>
<td>4.74</td>
<td>0.95</td>
<td>3.28</td>
<td>0.0087</td>
</tr>
<tr>
<td>Error (b)</td>
<td>102</td>
<td>29.48</td>
<td>0.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial (B)</td>
<td>2</td>
<td>4.96</td>
<td>2.48</td>
<td>13.86</td>
<td>0.0001</td>
</tr>
<tr>
<td>A X B</td>
<td>10</td>
<td>1.85</td>
<td>0.19</td>
<td>1.03</td>
<td>0.4157</td>
</tr>
<tr>
<td>Error (w)</td>
<td>204</td>
<td>36.52</td>
<td>0.18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Newman-Keuls test applied to the means showed the following order in list type/age group condition, ranging from greatest to least number of categories recalled for the first trial:

1. Slot-filler list/4-year-old group.
2. Taxonomic list/6-year-old group.
3. Slot-filler list/6-year-old group.
4. Slot-filler list/5-year-old group.
5. Taxonomic list/5-year-old group.
6. Taxonomic list/4-year-old group.

There was a significant difference between memory performance in the taxonomic list/4-year-old group condition and all other conditions ($p < .05$). Although there
was no statistically significant results in the second trial, children in the slot-filler list/4-year-old group condition recalled more categories than all other conditions, with children in the slot-filler list/6-year-old and taxonomic list/6-year-old conditions recalling the next greatest number of categories. Children in the taxonomic list/4-year-old condition recalled the least number of words. In the third trial there were no significant differences in performance among groups, although again, children in the taxonomic list/4-year-old group scored least well.

**Words Per Category (W/C) Recalled.**

The results from the ANOVA performed on the W/C measure (see Table 15) supported the prediction that there would be significant differences in the number of categories recalled among the six list type/age group conditions \((p < .01)\), and in the number of words per category recalled each time the task was administered \((p < .01)\). A Newman-Keuls test applied to the means showed a similar order in list type/age group condition to those found on the W and C measures. In all trials, children in the taxonomic list/6-year-old group condition recalled more words per category than all other conditions. Children in the taxonomic list/4-year-old group recalled significantly fewer words per category than children in all other list type/age group conditions \((p < .05)\).
Table 15: Analysis of Variance for Words Per Category (W/C) Recalled as a Function of List Type, Age Group, and Trial.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listgrp (A)</td>
<td>5</td>
<td>9.73</td>
<td>1.95</td>
<td>5.13</td>
<td>0.0003</td>
</tr>
<tr>
<td>Error (b)</td>
<td>102</td>
<td>38.68</td>
<td>0.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial (B)</td>
<td>2</td>
<td>21.63</td>
<td>10.81</td>
<td>130.36</td>
<td>0.0001</td>
</tr>
<tr>
<td>A X B</td>
<td>10</td>
<td>1.23</td>
<td>0.12</td>
<td>1.48</td>
<td>0.1478</td>
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<tr>
<td>Error (w)</td>
<td>204</td>
<td>16.92</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Intrusions as a function of List Type/Age Group Condition

In keeping with Lucariello and Nelson’s results, the ANOVA performed on category-appropriate intrusions (see Table 16) indicated that there were significant differences in the number of intrusions recalled among the six list type/age group conditions ($p < .01$). These results run counter to the results of the Study One Memory Task. A Newman-Keuls test applied to the means showed that 6-year-old, 5-year-old, and 4-year-old children receiving the slot-filler list recalled a significantly greater number of intrusions than children in all age groups receiving the taxonomic list ($p < .05$, in each case).
Table 16: Total Number of Intrusions as a Function of List Type, Recall Condition, and Trial.

<table>
<thead>
<tr>
<th>List</th>
<th>Age Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxonomic</td>
<td>4-year</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Taxonomic</td>
<td>5-year</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Taxonomic</td>
<td>6-year</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>4-year</td>
<td>9</td>
<td>4</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>5-year</td>
<td>5</td>
<td>3</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>6-year</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>18</td>
</tr>
</tbody>
</table>

Organizational Patterns in Recall

Recalled items in the slot-filler list/age group and taxonomic list/age group conditions were examined for incidence of clusters of items per category.

Table 17: Mean Clustering Scores as a Function of List Type, Age Group, and Trial.

<table>
<thead>
<tr>
<th>List</th>
<th>Age Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxonomic</td>
<td>4-year</td>
<td>0.9</td>
<td>1.3</td>
<td>1.6</td>
</tr>
<tr>
<td>Taxonomic</td>
<td>5-year</td>
<td>1.1</td>
<td>1.7</td>
<td>2.0</td>
</tr>
<tr>
<td>Taxonomic</td>
<td>6-year</td>
<td>1.3</td>
<td>2.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>4-year</td>
<td>1.1</td>
<td>1.2</td>
<td>1.7</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>5-year</td>
<td>1.3</td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Slot-filler</td>
<td>6-year</td>
<td>0.9</td>
<td>1.2</td>
<td>1.5</td>
</tr>
</tbody>
</table>
As in Study One, the maximum number of clustered items per category was three, with a maximum clustering score of nine for each administration of the task. The mean clustering scores are shown in Table 17.

The ANOVA performed on the clustering scores (see Table 18) revealed a significant effect for list type/age group ($p < .01$), a significant effect for trial ($p < .01$), and a significant list type/age group x trial effect ($p < .01$). A Newman-Keuls test applied to the means revealed that in the first trial, 6-year-old children receiving the slot-filler list and 4-year-old children receiving the taxonomic list had the lowest clustering scores, however, these fell short of statistical significance. In the second trial, children in the taxonomic list/6-year-old group and slot-filler list/5-year-old group recalled significantly more clustered responses than children in all other list type/age group conditions ($p < .05$, in each case). Trial three showed that 6-year-olds receiving the taxonomic list displayed a significantly greater degree of clustered recall than all other condition ($p < .05$).

Table 18: Analysis of Variance for Cluster Scores as a Function of List Type/Age Group and Trial.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listgrp (A)</td>
<td>5</td>
<td>87.97</td>
<td>17.59</td>
<td>10.23</td>
<td>0.0001</td>
</tr>
<tr>
<td>Error (b)</td>
<td>318</td>
<td>546.94</td>
<td>1.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trial (B)</td>
<td>2</td>
<td>128.17</td>
<td>64.08</td>
<td>77.16</td>
<td>0.0001</td>
</tr>
<tr>
<td>A X B</td>
<td>10</td>
<td>65.61</td>
<td>6.56</td>
<td>7.90</td>
<td>0.0001</td>
</tr>
<tr>
<td>Error (w)</td>
<td>636</td>
<td>528.22</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DISCUSSION

Recall as a Function of List Type/Age Group (Listgrp) Condition

As hypothesized, there were significant differences in the number of words, categories, and words per category recalled as a function of list type/age group. Interestingly, a pattern emerged that remained consistent across the different measures. Recall was consistently highest in the taxonomic list/6-year-old group condition and this tended to be followed by the slot-filler list/4-year-olds and 6-year olds, the slot-filler list/5-year-olds, the taxonomic list/5-year-olds, and the taxonomic list/4-year-olds.

The higher memory performance of 4-year-old children receiving the slot-filler list and consistently lowest performance of 4-year-olds receiving the taxonomic list (statistically significant for the latter, in most instances), lends strong support to the notion that 4-year-olds are more interested in constructing script-based relations among objects than constructing taxonomic relations. However, it is important not to overemphasize these results. For example, Bruner, Olver, & Greenfield (1966) argued that children of this age lack taxonomic categories and categorize solely on the basis of thematic (script-based) organization. A more reasonable explanation is that relational structures, such as events and themes, are a more common way of making sense of encounters, especially for young children. Taxonomy-based categories with their more abstract hierarchical levels of superordinate, basic, and subordinate items, on the other hand, are part of an organizational system that arises from the process of learning the language. It is not surprising, then, that children who are of an age of
limited language experiences, prefer to categorize their world according to more familiar script-based organization (see Markman, 1989).

The nature of the developmental shift in language learning is evident in the performances of both 6-year-old groups. That 6-year-old children receiving the taxonomic list consistently recalled the greatest number of responses, supports the theory that as children are inducted into the formal education system, they develop greater language expertise, to the extent that taxonomy-based categorization becomes the more salient form of conceptual organization. At first glance, the strong performance of 6-year-olds receiving the slot-filler list might appear contradictory; however, this result confirms the argument that script-based structures provide a firm semantic foundation. Gardner (1991) argued that because scripts play an important life long role in helping to assimilate new experiences, they should not be viewed as immature or a lesser form of categorization. Markman (1989) stated that attending to causal, spatial, and temporal relations between objects is essential for understanding the world. She believed that it is a heightening of interest in categorical relations, and not a loss of interest in thematic relations that takes place with development (also see Mandler, 1983).

As predicted, there was no significant difference in memory performance between the two 5-year-old groups, nor were there any significant differences in the performances of 5-year-olds and 4-year-olds, and 5-year-olds and 6-year-olds. These results confirm the hypothesis that 5-year-old children experience a transitional period
of shift from script-based to taxonomy-based structures of categorical organization, probably as a result of their introduction to formal schooling.

**Intrusions as a function of List Type/Age Group Condition**

As in Study One, the analyses of intrusions data was approached with interest and speculation. Because the Study Two Memory Task differed somewhat, a comparative discussion of results with Lucariello and Nelson's results and Study One results must be approached with tentativeness. However, in order to come to some conclusion regarding applicability of intrusions data, it is informative to discuss findings and concerns. To reiterate, Lucariello and Nelson made the claim that the greater number of intrusions in their slot-filler list/script-cued recall condition supported the hypothesized effect of slot-filler semantic organization on children’s performances on this type of memory task. Their claim was made with specific reference to this particular list type/recall condition, with qualification that category-appropriate intrusions were not as great on the slot-filler list in the category-cued and free recall conditions. Although their argument sounded reasonable, they did not provide conclusive evidence that intrusions in the slot-filler list/script-cued recall condition were the result of list type, recall condition, or both. Arguably, doing so would have been difficult considering more intrusions were recalled in their taxonomic list/category-cued recall condition.

In the Study Two Memory Task, a significantly greater number of intrusions were recalled by children of all age groups (6-year-olds, 4-year-olds, and 5-year-olds in that order) receiving the slot-filler list than in the three taxonomic list/age group
conditions \((p < .05, \text{ in each case})\). Contrary to Lucariello and Nelson’s claim, it would appear that age is a not determining factor. The inference may be made from these data that some factor inherent in the slot-filler list condition is responsible for facilitating the intrusions. One interesting aspect of the study was that older children who recalled the greatest number of intrusions tended to be those assigned to remedial or recovery reading programs. This may suggest that because these children still possess strong script-based organizational strategies, they are less likely to be able to assimilate taxonomic knowledge into existing structures. This situation implies a lack of compatibility between the knowledge bases of some children and the type of instruction promoted by the formal school curriculum. However, at this point, the results of the three studies are of such conflicting natures that it is questionable if any interpretations can be substantiated.

**Organizational Patterns in Recall**

Hasselhorn (1990) stated that young children’s free recall clustering is thought to be indicative of their knowledge bases. He elaborated that as children get older they become aware of the usefulness of category organization as a memory strategy that enables them to strategically activate category knowledge during recall. In keeping with this stance and the research hypothesis, the results showed that six-year-old children receiving the taxonomic list displayed a higher incidence of clustered items in recall than 6-year-old children receiving the slot-filler list. These results were statistically significant for the second and third trial \((p < .05, \text{ in each case})\). The assumption is made that because 6-year-old children have had anywhere from
between twelve to twenty-four months of experience of the formal elementary education system's promotion of taxonomies, they are more likely to organize their knowledge accordingly.

Although 5-year-old children receiving the slot-filler list tended to recall more of their items in clusters than 5-year-old children receiving the taxonomic list, according to prediction, these results were not significant. As previously argued, these results may lack statistical significance because children in this age group are in a process of transition from script-based to taxonomy-based organizational strategies. The assumption is made that 5-year-old children with more elementary school experience are more likely to display a greater knowledge of taxonomies. However, within-group age comparisons were not a focus of this task.

Contrary to prediction, there was no significant difference between the clustered recall of items by 4-year-old children receiving the slot-filler list and 4-year-old children receiving the taxonomic list. According to the research hypothesis, because script-based structures are thought to be a closer match with the semantic memories of young children, clustered recall of items in the slot-filler list condition was expected to be significantly higher. It may be speculated, albeit on weak grounds, that because all nine items on the slot-filler list belonged to the animal family (as did the items on the taxonomic list), this superordinate taxonomic information may have confounded the effects of the three scripts within. However, if this was the case, then it would be expected that this confounding effect would carry across all measures, which was not so.
TRIAD CARD SORTING TASK

METHOD

Subjects

From the thirty-six children in each age group, twelve (6 boys and 6 girls) were randomly assigned to each of either the two reading conditions or the control condition as follows:

1. 12 subjects (taxonomic reading condition).
2. 12 subjects (script reading condition).
3. 12 subjects (control condition).

From the random assignment schedule, it was observed that all conditions had children from each of the participating institutions. The mean age for each condition was:

1. Four-year-olds/taxonomic reading group (mean age was 4 years and 6 months).
2. Four-year-olds/script reading group (mean age was 4 years and 6 months).
3. Four-year-olds/control group (mean age was 4 years and 5 months).
4. Five-year-olds/taxonomic reading group (mean age was 5 years and 6 months).
5. Five-year-olds/script reading group (mean age was 5 years and 4 months).
6. Five-year-olds/control group (mean age was 5 years and 5 months).
7. Six-year-olds/taxonomic reading group (mean age was 6 years and 5 months).

8. Six-year-olds/script reading group (mean age was 6 years and 3 months).

9. Six-year-olds/control group (mean age was 6 years and 3 months).

Parents were told that this study examined "how books help children learn about animals."

Materials

Book Structure.

The picture book was derived from one used by Adams (1985) in her study of children's learning of animal taxonomies. It had a photograph album structure and contained equal sized photographs of different animals. The selection of appropriate generic, typical, atypical, and peripheral animal exemplars was based on information gathered in the Study One pilot test and from consultations with teachers. The book was entitled, "The Animal Book." It was expected that the title would not suggest any particular organizational scheme. This book presented the twenty-eight CAT, DOG, BIRD, HORSE, and ZOO animals (that made up the pretest Multiple Card Sorting Task) in a seven-paged heterogeneous array of four animals per page. Each array included a mixture of generic, typical, atypical, and peripheral taxonomy-based exemplars and typical, atypical, and peripheral script-based exemplars (see Table 19).
Table 19: "The Animal Book."
Arrays and Exemplars in Each Array

<table>
<thead>
<tr>
<th>Pages</th>
<th>Exemplars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ostrich, camel, black cat, puppy</td>
</tr>
<tr>
<td>2.</td>
<td>budgie, jaguar, wolf, thoroughbred</td>
</tr>
<tr>
<td>3.</td>
<td>monkey, black dog, flamingo, Siamese cat</td>
</tr>
<tr>
<td>4.</td>
<td>chick, brown horse, fox, giraffe</td>
</tr>
<tr>
<td>5.</td>
<td>zebra, brown bird, kitten, Afghan hound</td>
</tr>
<tr>
<td>6.</td>
<td>tabby cat, sheepdog, elephant, foal</td>
</tr>
<tr>
<td>7.</td>
<td>lion, duck, ass, Appaloosa</td>
</tr>
</tbody>
</table>

*Card Structure.*

The pretest Triad Card Sorting Task (see Appendix C) was comprised of sixteen separate sets, with three exemplars in each set. Each set included:

1. Either a generic, typical, or atypical exemplar from either of the taxonomy-based *CAT, BIRD, DOG,* and *HORSE* categories.

2. A peripheral exemplar from either of the taxonomy-based *CAT, BIRD, DOG,* and *HORSE* categories/typical exemplar from the script-based *ZOO* category.

3. A script-based exemplar that might be thematically associated with either of the other two exemplars.

There were no other taxonomy-based or script-based exemplars lending weight to decisions on exemplar relationships, as was the case in the Multiple Card Sorting Task. Within each triad set (e.g., *black cat/lion/mouse*) there existed the possibility of either of the following relationships:
1. A taxonomy-based pairing of either a generic, typical, or atypical
taxonomy-based exemplar and a peripheral taxonomy-based exemplar
(e.g., CAT:black cat and CAT:lion).

2. A script-based pairing of either a generic, typical, or atypical
taxonomy-based exemplar and a script-based (thematic) exemplar (e.g.,
CAT:black cat and SCRIPT:mouse).

3. A script-based pairing of a peripheral taxonomy-based/typical script­
based exemplar and a script-based (thematic) exemplar (e.g.,
CAT/SCRIPT:lion and SCRIPT:mouse).

In order to examine patterns of categorization, matching triads were designed,
comprised of similar taxonomy-based exemplars, similar peripheral taxonomy­
based/typical script-based exemplars, and similar script-based exemplars. The
exemplars were organized in corresponding blocks.

The posttest Triad Card Sorting Task was designed to examine patterns of
categorization, specifically slot-filler or taxonomic categorization of introduced
exemplars and slot-filler to taxonomic shifts in categorization. Exemplars were
organized in corresponding blocks similar to the pretest (see Appendix C).

The rationale for the Triad Card Sorting Task stemmed from the claim that
young children tend to group novel objects according to thematic relations (see
Lucariello and Nelson, 1985; Markman and Hutchinson, 1984). This task allowed for
the examination of (a) a greater variety of object, action, person, person role, animal,
and animal role relationships within scripts than did the multiple card sorting and
memory tasks, (b) patterns of slot-filler and taxonomic categorization within and between groups, and (c) slot-filler to taxonomic shifts in categorization.

Procedure

General.

Prior to the Pretest Session, children were randomly assigned to either of the two experimental reading or control groups. Two experimenters participated in the data collection, Experimenter 1 (researcher) and Experimenter 2 (volunteer), hereafter referred to as E1 and E2. Both experimenters took part in administering the Memory Task, Multiple Card Sorting Task, and Triad Card Sorting Task to the children. Task administration order was randomly selected for both sessions and the order of task administration for each subject within a session was the same. At this stage, E2 was blind with regard to each subject’s assigned experimental condition.

Pretest Session.

As in Adams’s (1985) study, boxes were used to create discrete spaces for the sorting of cards. Prior to the actual testing, the child was seated on the floor and given three warm-up tasks. Once familiarized, the first triad set of cards was displayed and the following instructions were given: "Look carefully at these three cards. I want you to put the two that best go together in this box [indicate] and the one that doesn’t belong in this box [indicate]."

After the child placed the animal cards in the boxes, she or he was permitted to make adjustments in the final pairing. The card pairing was then noted. Once this procedure had been completed, the child was then asked, "Why do you think these
two go together best"? (referring to paired exemplars), or, "Why doesn't this one belong"? (referring to discarded exemplar).

Records were kept of each child's comments or changes that were made. These records gave extra information regarding the child's categorization skills (e.g., even though the child may have paired the tabby cat with the mouse, thus suggesting a script-based [thematic] relationship, she or he may also have mentioned that a lion and a tabby cat are both CATs, thus suggesting knowledge of a taxonomic relationship). This procedure was repeated until all the triad sets had been sorted.

**Reading and Associated Language Game Sessions.**

A series of nine reading sessions began as soon as pretesting had been completed and continued over a two-and-a-half week period. These sessions were conducted on successive days or every other day and ended the day that posttesting began. In each of the reading groups, the 12 children were divided into two subgroups of six. In order to encourage high interest levels and unique input, group membership was reassigned for each session. El adopted the role of expert reader for both reading conditions. Both reading groups received the same book format and each child was issued a book.

For the taxonomic reading condition, the same procedure was used for all age groups. El introduced the book by saying: "This book is entitled, 'The Animal Book' and each page contains lots of different animals. Some animals belong to the same families and some animals do not. Each page includes animals that are common
and animals that are uncommon. I want you to tell me all that you know about the families that the animals belong to and I am going to tell you all that I know."

During the reading sessions, El emphasized the *CAT, BIRD, DOG,* and *HORSE* families (e.g., "This is a tabby cat, he is a friendly cat. This is a lion, he is a wild cat and not very friendly."). The *ZOO animals* were referred to as either belonging to the *ZOO family* or referred to according to the taxonomic family each animal belonged to. Script-based information (e.g., *A lion is a cat that lives in the jungle.*), was not discouraged; however, the emphasis was on the taxonomic family relationship of the exemplars.

For the script reading condition, the same procedure was used for all age groups. El introduced the book by saying: "This book is entitled, *'The Animal Book'* and it contains pictures of lots of different animals. Each page shows animals that are common and animals that are uncommon. I want you to tell me all that you know about where these animals live and I am going to tell you all that I know. Together we will make up some interesting stories." During the reading sessions, El encouraged children to talk about a wide range of animal related topics (e.g., animal habitats, caring for animals, animal habits). Taxonomy-based information (e.g., *a lion is a cat that lives in the jungle*), was not discouraged; however, the emphasis was on the script-based relationship of the exemplars.

The reading and language-games sessions were conducted as follows:

**Session One:** This session was of 30 minutes duration. For the first five minutes, children (apprentices) were encouraged to look at the pictures. El examined
and discussed each of the twenty-eight animals in the book. This involved a factual presentation of material, followed by a question-and-answer period. For example:

1. Taxonomic reading condition: "This is a lion. It is a wild cat. Can anyone tell me what a wild cat eats? Where does a lion live"?

2. Script reading condition: "This is a lion, it lives in the zoo or in Africa. Can anyone tell me what a lion eats"?

**Session Two:** This session was of 30 minutes duration. The format was similar to the first session, although more taxonomy-based and script-based information was presented to respective groups by El. For example:

1. Taxonomic reading condition: "This is a lion and this is a jaguar, they are both wild cats. Is it safe to pat a wild cat"?

2. Script reading condition: "This is a lion and this is a jaguar. They both live in Africa and if you go on safari, you might see them."

**Session Three:** This session was of 25 minutes duration and an extension of Session Two. After the question and answer period, children were encouraged to relate their experiences with animals presented in the book and/or create their own stories. For example:

1. Taxonomic reading condition: "When I was in Australia, I saw an ostrich. It couldn’t fly like most birds."

2. Script reading condition: "When I went to the zoo, I saw the zoo-keeper feed an ostrich some seeds."
**Session Four:** This was of 35 minutes duration. For the first half of this session, the expert and apprentices played a type of "identification" game. The children were asked to identify specific animals according to group membership. For example:

1. **Taxonomic reading condition:** "Who can point to all the dogs"?
2. **Script reading condition:** "Who can point to all the farm animals"?

For the second half of the session, the children were asked to draw specific animals as identified above and write small stories about them. For example:

1. **Taxonomic reading condition:** "This is a picture of a wolf. A wolf is a wild dog, and he will bite you if you try to pat him."
2. **Script reading condition:** "This is a picture of the sheepdog that herds the sheep on our farm. His name is Storm."

**Session Five:** This was of 30 minutes duration. During this session, the children played a competitive matching game. Each child was issued an identical set of animal picture cards matching those in the book. The objective of the game was to be the first to identify a specific taxonomy-based or script-based animal exemplar and answer questions about it. For example:

1. **Taxonomic reading condition:** "Who has the cat that is known as the king of the beasts? What is it called"?
2. **Script reading condition:** "Who has the animal that is used to herd sheep? Who does he belong to"?
**Session Six:** This was of 35 minutes duration. The children were divided into two teams. The game format was the same as in Session Five, however, the children were asked extra questions designed to examine and extend their categorical knowledge. For example:

1. Taxonomic reading condition: "What do *sheepdogs* and *wolves* have in common? What *family* do they belong to"?

2. Script reading condition: "Can you name two other animals that would *live on a farm* with a *sheepdog*"?

**Session Seven:** This was of 35 minutes duration. The children were each given a variety of pictures depicting different animals and were asked to create posters of either a taxonomy-based category or a script-based category. For example:

1. Taxonomic reading condition: Each poster was made up of an array of exemplars from either the *CAT, DOG, HORSE,* and *BIRD* families (e.g., under the heading *CAT FAMILY,* the children affixed the pictures and labelled each animal). On completion, the children presented and discussed their posters with the rest of the group.

2. Script reading condition: Each poster was made up of an array of exemplars from either *ZOO, HOME, FARM,* or *ELSEWHERE* scripts (e.g., under the heading *FARM ANIMALS,* the children affixed the pictures and labelled each animal). These posters were also presented to the rest of the group.
Session Eight: This was of 20 minutes duration. The children were encouraged to bring to the session, books, magazine articles, toys, drawings, photographs, and similar resources associated with animals and present them to the rest of the group. This was conducted in a manner similar to a morning talk session.

Session Nine: This was of 5 minutes duration. A short discussion session was conducted on an individual basis prior to posttesting. No new information was presented by the expert, instead, children were encouraged to respond to the open-ended question: "Tell me about the animals in this book."

Those children assigned to the control group did not receive any instruction.

Posttest Session.

This session was structured very much like the Pretest Session; E1 and E2 administered the modified posttest Triad Card Sorting Task and the modified posttest Multiple Carding Sorting Task (in that order).

RESULTS

Measures

The Triad Card Sorting Task yielded the following assessments for each child and involved:

1. A comparison of card sorting strategies as a function of age group. This analysis was conducted on the pretest questions 1 to 16.

2. A comparison of card sorting strategies to determine the effects of experimental reading condition (apprentice-expert interaction)/age
group. This analysis involved a comparison posttest gain scores on questions 1 to 4 and 9 to 12.

3. A comparison of pairings of slot-filler exemplars according to the strength of relationships in each set, to determine the effects of experimental reading condition (apprentice-expert interaction)/age group. This analysis involved a comparison of posttest pairings on questions, 1 to 4 and 9 to 12 (subtest 1) with 5 to 8 and 13 to 16 (subtest 2).

4. As part of the above discussion, comments made by children during card sorting sessions will be included.

Card Sorting Strategies as a Function of Age Group Condition

A one-way ANOVA (age group: 4-year-old, 5-year-old, 6-year-old) was used to analyze pretest scores on questions 1 to 16. This analysis provided for a comparison of card sorting strategies of 4-year-old, 5-year old, and 6-year old children (see Table 20), and as predicted, there were significant differences. A Newman-Keuls test applied to the means indicated that of the 16 exemplars, 4-year-olds paired a significantly greater number according to script-based relationships ($\bar{x} = 10.2$) than 5-year-olds ($\bar{x} = 6.0$) and 6-year-olds ($\bar{x} = 5.8$), $p < .01$. There was no significant difference between 5-year-old and 6-year-old children's card sorting behaviors; both age groups were more inclined to pair exemplars according to taxonomy-based relationships.
Table 20: Analysis of Variance for Card Sorting Strategies as a Function of Age Group.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age Group</td>
<td>2</td>
<td>445.80</td>
<td>222.90</td>
<td>10.36</td>
<td>0.0001</td>
</tr>
<tr>
<td>Error</td>
<td>105</td>
<td>2259.86</td>
<td>21.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>107</td>
<td>2705.66</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Card Sorting Strategies as a Function of Experimental/Age Group Condition: The Apprentice-Expert Shift*

Children had the option of sorting pretest and posttest triads on questions 1 to 4 and 9 to 12 (these were the sets of questions that remained constant for both testing sessions) according to script or taxonomy relations. For every script-based response, a point was awarded. The number of script-based responses on the pretest were compared with the number of script-based responses (gain score) on the posttest. A one-way ANOVA (age group/experimental condition) was used to analyze posttest gain scores (see Table 21). This analysis provided for a comparison of card sorting strategies to determine the effect the experimental condition (apprentice-expert interaction) as a function of age group. As predicted, there were significant differences in card sorting strategies according to experimental condition/age group, $p < .01$. 

133
Table 21: Analysis of Variance for Card Sorting Strategies as a Function of Experimental/Age Group Condition: The Apprentice-Expert Shift.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exp/Age</td>
<td>8</td>
<td>1114.81</td>
<td>139.35</td>
<td>14.66</td>
<td>0.0001</td>
</tr>
<tr>
<td>Error</td>
<td>207</td>
<td>1967.17</td>
<td>9.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>215</td>
<td>3081.98</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A Newman-Keuls test revealed that each age group assigned to the taxonomic book reading condition sorted their cards in a significantly different manner from children assigned to the script reading condition ($p < .05$, in each case). There were no significant differences in the gain scores between these taxonomic groups as a function of age (see Table 22).

Table 22: Mean Posttest Gain Scores as a Function of Experimental Condition/Age group (Exp/Age): The Apprentice-Expert Shift.

<table>
<thead>
<tr>
<th>Exp/Age</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-year-old/script</td>
<td>1.75</td>
</tr>
<tr>
<td>4-year-old/script</td>
<td>1.00</td>
</tr>
<tr>
<td>5-year-old/control</td>
<td>0.42</td>
</tr>
<tr>
<td>4-year-old/control</td>
<td>0.33</td>
</tr>
<tr>
<td>6-year-old/script</td>
<td>0.08</td>
</tr>
<tr>
<td>6-year-old/control</td>
<td>-0.50</td>
</tr>
<tr>
<td>4-year-old/taxonomic</td>
<td>-3.25</td>
</tr>
<tr>
<td>5-year-old/taxonomic</td>
<td>-3.42</td>
</tr>
<tr>
<td>6-year-old/taxonomic</td>
<td>-5.33</td>
</tr>
</tbody>
</table>
Although results of an earlier ANOVA (see Table 20) indicated that 4-year-old children constructed script-based relations, the results here show that those assigned to the taxonomic reading condition made a strong transition to taxonomy-based relations.

**Card Sorting Strategies as a Function of Experimental/Age Group Condition: Shifts in Slot-filler Categorization**

Children had the option of sorting triads on posttest questions 1 to 4 and 9 to 12 (subtest 1, these items remained constant across pre- and posttest sessions), and 5 to 8 and 13 to 16 (subtest 2, these were the introduced peripheral taxonomy/typical script items) according to script-based or taxonomy-based relations. For every script-based response, a point was awarded and a comparison of performances on both subtests was made. In order to analyze within-group differences, a separate ANOVA was computed on the data for each of the experimental/age group conditions. This comparison of subtests allowed for an examination of how the introduced slot-fillers were sorted by children assigned to the taxonomic reading condition. As predicted, there was no significant difference between the subtest 1 and subtest 2 mean scores for 4-year-old children. Similarly, the ANOVAs used to analyze the data for 5-year-olds and 6-year-olds yielded results of nonsignificance (see Table 23).
Table 23: Mean Subtest Scores as a Function of Taxonomic Experimental Condition/Age group: Shifts in Slot-filler Categorization.

<table>
<thead>
<tr>
<th>Age/Subtest</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-year-old/subtest 1</td>
<td>3.0</td>
</tr>
<tr>
<td>4-year-old/subtest 2</td>
<td>2.8</td>
</tr>
<tr>
<td>5-year-old/subtest 1</td>
<td>1.1</td>
</tr>
<tr>
<td>5-year-old/subtest 2</td>
<td>0.9</td>
</tr>
<tr>
<td>6-year-old/subtest 1</td>
<td>1.2</td>
</tr>
<tr>
<td>6-year-old/subtest 2</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Card Sorting Strategies as a Function of Age Group Condition

The Triad Card Sorting Task results were expected to lend support to Lucariello and Nelson's and Study One's Memory Task findings, that young children are more likely to construct script-based relations among objects, while older children are more likely to construct taxonomy-based relations. This task was designed to examine a greater variety of object, action, person, person role, animals, and animal role relationships within scripts than the Memory and Multiple Card Sorting Tasks. Some triads suggested strong script-based pairings (e.g., the horse and the saddle), while others were weaker (e.g., the horse and the open-bed truck).

The significant task sorting performance of 4-year-old children according to script-based reasoning lends strong support to the research hypothesis. Four-year-old children readily paired exemplars according to some familiar script or story and were more likely to create "far-fetched" stories than resort to taxonomic pairings (e.g., "a
lion would ask a mouse to come and play). This was also evident during the questioning sessions. When asked for their card sorting rationale, 4-year-olds had difficulty recognizing alternative taxonomic pairings, in comparison with older children who could readily acknowledge both (see Gardner, 1991). Interestingly, 4-year-old children were able to identify and discuss similar physical attributes of exemplars (e.g., a lion and a tabby cat both have paws, fur, and whiskers), but when asked if a lion was a cat, most children gave answers such as, "No," or "Not really, they just look the same." Those 4-year-olds with some knowledge of taxonomies, tended to respond with "a lion is a kind of a cat," or a "lion is an angry cat." The significant difference between card sorting strategies of 4-year-olds and 5-year-olds indicates that there is a marked script to taxonomy-based shift within the first year of schooling.

That 5-year-old and 6-year-old children displayed significant taxonomy-based card sorting strategies confirms the developmental nature of acquiring a lexicon. Through the shared activities and language-games directed by experts, older children have moved from initial script-based structures, beginning with learning family membership of typical, atypical, and peripheral category members in the context of activities, to more complex, abstract strategies of categorization (see Bullock, 1987). When asked for their card sorting rationale, some 5-year-olds and most 6-years identified taxonomic family membership, but also offered alternative script-based relations (e.g., a cat can chase a mouse, but a cat and a lion go together because they belong to the same family). For older children, there were no script alternatives in
some triads (e.g., a *horse would not ride* on an *open-bed truck*, because it would fall off). However, those triads that suggested stronger script-based pairings were grouped accordingly (e.g., the *horse* and the *saddle*).

Although not a direct study focus, discussions with teachers regarding the reading and language abilities of children, suggested that those older children with high script scores tended to have problems with reading comprehension and those children with high taxonomic scores came from homes rich in literary resources. Future research attempting to identify the nature of this phenomenon may make significant contributions to the development of remedial and recovery reading programs.

*Card Sorting Strategies as a Function of Experimental/Age Group Condition: The Apprentice-Expert Shift*

Interest in the processes and agents involved in children’s lexical development has given rise to recent studies concerned with the nature of apprentice-expert interactions (see Adams, 1985; Adams & Bullock, 1986). One of the focuses of Study Two was on the roles of expert language users and associated language-games in helping young children to learn the relations among superordinate, basic, and subordinate level exemplars of initial scripts and categorize them accordingly.

As predicted, children in the three age groups assigned to the taxonomic reading group shifted markedly from script-based to taxonomy-based card sorting strategies. The four-year-old children in the taxonomic group sorted cards in a significantly different manner from 4-year-olds assigned to the script group. This
result provides strong support for the hypothesis that expert language users and
language-games facilitate the developmental shift to categorical organization. The
major implication is that many young children may have the capacity to understand
superordinate, basic, and subordinate level relations if explicit and explanatory
instruction sessions are provided. To the contrary, however, if it is accepted that
these children have limited language experiences and, therefore, restricted taxonomic
knowledge bases and strategic competencies necessary to activate this knowledge,
these results may not have stood if a reassessment had been conducted several weeks
after instruction had ended. It is pertinent, therefore, to question whether children of
this age are capable of retaining and transferring this information (see Hasselhorn,
1990).

A particularly interesting feature that emerged was the apparent "instability" of
some 4-year-old's and most 5-year-old's semantic organization. During the reading
sessions, it was not unusual to observe children displaying strong script-based
organizational patterns on some days and taxonomy-based patterns on others. These
results lend weight to Vygotsky's (1962) argument that lexical acquisition involves a
"back and forth" movement of thought to word and word to thought. It was also
apparent that as children hung finer taxonomic meanings to words, their development
became unidirectional, as typified by the card sorting behaviors of six-year-old
children. In task performance, five-year-old children displayed the greatest "swings"
in direction, thus suggesting that they were more open to apprentice-expert guidance
regardless of the system of categorization promoted. Again, these results support the
theory that during introduction to formal schooling, 5-year-olds experience a transitional stage of development.

That most 6-year-old children in the taxonomic reading condition made the script to taxonomy transition, reinforces the theory that older children are at a stage of development enabling them to better accommodate more abstract knowledge inherent in language learning. The relatively unchanged posttest card sorting behavior of 6-year-olds assigned to the script reading condition confirms the prediction that there would be a lower incidence of transition from taxonomy to script organization. It would appear that once acquired, taxonomies become the more salient form of semantic organization, despite intensive apprentice-expert interactions promoting alternative structures. This implies that the constraints of the language and language learning strategies become more powerful determinants of semantic organization than the constraints of the world and associated script experiences.

**Card Sorting Strategies as a Function of Experimental/Age Group Condition: Shifts in Slot-filler Categorization**

This aspect of the task was designed to examine the transfer of knowledge, based on the prediction that children’s willingness to include peripheral slot-filler members in taxonomically organized categories would be influenced by the linguistic forms used by experts to mark the peripheral or context-specific nature of member relationships to those classes. For the four-year-old group receiving the taxonomic reading condition, there was no significant difference between the card sorting behavior in subtest 1 and subtest 2. Considering the premise that young children are
more interested in script relations, these results suggest that, with guidance from expert language users, they are capable of categorizing introduced exemplars, according to the taxonomic knowledge they have acquired on a parallel slot-filler (e.g., on the basis of lion taxonomic knowledge, tiger is categorized accordingly). It has been established from an examination of age differences, that some 5-year-olds and most 6-year-olds are more competent organizing knowledge taxonomically; the nonsignificant card sorting behaviors of children in these age groups assigned to the taxonomic reading condition, indicate that the transferal of introduced knowledge is readily accomplished. It should be clarified that because older children have established taxonomic categorical skills, it was not possible to determine whether the inclusion of introduced exemplars involved a transfer from script-based to taxonomic-based knowledge.

MULTIPLE CARD SORTING TASK

METHOD

Subjects

The selection and assignment of subjects was the same as it was for the Triad Card Sorting Task.

Materials

Book Structure.

The "The Animal Book" was also used for this task.
**Card Structure.**

The pretest Multiple Card Sorting Task was comprised of four separate sets of taxonomy-based cards:

1. **The CAT** category set.
2. **The BIRD** category set.
3. **The DOG** category set.
4. **The HORSE** category set.

Individual sets were comprised of the following:

1. Four taxonomy-based exemplars (i.e., one generic, one newborn, one typical, and one atypical).
2. Two peripheral taxonomy-based/typical script-based category exemplars.
3. Four script-based category exemplars.
4. The zoo animals were the same for each set (see Appendix D).

This task was designed to examine patterns of organization according to taxonomy-based or script-based relations of animal exemplars (e.g., in the **CAT** set, the child had the option of grouping the **lion** and **jaguar** exemplars with the taxonomy-based family of **CATS**, or with the script-based **ZOO animals**). The Multiple Card Sorting Task was modelled on the tasks used by Adams (1985) in her study of children's learning of animal taxonomies. It differs from the Triad Card Sorting task in that the grouping of exemplars depends on knowledge that is "associated" with each animal and not on a variety of cues inherent in the task.
The posttest Multiple Card Sorting Task was comprised of the four separate sets used in session 1. Each set had three extra exemplar cards:

1. A typical taxonomy-based category member.
2. A peripheral taxonomy-based/typical script-based zoo member.
3. A typical script-based zoo member.

For example, a *ginger cat*, a *tiger* and a *koala* were included with the *CAT* set.

This modification was designed to examine patterns of organization, especially shifts from script-based to taxonomy-based categorization (for example, in the *CAT* set, the child had the option of grouping the introduced *tiger* exemplar with the taxonomy-based family of *CATS*, or with the script-based *ZOO animals*) as a function of apprentice-expert interaction.

**Procedure**

**General.**

The Triad Card Sorting Task and the Multiple Card Sorting Task had the same general procedure.

**Pretest Session.**

Prior to the actual testing, the child was seated on the floor and given a warm-up task. Once familiarized, the child was then asked to sort the cards from each category set (one category set was sorted at a time, the *CAT* set first, then the *DOG* set, and so on). The ten cards in the first set were mixed together and displayed in front of the child. The following instructions were given: "Put all the *cats* in one box [indicate] and put all the *zoo animals* in another box [indicate]."
After the child had placed all the animal cards in the boxes, she or he was permitted to make adjustments in the final groupings. The card groupings were then noted. Once this had been completed, the child was then asked; "Are all the cats in this box?" "Are all the zoo animals in this box?" Children were permitted to make adjustments.

Records were kept of each child's comments or changes that were made. These records gave extra information regarding the child's categorization skills (e.g., even though the child may have placed the lion with zoo animals, he/she may have mentioned that it is also a wild cat).

**Reading and Associated Language Game Sessions.**

The series of nine reading sessions in the Triad Card Sorting Task procedure also related to the Multiple Card Sorting Task procedure (see Appendix G).

**Posttest Session.**

This session was structured very much like the Pretest Session. As noted, before posttesting, a final reading session was conducted. E1 and E2 then administered the modified posttest Triad Card Sorting Task, the modified posttest Multiple Carding Sorting Task.

**RESULTS**

**Measures**

Like the Triad Card Sorting Task, the Multiple Card Sorting Task yielded the following assessments for each child and involved:
1. A comparison of pretest card sorting strategies as a function of age group. For each child, the peripheral exemplars in the four animal sets were scored according to script-based assignment. A maximum score of 8 was awarded for perfect assignment according to scripts.

2. A comparison of card sorting strategies to determine the effects of experimental reading condition (apprentice-expert interaction)/age group. This analysis involved a comparison of posttest gain scores on the sorting of peripheral taxonomy/typical script exemplars that remained constant in both the pretest and posttest.

3. A comparison of pairings of card sorting strategies to determine the effects of expert - apprentice interactions on the placement of introduced slot-fillers. This analysis involved a comparison of posttest sorting of constant peripheral taxonomy/typical script exemplars with introduced slot-filler exemplars.

4. As part of the above discussion, comments made by children during card sorting sessions will included.

**Card Sorting Strategies as a Function of Age Group Condition**

A one-way ANOVA (age group: 4-year-old, 5-year-old, 6-year-old) was used to analyze pretest card sorting scores (see Table 24). The analysis provided a between-group comparison of performance as a function of age. As predicted, there were significant differences in 6-year-old card sorting strategies as compared with both 4-year-olds and 5-year-olds ($p < .01$). As in the Triad Card Sorting Task, an
examination of mean scores showed that 6-year-olds sorted exemplars according to
taxonomies, while 4-year-olds sorted according to scripts. Five-year-old children did
not show a strong inclination in either direction.

Table 24: Analysis of Variance for Card Sorting Strategies as a Function of Age
Group.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>pr &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Ss</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age Group</td>
<td>2</td>
<td>30.57</td>
<td>15.29</td>
<td>6.99</td>
<td>0.0014</td>
</tr>
<tr>
<td>Error</td>
<td>105</td>
<td>229.50</td>
<td>2.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>107</td>
<td>260.07</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Card Sorting Strategies as a Function of Experimental/Age Group Condition: The
Apprentice-Expert Shift

As in the Triad Card Sorting Task, children had the option of sorting pretest
and posttest peripheral taxonomy/typical script exemplars according to script-based or
taxonomy-based relations. For every script-based response, a point was awarded (a
maximum of 8 points was possible). A one-way ANOVA (experimental condition/age
group) was used to analyze posttest gain scores (see Table 25). This analysis
provided for a between-groups comparison of card sorting strategies to determine the
effects of the experimental condition (apprentice-expert interaction)/age group.
In keeping with the Triad Card Sorting Task, there were significant differences in card sorting strategies according to experimental condition/age group, $p < .01$). Children assigned to the script reading condition sorted cards differently from children assigned to the taxonomic reading condition. Interestingly, there were no significant differences as a function of age, within each experimental condition (see Table 26).

Table 26: Mean Posttest Gain Scores as a Function of Experimental Condition/Age group (Exp/Age): The Apprentice-Expert Shift.

<table>
<thead>
<tr>
<th>Exp/Age</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-year-old/script</td>
<td>3.42</td>
</tr>
<tr>
<td>5-year-old/script</td>
<td>1.92</td>
</tr>
<tr>
<td>6-year-old/script</td>
<td>1.83</td>
</tr>
<tr>
<td>4-year-old/control</td>
<td>0.00</td>
</tr>
<tr>
<td>6-year-old/control</td>
<td>-0.33</td>
</tr>
<tr>
<td>5-year-old/control</td>
<td>-0.75</td>
</tr>
<tr>
<td>6-year-old/taxonomic</td>
<td>-3.50</td>
</tr>
<tr>
<td>4-year-old/taxonomic</td>
<td>-3.75</td>
</tr>
<tr>
<td>5-year-old/taxonomic</td>
<td>-4.00</td>
</tr>
</tbody>
</table>
Results of an earlier ANOVA (see Table 24) indicated that 4-year-old children preferred to construct script-based relations; however, as was the case with the Triad Card Sorting Task, those assigned to the taxonomic reading condition made a strong transition to taxonomy-based relations.

*Card Sorting Strategies as a Function of Experimental/Age Group Condition: Shifts in Slot-filler Categorization*

Children had the option of sorting posttest exemplars according to script-based or taxonomy-based relations. Subtest 1 was comprised of items that remained constant across pretest and posttest sessions, and subtest 2 was comprised of introduced peripheral taxonomy/typical script slot-filler items. For every script-based response, a point was awarded and a comparison of performances on both subtests was made. Again, in order to examine within-group differences, a separate ANOVA was computed on the data for each of the experimental/age group conditions. This comparison of subtests allowed for an examination of how the introduced slot-fillers were sorted by children assigned to the taxonomic reading condition. As predicted, there was no significant difference between the subtest 1 and subtest 2 results within the 4-year-old age group. Similarly, the ANOVAs used to analyze the data for 5-year-olds and 6-year-olds yielded results of nonsignificance (see Table 27).
Table 27: Mean Subtest Scores as a Function of Taxonomic Experimental Condition/Age group: Shifts in Slot-filler Categorization.

<table>
<thead>
<tr>
<th>Age/Subtest</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-year-old/subtest 1</td>
<td>0.1</td>
</tr>
<tr>
<td>4-year-old/subtest 2</td>
<td>0.3</td>
</tr>
<tr>
<td>5-year-old/subtest 1</td>
<td>0.8</td>
</tr>
<tr>
<td>5-year-old/subtest 2</td>
<td>0.0</td>
</tr>
<tr>
<td>6-year-old/subtest 1</td>
<td>0.0</td>
</tr>
<tr>
<td>6-year-old/subtest 2</td>
<td>0.8</td>
</tr>
</tbody>
</table>

**DISCUSSION**

*Card Sorting Strategies as a Function of Age Group Condition*

The results of this task were also expected to lend support to the research hypothesis that younger children are more likely to construct script-based relations among objects, while older children are more likely to construct taxonomy-based relations. This task was designed to examine the nature of peripheral taxonomic exemplars and the ways in which children of different ages organize them semantically. The Multiple Card Sorting task differed from the Triad Card Sorting Task in that every exemplar was judged more as a entity, rather than as part of an elaborate script inherent in the task design. Each animal was judged according to children’s prior knowledge and as a result, on its association with other animal exemplars in the set.

According to the hypothesized nature of semantic structures of young children and the theory of prototypes, or "best category examples," it was expected that 4-
year-olds and some 5-year-olds would accommodate peripheral taxonomic exemplars within script-based structures, because the deviation of such exemplars from the central measure is such that distortion of the prototypical concept formation would arise if unconventional characteristics were attached to the process. The results of the Multiple Card Sorting Task mirrored those of the Triad Card Sorting Task, in that 4-year-olds were observed to group these exemplars within the context of the zoo. When younger children were asked if there were others ways to group the animals, they were generally adamant that there were not. This suggests an absence of a broad taxonomic knowledge base that would offer these children the alternatives that older children readily discussed (see Adams & Bullock, 1986). It was also apparent that children of all ages found some peripheral exemplars to be strongly associated within scripts (e.g., a lion with zoo animals), whereas others were strongly associated within taxonomies (e.g., a wolf with the dog family). Even older children with advanced taxonomic knowledge resorted to script-based categorization in cases where strong script associations were present. Not only does this illustrate the piecemeal nature of lexical development, it also supports the hypothesized effect of expert language users on young children’s lexical development. Because of idiosyncratic categorical structures, some expert language users may tend to retain script-based knowledge for some peripheral exemplars and not for others (e.g., in keeping with the previous illustration, experts may group lions with zoo animals and wolves with dogs) and transfer these anomalies to apprentice language users.
One of the difficulties analyzing this type of task is trying to identify the facilitative effects of different cues. During discussion sessions, it was obvious that verbal and visual cues elicited specific responses from children, especially 4-year-olds. When asked "Is a *wolf* a *dog*?", most responded that it was not; however, when shown a picture of a *wolf*, most grouped it with the *dog family*. Similarly, although 4-year-olds were able to identify similar "parts" of exemplars (e.g., *lions* and *tabby cats* have *whiskers* and *paws*), they were reluctant to categorize peripheral exemplars with taxonomic families (see Tversky, 1989). These observations lend weight to the notion that the learning of hierarchical relationships comes from children's experiences with language forms, and that world experiences form the initial foundation on which these abstract taxonomies are built. Adams and Bullock (1986) stated that young children do not organize their concepts taxonomically, primarily because in the early stages of language use they are not apprenticed into the activities upon which taxonomic relations depend and from which they are derived.

Five-year-old card sorting behavior was similar to that of 4-year-old, but differed from the 5-year-old Triad Card Sorting Task behavior. Although these results may be attributed to the differences in task construction, they may also be attributed to the familiar notion that children of this age group experience a stage of transition and fluctuation. Six-year-old children displayed significantly different card sorting behavior from the two other age groups and the mean score based on script knowledge, indicates that older children have established taxonomic categorical structures. Interestingly, 6-year-olds were more likely to offer unsolicited information.
on alternative ways to sort cards; most could acknowledge script associations, before
deciding on a taxonomic grouping. These results lend strong support to the
hypothesis that the development of a lexicon moves from initial script-based structures
to more sophisticated, abstract taxonomic structures.

**Card Sorting Strategies as a Function of Experimental/Age Group Condition: The**
**Apprentice-Expert Shift**

The results of the Multiple Card Sorting Task confirms the hypothesis that
expert language users, through the introduction of sophisticated language games assist
young children in learning the taxonomic relations of initial script-based slot-fillers
and categorizing them accordingly. As predicted, children assigned to the taxonomic
groups clearly displayed shifts from script to taxonomy reasoning in their methods of
card sorting. Four-year-olds observed in the pretest to sort script-wise, changed
considerably after assignment to the taxonomic group. Conversely, 4-year-olds
receiving script instruction continued to sort their cards as previously. During the
posttest session, younger children in the taxonomic group tended to provide more
elaborate explanations for their selection of groups, whereas, children in the script
reading group did not. As noted however, some speculation is made with regard to
the stability of this shift in categorization strategies. The suggestion is made that
stability greatly depends on the taxonomic knowledge base, as well as on the
possession of organizational strategies. The question of whether this accelerated
knowledge will be retained and transferred is a pertinent one.
As evidenced in the Triad Card Sorting Task, 5-year-old children tended to experience the most extreme "swings" in organizational strategies, depending on reading group assignment. Again, the suggestion is proffered that this is indicative of the back and forth movement of the thought to word and word to thought process that 5-year-olds experience during this stage of transition. That 4-year-old and 6-year-old made less pronounced shifts suggests the salience of respective script-based and taxonomy-based semantic structures. It should be noted however, that for the 5-year-old group, the most pronounced change was found in the card sorting behavior of children receiving taxonomic instruction, thus suggesting that these children are entering the preliminary stages of acquiring taxonomic knowledge.

Six-year-old children continued to display strong taxonomic card sorting behavior and were less likely to adopt script-based sorting strategies, as observed by the results of children assigned to the script reading group. This finding supports the hypothesis that older children are better able to accommodate abstract knowledge inherent in language learning. For these older children, it is obvious that taxonomies are the more salient form of semantic organization, and as previously suggested, this is a direct result of the elementary school curriculum’s promotion of hierarchical organization of concepts.

**Card Sorting Strategies as a Function of Experimental Condition/Age Group: Shifts in Slot-filler Categorization**

This analysis examined children's ability to transfer knowledge of one particular concept to a parallel concept or slot-filler and recategorize it according to
newly acquired system. Four-year-olds assigned to the taxonomic reading group made a strong shift from script-based reasoning in the pretest to taxonomic sorting behaviors in both post-subtests. This result is important because it confirms the hypothesis that children are influenced by the directions of expert language users and as a result, have the ability to activate this newly acquired knowledge and apply it to more novel situations. That these children "shifted" information introduced during the language-game sessions suggests that a knowledge of taxonomic strategies enables the accommodation of information that has not been the subject of direct attention. Hasselhorn (1990), who talked of taxonomic readiness and knowledge activation strategies, may agree that learning the properties of taxonomies empowers children to accommodate information more rapidly. Similarly, Lucariello and Nelson (1985) would claim that this process is an natural extension of slot-filler categorization. The knowledge that children have of slots within scripts and the types of exemplars that fill them, sets the foundation for taxonomic reasoning (e.g., swimsuit initially categorized as something to wear to the beach, becomes beach CLOTHES, and finally CLOTHES).

Five-year-old children assigned to the taxonomic group also showed a strong transition to hierarchical reasoning. Again, the absence of a significant difference between subtest performances, indicates the transferral of introduced knowledge. A lack of significant differences between subtests was also found for the six-year-old children receiving taxonomic instruction, again indicating that the transferral of introduced knowledge was readily accomplished. As mentioned in the Triad Card
Sorting Task discussion, it is important to clarify that this transferral is assumed to involve taxonomic knowledge to taxonomic knowledge (as opposed to 4-year-olds and some 5-year-olds transfer of script knowledge to taxonomic knowledge), since results have shown that 6-year-olds have developed sophisticated taxonomic structures. This development was also evident during reading sessions, older children were quick to recognize the status of introduced exemplars (e.g., "a tiger is a wild cat too"), whereas many younger children experienced difficulties.

**SUMMARY**

Study Two examined several aspects of the hypothesized nature of the apprentice-expert relationship and the resultant slot-filler - taxonomic shift in the categorization of early words.

The Memory Task found strong support for the proposal that slot-filler categories provide young children with a more familiar type of categorical organization leading to greater recall of words, categories, and words per category, as well as clustered organization in recall. The results also support the hypothesis that the acquisition of a lexicon is a developmental process, during which, 5-year-old children tend to show no significant preference for either script-based or taxonomic-based reasoning. On the contrary, six-year-old children were observed to display a significant preference for hierarchical reasoning. From this result, the inference is drawn that script-based structures provide the foundation for these later developing taxonomies. The Triad and Multiple Card Sorting Tasks found similar preferences in
children's sorting of peripheral animal exemplars; these results lend significant support to the findings of the Memory Task.

In examining the effects of apprentice-expert interactions (in the form of experimental reading instruction) on the acquisition of taxonomic categorical knowledge, it was found that children assigned to the taxonomic reading groups experienced marked changes in card sorting strategies on the posttest sessions of both card sorting tasks. It was also found that children in these groups were able to transfer their newly acquired knowledge of taxonomic relations among exemplars and accommodate introduced exemplars. These findings provide conclusive evidence that expert language users play a vital role in helping young children to learn the relations among superordinate, basic and subordinate level exemplars of initial scripts and categorize them according to taxonomies (see Adams, 1985).
CHAPTER V

GENERAL DISCUSSION AND IMPLICATIONS

GENERAL DISCUSSION

SUMMARY

This research has accomplished a re-examination of Lucariello and Nelson's study, as well as an examination of parallel tasks, in order to determine whether the theory of script-based slot-filler categorization is a reasonable explanation of how children first organize their knowledge. In the past, studies have tended to focus on the phenomenon in isolation from the formal educational environment, thus leaving educators to make leaps of assumption based on open-ended theory. By introducing the expert-apprentice model of categorical development, this research has attempted to initiate the bridging of the gap between hypothetical and pragmatical perspectives. In short, by achieving the ostensible objectives of reconfirming the theoretical foundation that children's initial concepts and categories are derived from event representations and finding strong support for the proposition that expert language users facilitate the later slot-filler to taxonomy shift in children's categorical organization, future research examining the implications for curriculum development in preschools and early elementary schools rests on firm foundations.

In the first part of this chapter, the arguments for (a) the theory of slot-filler categorization of early words and (b) the theory of a slot-filler - taxonomic shift in the categorization of early words are addressed in terms of the research findings of
Studies One and Two. In the second part of the chapter, the implications of the research findings are discussed in terms of the theoretical foundations and contributions of (a) the prototype hypothesis, (b) the theory of concept and category derivation from event representations, and (c) the social support position.

ADDRESSING THEORETICAL ARGUMENTS

An Argument for the Theory of Slot-filler Categorization of Early Words

If, as research suggests, script-based slot-filler categorization enters into semantic organization as the first and most salient memory structure, will younger children who have had limited exposure to the formal education system be more inclined to think according to scripts and display slot-filler patterns of organization than older children? And does this system of schematic organization provide the initial foundation for later taxonomic organization? Studies One and Two tested the research hypothesis that scripts or event sequences provide a basis for the categorical structures in the semantic memories of young children.

From the results of the memory recall and card sorting tasks, conclusive support can be given to the proposal that script-based slot-filler categories have considerable strength and depth for young children. In the Study One Memory Task, the strength of cues in facilitating recall of the slot-filler list was apparent, suggesting that a combination of interrelated encoded items and script-based retrieval cues produced the effect. Similarly, the Study Two Memory Task results indicated that responses to category-cued retrieval prompts were consistently higher on the slot-filler list than on the taxonomic list for four-year-old children. On the Triad Card Sorting
Task, 4-year-old children readily paired exemplars according to familiar scripts and displayed limited knowledge of taxonomies, while 6-year-old children consistently paired exemplars according to hierarchical relations. Results of the Multiple Card Sorting Task also showed that young children are more likely to group peripheral exemplars according to script-based relations, whereas, 6-year-olds prefer a taxonomic perspective.

Although the data from memory performance on the Study One Memory Task do not support the position that preschool children have highly developed taxonomic systems of organization readily available, the forthcoming emergence of taxonomically organized categories was signalled by the effect of category cues (over free recall cues) on both lists. Similarly, Lucariello and Nelson found that hierarchical taxonomic categories were recognizable by young children as evidenced by the (nonsignificant) higher category recall for the taxonomic list in the category-cued condition. These data support the position that hierarchical categorical organization is integrated with schematic organization of events from a very early age (Mandler, 1983) and that more advanced taxonomies emerge and develop from this initial conceptual knowledge base (Lucariello & Nelson, 1985).

On the assumption that scripts are a major form of conceptual representation for preschool children (also see Nelson et al., 1983; Nelson & Gruendel, 1981), it must be accepted that this knowledge of functionally related, spacio-temporal syntagmatic associations has been encoded in children’s long term memories. Therefore, although expert language users show preference for taxonomic
organization, their knowledge and use of scripts remains strong (see Gardner, 1991). The performance of 6-year-old children on the Study Two Memory Task clearly illustrates the nature of this developmental shift. Children receiving the taxonomic list consistently recalled the greatest number of responses, yet children receiving the slot-filler list also performed strongly. Perhaps because 5-year-old children are thought to be in a transitional stage of categorical organization, there were no consistent differences in memory performance found between them and 4- and 6-year-old children. Five-year-old children showed preferences in some instances for script-based reasoning and preferences in others for taxonomic-based reasoning. These results suggest that a complementary relationship between the two systems exists, one that is most apparent during the transitional stage.

For present purposes, it is important that the findings of Study One and Two be interpreted in terms of the differentiation between semantic and conceptual structures in long term memory. Nelson, 1982 proposed that purely experiential-based structures do not enter into organization in semantic memory, primarily because the nature of language imposes its own inherent organizational structures on the encoding of knowledge and accesses only that information. However, this does not mean that semantic memory does not draw on paradigmatic conceptual organization, but it does mean that hierarchical taxonomy-based categories which draw on and organize the first context-derived categories are less developed in younger children. Accordingly, then, with the increase in age and schooling experiences, children’s
memory performance for lists of taxonomically related items improves (see Ornstein & Corsale, 1979).

In conclusion, this dissertation found significant support for the research hypothesis that scripts or event sequences provide a basis for the categorical structures in the semantic memories of young children.

An Argument for the Theory of a Slot-filler - Taxonomic Shift in the Categorization of Early Words

If children's classification skills are defined by the cognitive and communicative context, do expert language users play a significant role in guiding children from a very constrained, naive set of categories to a sophisticated, ordered, hierarchical organization of the world? Does this instruction shape the apprentice's class inclusion relations, beginning with learning family membership of typical, atypical, and peripheral category members in the context of activities? What part do early language-games play in preparing children for participation in more advanced, sophisticated language-games? Or specifically, what part do early language-games play in helping young children learn to categorize taxonomically peripheral members of category scripts according to more sophisticated hierarchical, structures? Study Two tested the hypothesis that it is only later (usually around the time that schooling begins), that children develop the use of more complex taxonomic categorical structures through interactions with expert language users.

As discussed in the preceding section, the Study Two Memory Task results indicate that four-year-old children display significant patterns of slot-filler
organization, six-year-old children display significant patterns of taxonomic organization, and five-year-old children who are in a transitional stage of development, do not consistently display significant patterns of either. These results were replicated by the Triad Card Sorting Task and the Multiple Card Sorting Task. In examining the reasons for these differences in categorical strategies, strong support was found for the hypothesis that through shared activities and language-games directed by experts, children move from simple expert-apprentice games to highly complex intellectual activities.

Predictably, children in the three age groups assigned to the taxonomic reading condition shifted markedly when performances on subsections of the posttest were compared with pretest performance. Four-year-old children displayed significant shifts from script-based to taxonomy-based card sorting strategies, suggesting that not only are children of this age receptive to learning the relationships between superordinate, basic, and subordinate level category members, they are also capable of acquiring the language-based retrieval strategies necessary to encode and recall this information. However, as discussed earlier, if the restricted nature of young children's taxonomic knowledge foundation is taken into account, it may be pertinent to examine the retention and transference of this information after a set period of time has lapsed.

The performances of five-year-old children on all the Study Two tasks are of particular interest because they provide some insight into the nature of the transitional or shift stage. On the surface, the idea of development from one categorical stage to
the next may imply an orderly forward progression, however, this does not appear to be the case in lexical development. From their performances on tasks, participation in reading sessions, and responses during discussion periods, 5-year-olds displayed less consistent, less stable behavior than the other two age groups. Vygotsky (1962) described the back and forth movement of lexical acquisition, a characterization which appears to aptly describe these children. Gardner (1991) suggested that students who are novice language users need a period of exploration and a phase of apprenticeship in order to strike a balance between existing ways of knowing and the disjunctions associated with entry into formal educational institutions. The process of structuring a new system of semantic organization from an existing system appears to be a piecemeal process involving considerable experimentation with the relations among items in different categorical levels. From the both card sorting tasks it was apparent that 4-year-old children and some 5-year-olds (who had recently started elementary school) had the greatest difficulty in recognizing the taxonomic status of peripheral and atypical exemplars. When confronted by exemplars that were relatively close to the category prototype in overall appearance or on some other dimension of prior knowledge, all children recognized them as members of a particular category with rapidity and confidence (e.g., a tabby cat was easily recognized as a CAT), but when exemplars deviated too greatly form the prototype on a number of dimensions, they became peripheral and younger children had difficulty categorizing them (e.g., a lion was not easily recognized as a CAT).
As predicted, children's willingness to include peripheral slot-filler members in taxonomically organized categories was influenced by the linguistic forms used by adults to mark the peripheral or context-specific nature of member relationships to those classes. Those children assigned to the taxonomic reading groups displayed a greater incidence of classifying peripheral slot-filler members taxonomically. From their performances on the Triad Card Sorting Task and the Multiple Card Sorting Task, four-year-olds who made the shift from script-based reasoning to taxonomy-based reasoning under the direction of expert language users, also correctly categorized introduced peripheral exemplars, presumably according to the taxonomic knowledge they had acquired of the parallel slot-filler. The 5-year-old and 6-year-old groups also displayed the ability to accommodate introduced exemplars according to taxonomies. The 4-year-old group assigned to the taxonomic reading condition is of particular interest because, for most, performance involved two abstract and unfamiliar requirements: one involved the shift in categorization systems (e.g., a shift from script-based categorization of a lion with ZOO animals to taxonomy-based categorization of a lion with CATS) and the other involved the assignment of the introduced exemplars according to this shift (e.g., in learning the taxonomy-based categorization of a lion with CATS, children were able to transfer that information to other peripheral CAT family members, such as tiger). Some 5-year-olds experienced the same dual performance, while other 5-year-olds and most 6-year-olds, who already possessed an understanding of taxonomies, were mostly concerned with the placement of peripheral exemplars. These results suggest that all children assigned to
the taxonomic reading group acquired the knowledge activation strategies necessary to encode, organize and retrieve hierarchical information. Gardner (1991) commented that these naming and classifying taxonomic skills are the central aspects of language that open up an entire universe of meaning to young children. Once children acquire these strategies, they are in possession of indispensable cognitive tools.

The results of this study support the hypothesis that the acquisition of complex taxonomic categorical structures is a later stage of development, and that this develops as children increase their interactions with expert language users. The formal schooling system is one environment where this apprentice-expert guidance takes place.

EDUCATIONAL AND RESEARCH IMPLICATIONS

EDUCATIONAL IMPLICATIONS

Introduction

From the series of tasks conducted, strong support was found for the developmental theory that there are several distinct, yet interrelated stages that mark children’s lexical acquisition. In reiteration, the findings established that script-based categories derived from children’s experiences combine to develop into larger taxonomic categories as children learn, or are taught more about their environment. Within the formal schooling system, this shift in categorical organization is facilitated by expert language users, whose role is one of guaranteeing that children conform to socially prescribed naming practices and ways of thinking. It has been established
that this transition is not just a simple case of learning to reorganize existing
knowledge according to familiar structures, it involves the learning of complex and
abstract categories, quite different from what has already been assimilated. The
complexity lies in the natures of the two (at times contrasting and at others,
complementary) types of knowledge organization. Although preschool children's
categorical knowledge is derived from and restricted to use in particular contexts, this
system assists them in bringing some semblance of organization to their initial
experiences and provides the foundation for the later development of taxonomic
structures. To accommodate the broadening of experiences, children begin to
reorganize their conceptual bases in order to better explain newly established relations
among terms. This reorganization depends on their experiences with language use,
and learning of hierarchical relationships comes from experiences with language
forms, rather than directly from experiences in the world.

Having found support for the theoretical, attention is now turned to more
practical implications of this research. The following section will discuss possible
contributions of the research to the development of early elementary curricula. Some
suggestions for future research projects will also be included in this discussion.

*Providing a Theoretical Foundation for the Design and Development of Early
Elementary School Whole-Language Curricula*

The whole-language curricula has been a feature of New Zealand elementary
schools for several years and has undergone a series of assessments, reassessments,
and modifications since its inception. The fundamental idea of the whole-language
approach is to provide children with modelled experiences in speaking, reading, and writing as early as possible. Early immersion in the "formal" world of language arts occurs on the first day that children enter school (the fifth birthday for all New Zealand children). The findings of Study Two lend support to the theoretical underpinnings of this approach: emphasis is placed on the importance of the interpersonal domain, where language is used to guide the thought processes of young children. Adams (1985) would probably applaud this direction in curriculum development, given her proposal that the application of an apprenticeship framework to the domain of concept development and language acquisition is appropriate and informative. Further, Adams and Bullock (1967) stated that the importance of social factors in lexical development demonstrates that the construction of a semantic system is a collaborative project, whereby the joint efforts of apprentices and experts ensure that the end product of their endeavors will be a conceptual system in which behavioral manifestations are shared, making communication between members of the culture possible. They went on to suggest that by engaging children in organized activities and by explicitly directing children’s attention to aspects of objects and events that might not be spontaneously noticed, expert language users systematically bias semantic network development and thereby ensure that apprentices develop conventionalized and functionally useful semantic systems (also see Bruner, 1981, 1983).

From their first day at school, children are surrounded by adults and peers who are reading, writing, and speaking and as a result, are drawn into that milieu.
As apprentice language users, they learn for example, to tell stories and have experts write them down, to make their own story books out of pictures and talk about them, to create their own spellings of words and have experts correct them, and to "read" stories to others and have others read to them. This approach to language learning has attempted to make the process a more natural, enjoyable, and achievable one. In the past, young children moved from a preschool environment, where language learning was a spontaneous, exploratory process (mirrored in the whole-language model) to a formal system that emphasized the learning of parts of language and the skills needed to decode them. These skills and parts were learned more often than not, by using the language out of context and through a multitude of practice sessions (see Cutting, 1990). Not surprisingly, many children found the preschool to elementary school transition a difficult one.

The findings of this dissertation lend strong support to one model and, by default, question the effectiveness of the other, especially for young children. It has been firmly established that young children order their worlds according to a series of scripts and that they learn to identify features that are reliably associated with recurrent events. An appreciation and mastery of script knowledge is not necessarily a linguistic activity in itself, rather, script knowledge becomes enmeshed with linguistic competence (see Gardner, 1991). For young children, these scripts initially allow them to conceptualize and report their experiences in life. What they learn about themselves and their worlds begins with their experiences and not their ability to manipulate language forms. These scripts serve an important role in that they are a
generic set of sequences against which newly encountered events are judged. Lucariello and Nelson's slot-filler theory extends this idea: once children have a familiarity with particular scripts, they are able to identify the relations between different script components, as well as parts that are constant and parts that are interchangeable. Within each script, children learn that they can slot different exemplars and that these slot-fillers have common characteristics. It stands to reason, therefore, that children's immersion in the formal schooling system should be characterized by experiences to which they can relate. Children will expect to read, write, and talk about experiences within the school curricula that are familiar and in order to readily assimilate new information, they will expect to be taught information that matches their existing knowledge. McKeough (1992) advocated this approach after finding that children had difficulty in producing stories that were characteristic of higher developmental stages without some form of conceptual bridge between their current level of functioning and the next level of hierarchical development. In keeping with this proposal, Cormier (1987) reinforced the notion that some form of apprentice-expert scaffolding is a desirable feature of instruction, because young children are clearly at a disadvantage when asked to categorize information according to elaborate classification structures. Whereas apprentices classify according to surface features, experts call on elaborate knowledge networks.

The whole-language program has moved towards providing these consistent and compatible learning experiences for children. Through these experiences, children are also introduced to formal language learning with its taxonomies and
associated strategies. Because this is a gradual process, children are spared the
dilemma of coping with clashes between their existing system of script-based
categorization and the more technical and abstract taxonomy-based categorization.
Vygotsky's (1962) interpsychological/intrapsychological model has a direct bearing on
the whole-language approach. In keeping with Vygotskian thought, children are
couraged to participate in social situations that promote a variety of compatible
language learning experiences. Once children begin to speak, the acquisition of
concepts and categories occurs at this interpsychological level, and as children
internalize their experiences and knowledge of language forms, they begin to achieve
expert language user status. Inherent in the whole-language model is a crucial
component of an effective teaching and learning situation; children are more likely to
remain interested and motivated to participate in the language program, if they are
working within an area of familiarity and challenge. Research findings, including
those of Studies One and Two, have lead to an increased appreciation of what is
involved in the acquisition and organization of a lexicon. This, in turn, has resulted
in the development of educational programs, such as the whole-language curriculum,
that are more tailored and cater more specifically to the developmental needs of
children. The findings of this research also suggest that other areas in the education
system that may need addressing. Some suggestions follow:

1. Although it was found that children of different ages tend to categorize
their experiences according to either script-based or taxonomy-based semantic
structures, some children fell outside the realms of expected group behavior as a
function of age. Because the performances of exceptional children, especially those with learning disabilities, have long been a source of concern for educators, the findings of Studies One and Two are important in that they may lead to speculation on the nature of the relationship between the development of categorical organizational structures and learning disabilities. Research examining possible mismatches between children's semantic organizational structures and formal programs of instruction may prove beneficial. The types of apprentice-expert interactions, as well as the types and varieties of teaching/learning resources available merit particular attention. Results from this type of diagnostic research may provide helpful information for developers of special educational programs and resources for exceptional children.

2. Differences in academic performance are sometimes credited to factors such as gender, socio-economic status, ethnicity, educational opportunities, and the like. If the assumption is made that academic performance is dependent on the development of categorical structures and associated words, it will be valuable to examine the effects of these factors.

Although not a focus of this research, the question of the differences in lexical development as a function of ethnicity is a reasonable one. Gardner (1991) suggested that whole-language programs provide consistent and compatible learning experiences for children, yet, it is realistic to ask, how educators determine what is consistent and compatible for children from different backgrounds, and with a variety of different educational needs. If, as the findings of this research suggest, script-based slot-filler categorization enters into semantic memory as the first and most salient memory
structures, and continued acquisition of concepts, categories, and word labels within a particular language community occurs initially on an interpsychological plane, is there a mismatch between language that is learned in the home environment and language that is learned in the formal education environment? If children learn to think and speak in one language form and are educated in another, educators must ask whether this situation gives rise to unfamiliar experiences, and in turn, creates "learning environments" where children find it difficult to assimilate new information. Until now, it seems to been a common educational practice to provide children from minority language communities with expert language user role models of standard English, and expect that they will think, act, and speak accordingly. If, as research suggests, the process of lexical development is a complex interpsychological/intrapsychological development spanning many years, the provision of role models alone may not be enough. Although this research has found support for the apprentice-expert model of language learning, this interaction is seen as part of a long term development, within a learning environment that provides consistent and compatible experiences for apprentice language users. Future research addressing the needs of such children, and evaluating the effectiveness of existing language arts programs of instruction should receive priority.

3. Finally (and succinctly), the primary goal for educators should be one of continual evaluation and re-evaluation of programs of learning and teaching. Having found strong support for the research hypotheses, the next step is to determine
how these findings can be used in the design and development of more effective pre-
school and early elementary school programs across curricula.

Implications for the Design of Beginning Readers.

It has been firmly established that the first words that children learn are those
that label basic level objects. During the preschool and early elementary years,
children experience a rapid acquisition of words that results from their natural
inquisitiveness to make as much sense as possible of their worlds, under the guidance
of expert language users. The predisposition to name things at the basic level stems
from several factors; objects are commonplace and therefore easy to see, feel and
operate upon, recognizable by depictable instances, and generic without being too
general. Thus a cat is more likely to be named as a CAT (basic level term) than as an
ANIMAL (superordinate level term), or than as a Persian (subordinate level term).
(See Rosch, 1978) This phenomenon suggests several important considerations for
the design of early reading books. First, as Gardner (1991) suggested, it is essential,
if children are to be expected to assimilate new information, that the stories in books
be compatible with the stories or scripts that children have in their repertoires.

Second, the use of unfamiliar terms, or terms that are of the superordinate and
subordinate levels should be omitted, unless the author specifically wishes to
introduce children to this new information. If the latter, then this purpose would best
be accomplished by introducing new terms within the slots vacated by similar and
familiar exemplars (e.g., I saw a wild cat at the ZOO; I saw a lion at the ZOO; I saw
a puma at the ZOO). This introduction of new word meanings also needs to be clear
and easy for children to identify; introduced slot-fillers should be recognizable as reasonable alternatives and not deviate too greatly from previous slot-fillers (see Lucariello & Nelson, 1985). In some cases, specific instruction from experts is necessary to establish hierarchical relationships among exemplars.

Third, since this dissertation has established that pictures have a strong facilitative effect on encoding, it stands that the choice of illustrations is as important a consideration as text. In order to illustrate superordinate words, several recognizable examples of the category should be grouped together, accompanied by the superordinate word label. Similarly, in illustrating a subordinate word, several subordinates of the same basic level category should be featured and labelled individually (see Mervis, 1983).

Fourth, care should be taken in the selection of "good" category exemplars, over "poor." It has been shown from the results of both card sorting tasks in Study Two, that young children find it difficult to recognize the taxonomic status of peripheral exemplars if they deviate too greatly from the category prototype, therefore pairing exemplars such as emu and penguin, rather than robin or sparrow with BIRD, becomes a source of confusion for children.

Fifth, authors should be careful when using anomalous references for young children (e.g., the use of ANIMAL when referring to a shark). Although this reference may make reasonable sense to an adult, it may not to a child, because most young children would think of a shark as a fish. Introducing children to this level of abstraction requires specific apprentice-expert instruction to explain unusual relations
among exemplars. The use of texts and illustrations of poor exemplars to introduce words that children do not yet know, or concepts that are confusing are never justified.

**IMPLICATIONS FOR FUTURE RESEARCH**

Lucariello and Nelson (1985) cautioned that their studies represented preliminary investigations into the nature of semantic organization in young children. They suggested that research from different paradigms is needed to provide further support for the hypothesis that slot-fillers play an important role in the development of cognitive categories. Their challenge was the impetus for this dissertation, and has resulted in the contribution of significant support for the development and fine tuning of a model that emphasizes the social embeddedness of categorization and related cognitive processes. However, rather than view this contribution as "means to an end," it is more realistic to view it as a "step in the process."

Future research must necessarily have two foci: the first should be on attempting to better understand the nature of lexical development, and the second should be on addressing the educational implications of this understanding. From this dissertation, several considerations for a prospective research agenda have arisen. Consider the following: What questions need to be addressed in order to better understand the process of concept acquisition and organization?

(a) If script-based slot-filler categorization enters into semantic organization as the first and most salient structure, what other processes are involved in the
transition from this type of organization to more abstract and advanced semantic structures?

(b) What are the language learning constraints placed on young children as they move from one system of categorization to another? Are younger children less likely to retain and transfer newly acquired knowledge of taxonomies if rehearsal of information and practice with organizational strategies are not continuing processes?

(c) If older children develop the use of more complex hierarchical taxonomic categorization, does slot-filler categorization still operate and retain its importance? If so, under what circumstances do expert language users rely on this information?

(d) What are the specific roles and contributions of expert language users in helping guide young children from one form of categorical organization to another?

(e) What is the nature of taxonomies, specifically, the encoding processes, the knowledge base, and the retrieval strategies that young children must acquire?
APPENDIX A

STUDY ONE: MEMORY TASK

RECALL CONDITIONS FOR THE SLOT-FILLER LIST

Questions
(a) Free recall: Can you tell me all the words we just said?
(b) Category-cued recall: Can you tell me all the (clothes, food, animals) we just said?
(c) Script-cued recall: Can you tell me those things you would (put on to go outside, eat for lunch, see at the zoo).

Exemplars
(a) Outside clothes: pants
   jacket
   socks
(b) Zoo animals: lion
   giraffe
   bear
(c) Lunch food: sandwich
   cheese
   apple

RECALL CONDITIONS FOR THE TAXONOMIC LIST

Questions
(a) Free recall: Can you tell me all the words we just said?
(b) Category-cued recall: Can you tell me all the (cats, birds, dogs) we just said?

Exemplars
(a) Clothes: pajamas
   pants
   shirt
(b) Animals: lion
   cat
   horse
(c) Food: cereal
   cheese
   apple
APPENDIX B

STUDY TWO: MEMORY TASK

RECALL CONDITION FOR THE SLOT-FILLER LIST

**Question**
(a) Category-cued recall: Can you tell me all the animals we just said?

**Exemplars**
(a) Farm animals: Horse, Sheepdog, Duck
(b) Pet animals: Tabby, Budgie, Afghan
(c) Zoo animals: Elephant, Monkey, Camel

RECALL CONDITION FOR THE TAXONOMIC LIST

**Question**
(a) Category-cued recall: Can you tell me all the animals we just said?

**Exemplars**
(a) Cats: Tabby, Kitten, Siamese
(b) Birds: Budgie, Chick, Duck
(c) Dogs: Sheepdog, Puppy, Afghan
APPENDIX C

STUDY TWO: TRIAD CARD SORTING TASK - PRETEST

Questions
(a) Can you tell me the two cards that best go together? Why?
(b) Can you tell me the card that does not belong? Why?

Exemplars

<table>
<thead>
<tr>
<th>Taxonomy</th>
<th>Taxonomy/Script</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. black cat (G)</td>
<td>lion</td>
<td>mouse</td>
</tr>
<tr>
<td>2. cream dog (G)</td>
<td>wolf</td>
<td>girl</td>
</tr>
<tr>
<td>3. brown bird (G)</td>
<td>flamingo</td>
<td>giraffe</td>
</tr>
<tr>
<td>4. brown horse (G)</td>
<td>zebra</td>
<td>saddle</td>
</tr>
<tr>
<td>5. black cat (G)</td>
<td>jaguar</td>
<td>bird</td>
</tr>
<tr>
<td>6. cream dog (G)</td>
<td>fox</td>
<td>boy</td>
</tr>
<tr>
<td>7. brown bird (G)</td>
<td>ostrich</td>
<td>elephant</td>
</tr>
<tr>
<td>8. brown horse (G)</td>
<td>ass</td>
<td>bridle</td>
</tr>
<tr>
<td>9. Siamese (A)</td>
<td>lion</td>
<td>cage</td>
</tr>
<tr>
<td>10. Afghan (A)</td>
<td>wolf</td>
<td>kennel</td>
</tr>
<tr>
<td>11. duck (A)</td>
<td>flamingo</td>
<td>eggs</td>
</tr>
<tr>
<td>12. Appaloosa (A)</td>
<td>zebra</td>
<td>vehicle</td>
</tr>
<tr>
<td>13. Siamese (A)</td>
<td>jaguar</td>
<td>cage</td>
</tr>
<tr>
<td>14. Afghan (A)</td>
<td>fox</td>
<td>kennel</td>
</tr>
<tr>
<td>15. duck (A)</td>
<td>ostrich</td>
<td>eggs</td>
</tr>
<tr>
<td>16. Appaloosa (A)</td>
<td>ass</td>
<td>vehicle</td>
</tr>
</tbody>
</table>

1. The taxonomy-based exemplars 1-4 were the same as the taxonomy-based exemplars 5-8. Exemplars 9-12 were the same as 13-16.
2. The taxonomy-based/script-based exemplars 1-4 were the same form as the taxonomy-based/script-based exemplars 5-8. Exemplars 9-12 were the same form as exemplars 13-16. Exemplars 1-4 and 9-12 were the same, as were exemplars 5-8 and 13-16.
3. The script-based (thematic) exemplars 1-4 were the same form as the script-based (thematic) exemplars 5-8. Exemplars 9-12 were the same as exemplars 13-16.
APPENDIX C (continued)

STUDY TWO: TRIAD CARD SORTING TASK - POSTTEST

Questions
(a) Can you tell me the two cards that best go together? Why?
(b) Can you tell me the card that does not belong? Why?

Exemplars

<table>
<thead>
<tr>
<th>Taxonomy</th>
<th>Taxonomy/Script</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. black cat (G)</td>
<td>lion</td>
<td>mouse</td>
</tr>
<tr>
<td>2. cream dog (G)</td>
<td>wolf</td>
<td>girl</td>
</tr>
<tr>
<td>3. brown bird (G)</td>
<td>flamingo</td>
<td>giraffe</td>
</tr>
<tr>
<td>4. brown horse (G)</td>
<td>zebra</td>
<td>saddle</td>
</tr>
<tr>
<td>5. black cat (G)</td>
<td>tiger</td>
<td>bird</td>
</tr>
<tr>
<td>6. cream dog (G)</td>
<td>wild dog</td>
<td>boy</td>
</tr>
<tr>
<td>7. brown bird (G)</td>
<td>penguin</td>
<td>elephant</td>
</tr>
<tr>
<td>8. brown horse (G)</td>
<td>donkey</td>
<td>bridle</td>
</tr>
<tr>
<td>9. Siamese (A)</td>
<td>lion</td>
<td>cage</td>
</tr>
<tr>
<td>10. Afghan (A)</td>
<td>wolf</td>
<td>kennel</td>
</tr>
<tr>
<td>11. duck (A)</td>
<td>flamingo</td>
<td>eggs</td>
</tr>
<tr>
<td>12. Appaloosa (A)</td>
<td>zebra</td>
<td>vehicle</td>
</tr>
<tr>
<td>13. Siamese (A)</td>
<td>tiger</td>
<td>cage</td>
</tr>
<tr>
<td>14. Afghan (A)</td>
<td>wild dog</td>
<td>kennel</td>
</tr>
<tr>
<td>15. duck (A)</td>
<td>penguin</td>
<td>eggs</td>
</tr>
<tr>
<td>16. Appaloosa (A)</td>
<td>donkey</td>
<td>vehicle</td>
</tr>
</tbody>
</table>

1. The introduced exemplars 5-8 (and 13-16) were script-based/taxonomy-based equivalents of corresponding pre-test exemplars.
2. The taxonomy-based exemplars 1-4 and 5-8 were the same, and exemplars 9-12 were the same as 13-16.
3. The taxonomy-based/script-based exemplars 1-4 were the same as 9-12, and exemplars 5-8 were the same as 13-16.
4. The script-based (thematic) exemplars 1-4 were the same form as the script-based (thematic) exemplars 5-8. Exemplars 9-12 were the same as exemplars 13-16.
5. G = generic exemplar, A = atypical exemplar.
APPENDIX D

STUDY TWO: MULTIPLE CARD SORTING TASK - CAT EXEMPLARS

PRETEST

Questions
(a) Can you put all the CATs in one box?
(b) Can you put all the ZOO animals in one box?
(c) [Ask children why they put each card in a certain box]

Exemplars
black cat     generic/taxonomic
kitten        maturational/taxonomic
tabby         typical/taxonomic
Siamese       atypical/taxonomic
LION          peripheral/taxonomic - typical/script
JAGUAR        peripheral/taxonomic - typical/script
camel         typical/script
monkey        typical/script
giraffe       typical/script
elephant      typical/script

POSTTEST

Questions
(a) As in session 1

Additional exemplars
ginger         typical/taxonomic
TIGER          peripheral/taxonomic - typical/script
koala          typical/script
APPENDIX D (continued)

STUDY TWO: MULTIPLE CARD SORTING TASK - DOG EXEMPLARS

PRETEST

Questions
(a) Can you put all the DOGs in one box?
(b) Can you put all the ZOO animals in one box?
(c) [Ask children why they put each card in a certain box]

Exemplars
black dog generic/taxonomic
puppy maturational/taxonomic
sheepdog typical/taxonomic
Afghan atypical/taxonomic
FOX peripheral/taxonomic - typical/script
WOLF peripheral/taxonomic - typical/script
camel typical/script
monkey typical/script
giraffe typical/script
elephant typical/script

POSTTEST

Questions
(a) As in session 1

Additional exemplars
collie typical/taxonomic
WILD DOG peripheral/taxonomic - typical/script
koala typical/script
APPENDIX D (continued)

STUDY TWO: MULTIPLE CARD SORTING TASK - BIRD EXEMPLARS

PRETEST

Questions
(a) Can you put all the BIRDs in one box?
(b) Can you put all the ZOO animals in one box?
(c) [Ask children why they put each card in a certain box]

Exemplars
brown bird          generic/taxonomic
chick               maturational/taxonomic
budgie              typical/taxonomic
duck                atypical/taxonomic
OSTRICH             peripheral/taxonomic - typical/script
FLAMINGO            peripheral/taxonomic - typical/script
camel               typical/script
monkey              typical/script
giraffe             typical/script
elephant            typical/script

POSTTEST

Questions
(a) As in session 1

Additional exemplars
seagull              typical/taxonomic
PENGUIN              peripheral/taxonomic - typical/script
koala                typical/script
APPENDIX D (continued)

STUDY TWO: MULTIPLE CARD SORTING TASK - HORSE EXEMPLARS

PRETEST

Questions
(a) Can you put all the HORSES in one box?
(b) Can you put all the ZOO animals in one box?
(c) [Ask children why they put each card in a certain box]

Exemplars

<table>
<thead>
<tr>
<th>Animal</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>brown horse</td>
<td>generic/taxonomic</td>
</tr>
<tr>
<td>foal</td>
<td>maturational/taxonomic</td>
</tr>
<tr>
<td>thoroughbred</td>
<td>typical/taxonomic</td>
</tr>
<tr>
<td>Appaloosa</td>
<td>atypical/taxonomic</td>
</tr>
<tr>
<td>ZEBRA</td>
<td>peripheral/taxonomic - typical/script</td>
</tr>
<tr>
<td>ASS</td>
<td>peripheral/taxonomic - typical/script</td>
</tr>
<tr>
<td>camel</td>
<td>typical/script</td>
</tr>
<tr>
<td>monkey</td>
<td>typical/script</td>
</tr>
<tr>
<td>giraffe</td>
<td>typical/script</td>
</tr>
<tr>
<td>elephant</td>
<td>typical/script</td>
</tr>
</tbody>
</table>

POSTTEST

Questions
(a) As in sessions 1

Additional exemplars

<table>
<thead>
<tr>
<th>Animal</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shetland</td>
<td>typical/taxonomic</td>
</tr>
<tr>
<td>DONKEY</td>
<td>peripheral/taxonomic - typical/script</td>
</tr>
<tr>
<td>koala</td>
<td>typical/script</td>
</tr>
</tbody>
</table>
APPENDIX E

STUDY TWO: ANIMAL PLATE REFERENCES

CATS


DOGS


185


**BIRDS**


**HORSES**


**ZOO ANIMALS**


APPENDIX F

STUDY ONE: MEMORY TASK - ASSESSMENT FORM

<table>
<thead>
<tr>
<th>List: Slot Tax</th>
<th>Recall: Free Category Script</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
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<tbody>
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Notes
APPENDIX F (continued)

STUDY TWO: MEMORY TASK - ASSESSMENT FORM

<table>
<thead>
<tr>
<th>Student:</th>
<th>Gender: M F</th>
<th>Birthday:</th>
</tr>
</thead>
<tbody>
<tr>
<td>School:</td>
<td>Date:</td>
<td>Examiner:</td>
</tr>
</tbody>
</table>

**List:** Slot Tax  
**Recall:** Free Category Script

<table>
<thead>
<tr>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
</tr>
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<tbody>
<tr>
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</tr>
<tr>
<td>Notes</td>
<td></td>
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</tbody>
</table>

189
APPENDIX F (continued)

STUDY TWO: TRIAD CARD SORTING TASK - ASSESSMENT FORM

PRETEST

Student: ___________ Gender: M F Birthday: ___________
School: ___________ Date: ___________ Examiner: ___________

Questions
(a) Can you tell me the two cards that best go together? Why?
(b) Can you tell me the card that does not belong? Why?

Exemplars

<table>
<thead>
<tr>
<th>Taxonomy</th>
<th>Taxonomy/Script</th>
<th>Script</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. black cat</td>
<td>lion</td>
<td>mouse</td>
</tr>
<tr>
<td>2. cream dog</td>
<td>wolf</td>
<td>girl</td>
</tr>
<tr>
<td>3. brown bird</td>
<td>flamingo</td>
<td>giraffe</td>
</tr>
<tr>
<td>4. brown horse</td>
<td>zebra</td>
<td>saddle</td>
</tr>
<tr>
<td>5. black cat</td>
<td>jaguar</td>
<td>bird</td>
</tr>
<tr>
<td>6. cream dog</td>
<td>fox</td>
<td>boy</td>
</tr>
<tr>
<td>7. brown bird</td>
<td>ostrich</td>
<td>elephant</td>
</tr>
<tr>
<td>8. brown horse</td>
<td>ass</td>
<td>bridle</td>
</tr>
<tr>
<td>9. Siamese</td>
<td>lion</td>
<td>cage</td>
</tr>
<tr>
<td>10. Afghan</td>
<td>wolf</td>
<td>kennel</td>
</tr>
<tr>
<td>11. duck</td>
<td>flamingo</td>
<td>eggs</td>
</tr>
<tr>
<td>12. Appaloosa</td>
<td>zebra</td>
<td>vehicle</td>
</tr>
<tr>
<td>13. Siamese</td>
<td>jaguar</td>
<td>cage</td>
</tr>
<tr>
<td>14. Afghan</td>
<td>fox</td>
<td>kennel</td>
</tr>
<tr>
<td>15. duck</td>
<td>ostrich</td>
<td>eggs</td>
</tr>
<tr>
<td>16. Appaloosa</td>
<td>ass</td>
<td>vehicle</td>
</tr>
</tbody>
</table>

Notes
STUDY TWO: TRIAD CARD SORTING TASK - ASSESSMENT FORM

POSTTEST

Student: ___________ Gender: M F Birthday: ___________

School: ___________ Date: ___________ Examiner: ___________

Questions
(a) Can you tell me the two cards that best go together? Why?
(b) Can you tell me the card that does not belong? Why?

Exemplars

<table>
<thead>
<tr>
<th>Taxonomy</th>
<th>Taxonomy/Script</th>
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</thead>
<tbody>
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</tr>
<tr>
<td>2. cream dog</td>
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<td>3. brown bird</td>
<td>flamingo</td>
<td>giraffe</td>
</tr>
<tr>
<td>4. brown horse</td>
<td>zebra</td>
<td>saddle</td>
</tr>
<tr>
<td>5. black cat</td>
<td>tiger</td>
<td>bird</td>
</tr>
<tr>
<td>6. cream dog</td>
<td>wild dog</td>
<td>boy</td>
</tr>
<tr>
<td>7. brown bird</td>
<td>penguin</td>
<td>elephant</td>
</tr>
<tr>
<td>8. brown horse</td>
<td>donkey</td>
<td>bridle</td>
</tr>
<tr>
<td>9. Siamese</td>
<td>lion</td>
<td>cage</td>
</tr>
<tr>
<td>10. Afghan</td>
<td>wolf</td>
<td>kennel</td>
</tr>
<tr>
<td>11. duck</td>
<td>flamingo</td>
<td>eggs</td>
</tr>
<tr>
<td>12. Appaloosa</td>
<td>zebra</td>
<td>vehicle</td>
</tr>
<tr>
<td>13. Siamese</td>
<td>tiger</td>
<td>cage</td>
</tr>
<tr>
<td>14. Afghan</td>
<td>wild dog</td>
<td>kennel</td>
</tr>
<tr>
<td>15. duck</td>
<td>penguin</td>
<td>eggs</td>
</tr>
<tr>
<td>16. Appaloosa</td>
<td>donkey</td>
<td>vehicle</td>
</tr>
</tbody>
</table>
APPENDIX F (continued)

STUDY TWO: MULTIPLE CARD SORTING TASK - ASSESSMENT FORM

**PRETEST**

Student: ___________  Gender: M  F  Birthday: ___________

School: ___________  Date: ___________  Examiner: ___________

**Questions**

(a) Can you put all the CATS/DOGS/etc in one box?
(b) Can you put all the ZOO animals in one box?
(c) [Ask children why they put each card in a certain box]

**Exemplars**

<table>
<thead>
<tr>
<th>Cats</th>
<th>Dogs</th>
<th>Birds</th>
<th>Horses</th>
</tr>
</thead>
<tbody>
<tr>
<td>black: C Z</td>
<td>black: D Z</td>
<td>brown: B Z</td>
<td>brown: H Z</td>
</tr>
<tr>
<td>kitten: C Z</td>
<td>puppy: D Z</td>
<td>chick: B Z</td>
<td>foal: H Z</td>
</tr>
<tr>
<td>tabby: C Z</td>
<td>sheep: D Z</td>
<td>budgi: B Z</td>
<td>thbrd: H Z</td>
</tr>
<tr>
<td>Siam: C Z</td>
<td>Afghn: D Z</td>
<td>duck: B Z</td>
<td>Appal: H Z</td>
</tr>
<tr>
<td>LION: C Z</td>
<td>WOLF: D Z</td>
<td>OSTR: B Z</td>
<td>ZEBRA: H Z</td>
</tr>
<tr>
<td>JAGUR: C Z</td>
<td>FOX: D Z</td>
<td>FLAMG: B Z</td>
<td>W/ASS: H Z</td>
</tr>
<tr>
<td>camel: C Z</td>
<td>camel: D Z</td>
<td>camel: B Z</td>
<td>camel: H Z</td>
</tr>
<tr>
<td>monkey: C Z</td>
<td>monkey: D Z</td>
<td>monkey: B Z</td>
<td>monkey: H Z</td>
</tr>
<tr>
<td>giraf: C Z</td>
<td>giraf: D Z</td>
<td>giraf: B Z</td>
<td>giraf: H Z</td>
</tr>
<tr>
<td>eleph: C Z</td>
<td>eleph: D Z</td>
<td>eleph: B Z</td>
<td>eleph: H Z</td>
</tr>
</tbody>
</table>

**Notes**
APPENDIX F (continued)

STUDY TWO: MULTIPLE CARD SORTING TASK - ASSESSMENT FORM

POSTTEST

Student: ___________  Gender: M  F  Birthday: ___________
School: ___________  Date: ___________  Examiner: ___________

Questions
(a) Can you put all the CATS/DOGS/etc in one box?
(b) Can you put all the ZOO animals in one box?
(c) [Ask children why they put each card in a certain box]

Exemplars

<table>
<thead>
<tr>
<th>Cats</th>
<th>Dogs</th>
<th>Birds</th>
<th>Horses</th>
</tr>
</thead>
<tbody>
<tr>
<td>black: C Z</td>
<td>black: D Z</td>
<td>brown: B Z</td>
<td>brown: H Z</td>
</tr>
<tr>
<td>kitt: C Z</td>
<td>puppy: D Z</td>
<td>chick: B Z</td>
<td>foal: H Z</td>
</tr>
<tr>
<td>tabby: C Z</td>
<td>sheep: D Z</td>
<td>budgi: B Z</td>
<td>thbrd: H Z</td>
</tr>
<tr>
<td>Siam: C Z</td>
<td>Afghn: D Z</td>
<td>duck: B Z</td>
<td>Appal: H Z</td>
</tr>
<tr>
<td>LION: C Z</td>
<td>WOLF: D Z</td>
<td>OSTR: B Z</td>
<td>ZEBRA: H Z</td>
</tr>
<tr>
<td>JAGUR: C Z</td>
<td>FOX: D Z</td>
<td>FLAMG: B Z</td>
<td>W/ASS: H Z</td>
</tr>
<tr>
<td>camel: C Z</td>
<td>camel: D Z</td>
<td>camel: B Z</td>
<td>camel: H Z</td>
</tr>
<tr>
<td>monky: C Z</td>
<td>monky: D Z</td>
<td>monky: B Z</td>
<td>monky: H Z</td>
</tr>
<tr>
<td>giraf: C Z</td>
<td>giraf: D Z</td>
<td>giraf: B Z</td>
<td>giraf: H Z</td>
</tr>
<tr>
<td>eleph: C Z</td>
<td>eleph: D Z</td>
<td>eleph: B Z</td>
<td>eleph: H Z</td>
</tr>
<tr>
<td>gingr: C Z</td>
<td>colli: D Z</td>
<td>s/gul: B Z</td>
<td>Shetl: H Z</td>
</tr>
<tr>
<td>TIGER: C Z</td>
<td>W/DOG: D Z</td>
<td>PENGN: B Z</td>
<td>DONKY: H Z</td>
</tr>
<tr>
<td>koala: C Z</td>
<td>koala: D Z</td>
<td>koala: B Z</td>
<td>koala: H Z</td>
</tr>
</tbody>
</table>

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APPENDIX G

STUDY TWO: READING AND LANGUAGE-GAME SESSIONS

The reading and language-game sessions were conducted as follows:

Session One

This session was of 30 minutes duration. For the first five minutes, children (apprentices) were encouraged to look at the pictures. The adult (expert) reader then examined and discussed each of the twenty-eight animals in the book. This involved a factual presentation of material, followed by a question-and-answer period. For example:

(a) Taxonomic reading condition: "This is a lion. It is a wild cat. Can anyone tell me what a wild cat eats? Where does a lion live"?
(b) Script reading condition: "This is a lion, it lives in the zoo or in Africa. Can anyone tell me what a lion eats"?

Session Two

This session was of 30 minutes duration. The format was similar to the first session, although more taxonomy-based and script-based information was presented to respective groups by the expert reader. For example:

(a) Taxonomic reading condition: "This is a lion and this is a jaguar, they are both wild cats. Is it safe to pat a wild cat"?
(b) Script reading condition: "This is a lion and this is a jaguar. They both live in Africa and if you go on safari, you might see them."

Session Three

This session was of 25 minutes duration and an extension of Session Two. After the question and answer period, children were encouraged to relate their experiences with animals presented in the book and/or create their own stories. For example:

(a) Taxonomic reading condition: "When I was in Australia, I saw an ostrich. It couldn’t fly like most birds."
(b) Script reading condition: "When I went to the zoo, I saw the zookeeper feed an ostrich some seeds."
Session Four

This was of 35 minutes duration. For the first half of this session, the expert and apprentices played a type of "identification" game. The children were asked to identify specific animals according to group membership. For example:

(a) Taxonomic reading condition: "Who can point to all the dogs"?
(b) Script reading condition: "Who can point to all the farm animals"?

For the second half of the session, the children were asked to draw specific animals as identified above and write small stories about them. For example:

(a) Taxonomic reading condition: "This is a picture of a wolf. A wolf is a wild dog, and he will bite you if try to pat him."
(b) Script reading condition: "This is a picture of the sheepdog that herds the sheep on our farm. His name is Storm."

Session Five

This was of 30 minutes duration. During this session, the children played a competitive matching game. Each child was issued an identical set of animal picture cards (also identical to those appearing in the book). The objective of the game was to be the first to identify a specific taxonomy-based or script-based animal exemplar and answer questions about it. For example:

(a) Taxonomic reading condition: "Who has the cat that is known as the king of the beasts? What is it called"?
(b) Script reading condition: "Who has the animal that is used to herd sheep? Who does he belong to"?

Session Six

This was of 35 minutes duration. The children were divided into two teams. The game format was the same as in Session Five, however, the children were asked extra questions designed to examine and extend their categorical knowledge. For example:

(a) Taxonomic reading condition: "What do sheepdogs and wolves have in common? What family do they belong to"?
(b) Script reading condition: "Can you name two other animals that would live on a farm with a sheepdog"?

Session Seven

This was of 35 minutes duration. The children were each given a variety of pictures depicting different animals and were asked to create posters of either a taxonomy-based category or a script-based category. For example:

(a) Taxonomic reading condition: Each posters was made up of an array of exemplars from either the CAT, DOG, HORSE, and BIRD families
(e.g., under the heading *CAT FAMILY*, the children affixed the pictures and labelled each animal). On completion, the children presented and discussed their posters with the rest of the group.

(b) Script reading condition: Each poster was made up of an array of exemplars from either *ZOO, HOME, FARM, or ELSEWHERE* scripts (e.g., under the heading *FARM ANIMALS*, the children affixed the pictures and labelled each animal). These posters were also presented to the rest of the group.

**Session Eight**

This was of 20 minutes duration. The children were encouraged to bring to the session, books, magazine articles, toys, drawings, photographs, and similar resources associated with animals and present them to the rest of the group. This was conducted in a manner similar to a morning talk session.

**Session Nine**

This was of 5 minutes duration. This was a short discussion session conducted on an individual basis prior to posttesting. No new information was presented by the expert, instead, children were encouraged to respond to the open-ended question: "Tell me about the animals in this book."
GLOSSARY

Anomalous exemplar: An exemplar that is considered "unusual" or that deviates from the rule (e.g., a dodo is an anomalous BIRD category exemplar).

Apprentice language user: A language user, generally a child, who, because of relatively constrained experiences, possesses organizational strategies that do not conform to those used by an adult or expert language user.

Atypical exemplar: An exemplar that occurs in a cognitive "slot" normally filled by a typical exemplar (e.g., an ostrich is an atypical BIRD, if the reference is to birds that live in the garden).

Basic level categorization: The most inclusive level at which categories can mirror the structure of attributes perceived. Basic level exemplars share an optimal number of attributes, shapes, functions, and so on (e.g., BIRD vs. HORSE).

Category: A group membership of exemplars based on equivalence. A category is designated by name, (e.g., dog), and is a general and context-free structure that defines logical and physical relations.

Categorization: The process of assigning group membership to exemplars on the basis of equivalence; the grouping of diverse instances of objects and events in order to organize the world. The purpose of categorization is to reduce the infinite differences among stimuli to behaviorally and cognitively usable proportions.

Class inclusion: The assigning of taxonomic family membership to typical, atypical, and peripheral exemplars. Class inclusion knowledge is the ability to assign category membership based on the knowledge of the shared attributes of specific category exemplars (e.g., recognizing the class inclusion relationships among robin, duck, and ostrich).

Concept: A set of properties that are associated with each other in memory and thus form a unit. The properties can be of any type, transitory or permanent, concrete or abstract, perceptual or functional, combined in all sorts of ways.

Extensional word meaning: The extensional meaning of an object term is its specification in terms of objects referents; the sets of objects to which it can be applied.
**Expert language user:** A language user who has acquired the culturally shared ways of thinking and knowing; a knowledge of the different routines, events, and activities that give rise to a conformity of organizational skills, shared by most adults (expert language users).

**Intrusion:** With reference to Lucariello and Nelson's study and Study One, this is a response that is incorrect, although category appropriate (e.g., on the slot-filler recall list, the zoo animals to be recalled were lion, giraffe, and bear; an intrusion would be elephant).

**Intensional word meaning:** The intensional meaning of an object term is its specification in terms of attributes, features, relationships or whatever representational components one wishes to posit.

**Language-game:** The process by which skills of categorization are socially transferred from adults (experts) to children (apprentices) in the context of joint activity. The apprenticeship process ensures that children come to learn the culturally shared ways of thinking and knowing.

**Overextension error:** An error that occurs when children attach too broad a meaning to a term (e.g., DOG might refer to dogs, as well as, horses, bears, and goats).

**Overlap error:** An error that combines both underextension and overextension errors (e.g., DOG might refer to all brown dogs and calves, but not to Great Danes and cows), indicating a partial overlap of children's meanings of DOG with adult's meanings of DOG and COW.

**Paradigmatic distinction:** This relates to words that are from the same grammatical form class as a stimulus word (e.g., a response to the stimulus word man would be woman [an opposite relationship], rather than work [a story relationship]).

**Peripheral exemplar:** An exemplar that falls outside of the conventional boundary of a category (e.g., a lion is a peripheral CAT category member).

**Prototypical concept:** A subcategory or category member that has special status, that of being the "best example" within a specific context (e.g., a thrush is a prototypical BIRD in New Zealand gardens).
Schema: A mental structure whose elements are related to one another on the basis of spatial, temporal, or causal contiguities instead of class membership and similarity relations that are the framework of object categories (e.g., the partial schema representation of a house would include building, construction materials, contains rooms, functions as a dwelling, shape, size, location).

Script (event representation): A script is an event sequence that describes the interaction of a number of different concepts (people, places, and things), organized around a goal (e.g., eating at a restaurant).

Slot-filler category: A category formed on the basis of shared function which enables substitution of objects within a given frame.

Subordinate level categorization: The level of categorization where exemplars share most attributes and functions, differing from each other by only a select few (e.g., Siamese cat vs. Persian cat).

Superordinate level categorization: The level of categorization where few attributes or functions are shared by exemplars (e.g., CAT vs. VEHICLES).

Syntagmatic (or syntactic) distinction: This relates to words that are from a form class that is frequently found in contiguity with a stimulus word in a syntactic sequence (e.g., a response to the stimulus word man would be work [a story relationship], rather than woman [an opposite relationship]).

Taxonomy: A system by which categories are related to one another by means of class inclusion.

Typical exemplar: An exemplar that is considered the "best fit" when it occurs in a certain cognitive "slot" (e.g., a penguin is a typical zoo BIRD).

Underextension error: An error that occurs when children have a limited set of appropriate exemplar references (e.g., a DOG might be used to refer to all brown dogs but not to a specific breed of dog).
REFERENCES


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