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Metacognitive strategies used by first graders to interpret metaphors

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San Jose State University, 1991

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**METACOGNITIVE STRATEGIES USED BY FIRST GRADERS
TO INTERPRET METAPHORS**

**A Thesis
Presented to
The Faculty of the School of Education
San Jose State University**

**In Partial Fulfillment
of the Requirements for the Degree
Master of Arts**

**By
Kathleen M. Conradson
May, 1991**

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ABSTRACT

METACOGNITIVE STRATEGIES USED BY FIRST GRADERS TO INTERPRET METAPHORS

by Kathleen M. Conradson

The purpose of this thesis was to assess first graders' comprehension of commonly used metaphors previously unknown to them. To this end, in-depth interviews utilizing a pretested metaphor comprehension task were conducted individually with ten first grade students. During the interviews, each child was asked to interpret ten age-appropriate metaphors. Responses were tape-recorded and transcribed.

For the most part, the children in this study were seen as actively constructing meaning from metaphors given age-appropriate content and linguistic form. The metacognitive, or self-determined, strategies used by the first graders to gain meaning from metaphors included the application of firsthand experiences, background information, and/or logical processes to discern similarities based on the physical and/or functional attributes of the objects compared.

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Chapter 1

INTRODUCTION

Introduction

In simplest terms, a metaphor is any comparison that cannot be taken literally. The "essence" of such comparisons "is understanding and experiencing one kind of thing in terms of another" (Lakoff & Johnson, 1980). The making of metaphors has been described as a "game that language users play" (Kazemek & Rigg, 1987). One player, for instance, asserts that the sun is a golden earring; subsequent players look for the similarities between the sun and a golden earring that allow for such an assertion.

Metaphors are sometimes used to clarify by comparing something new to something familiar; at other times, they are used to intensify feeling. Often, metaphors appeal to both the imagination and the intellect; their purpose is to make the reader or listener feel as well as to understand. Roland Bartel (1983), for example, considers the way reporters described the May 18, 1980, eruption of Mt. Saint Helens in Washington state: "lava oozed from the bottom of the crater like bread

dough"; "millions of trees were knocked down in rows as if a giant had been playing pick-up sticks"; "Spirit Lake became a cauldron of logs and boiling mud" (p. 42). The reporters used these comparisons both to clarify an unfamiliar phenomenon and to appeal to the imagination.

The impulse to make metaphors has long intrigued philosophers and linguists. Indeed, in the fourth century B.C., Aristotle contended that "the greatest thing by far is to be master of metaphor. It is the one thing that cannot be learnt from others; it is also a sign of genius, since a good metaphor implies an intuitive perception of the similarity in dissimilars" (Poetics, Chapter 22).

In the present century, however, certain philosophers and researchers have argued that the ability to create metaphors, rather than being "a sign of genius" and the particular province of poets, is a basic human endowment (Geller, 1984; Lakoff & Johnson, 1980; Langer, 1947; Pickering & Attridge, 1990). Lakoff and Johnson (1980) put forth the idea of metaphor as central to the ways we perceive and live in the world: ". . . metaphor is pervasive in everyday life, not just in language but in thought and action. Our ordinary conceptual system, in terms of which we both think and act, is fundamentally metaphorical in nature" (p. 3).

To demonstrate how metaphors structure our everyday realities, Lakoff and Johnson use the example, "Time is money." This metaphor is reflected in our language by a wide variety of expressions: we save time, waste time, spend time, run out of time, invest time, squander time, or sometimes have time to spare. Thus, in our culture, we conceive of time as a valuable commodity, as a limited resource used to accomplish our goals. Lakoff and Johnson contend that "time is money" is but one of the many conventional metaphors that help to structure the way we perceive reality.

In modern thought, then, metaphor has moved from the ornamental periphery of discourse to assume a central position (Cowan & Feucht-Haviar, 1978). It is no longer viewed as the private domain of poets and English teachers; nor is it seen as an endeavor exclusive to adults. Indeed, Geller (1984) describes metaphor as "an elementary mode of apprehending the world" and evinces the "growing capacities" of children to produce and comprehend metaphors.

That children use metaphorical expressions in everyday speech and play has been well documented (Billow, 1981; Britton, 1970; Carlson & Anisfeld, 1969; Chukovsky, 1968; Gardner & Winner, 1978; Geller, 1984; Piaget, 1963; Winner, 1979). Gardner and Winner (1978), for example, describe the way 4- and 5-year-old children "can nearly effortlessly come up

with a whole series of appropriate and appealing metaphoric renamings" during play:

[One] subject in our studies in short order renamed a flashlight battery, "a sleeping bag all rolled up and ready to go over to a friend's house"; a hairbrush, "a park with grass"; a spotted rubber ball, "a big fat lady bug"; a puppet placed on top of a block, "a statue"; and when the puppet was moved past it, a red block was labelled "a thing to show where the rocks are . . . he's sailing in a boat" (p. 133).

Gardner and Winner contend that such renamings during play are indicative of early metaphoric thinking in that the children (1) have based the renamings on similarities between objects and (2) are aware that they are overriding the usual names.

In addition to instances of metaphoric renaming during play, young children spontaneously use metaphors of their own invention. While listening to a symphony on classical radio, for example, one 3-year-old exclaimed, "The music has froggies and kitties and doggies in it!" After northern California's October 17, 1989, earthquake, a 6-year-old commented, "It felt like giant cans were rolling under the house." Another

time, this same 6-year-old queried, "Isn't my memory kind of like a camera? It takes pictures of things I see so I don't forget them."

According to Geller (1984), the children in the preceding examples are "juxtaposing the known with the unknown through metaphoric creations." In other words, they are drawing on a familiar experience in order to create links--a context--for the new experience (Britton, 1970).

Thus, children produce original metaphors in everyday speech and play. Such production, however, leads to another area of inquiry. How do children respond to metaphors not of their own invention? Specifically, how do children go about making sense of metaphors encountered in the speech and writings of others?

Existing research reveals conflicting findings about the ability of children to understand metaphors. While many studies seem to indicate that children interpret metaphors in a literal manner until late childhood or early adolescence (Cometa & Eson, 1978; Gardner & Winner, 1978; Winner, Rosenstiel, & Gardner, 1976), there is other evidence suggesting that even preschool children have some basic understanding of metaphorical language (Gentner, 1977, 1988; Pearson, 1990; Vosniadou & Ortony, 1983; Vosniadou, Ortony, Reynolds, & Wilson, 1984).

Statement of Problem

For more than two decades, research on the development of metaphoric competence in children has produced tenuous and often conflicting results: "Evidence that young children are quite poor at metaphoric interpretation sits side by side with equally compelling evidence that they are uniquely talented at [producing] metaphoric language" (Gentner, 1988).

Certain researchers now believe, however, that the materials and tasks used in many early studies assessing children's comprehension of metaphor were inappropriate to children's knowledge levels and linguistic skills; as a result, the ability of children to understand metaphorical language has been underestimated (Gentner, 1977, 1988; Pearson, 1990; Vosniadou & Ortony, 1983; Vosniadou, Ortony, Reynolds, & Wilson, 1984).

Statement of Purpose

The purpose of this research was twofold: (1) to test a seemingly age-appropriate task in order to assess 6- and 7-year-old children's comprehension of commonly used metaphors previously unknown to them; and (2) to use the pretested task to determine individual interpretations of metaphors during in-depth interviews with ten first grade students.

Research Questions

1. What metacognitive strategies do children ages 6 and 7 use to comprehend commonly used metaphors previously unknown to them?
2. How do the findings of this study support/challenge those of previous studies of children's comprehension of metaphor?

Operational Definitions

For the purpose of this research, the researcher defined the following terms.

Figurative language. Language that is not intended to be interpreted in a literal sense. Figurative language makes use of comparisons between dissimilar objects and events and consists of figures of speech such as metaphor and simile. In this research, the terms "figurative language" and "metaphorical language" are used synonymously.

Literal language. A fact or idea stated directly. Literal language refers to word meanings found in dictionaries. These meanings have become standardized through repetition and public consensus. Thus, a writer or speaker uses literal language when he or she intends something to be understood exactly as it is written.

To demonstrate the relationship between literal and figurative meanings, consider the way words are transferred from literal to figurative categories. The word "backbone," for instance, originally meant the vertebral column of the human body. It was then transferred to figurative categories suggesting such qualities as stability, strength, and support. Thus star players are the backbone of a team; civic leaders are the backbone of a community.

Metacognitive strategies. The active and conscious ways an individual goes about processing information and constructing meaning.

Metacognitive strategies for comprehending metaphors include the use of firsthand experiences, background information, and/or logical processes in discerning nonliteral similarities between compared objects.

Metaphor. A nonliteral comparison between two essentially unlike things with the intent of clarifying or giving added meaning to one of them. Metaphors reveal a similarity or similarities between two otherwise very different objects or events.

Metaphor is sometimes defined restrictively in terms of its literary uses; it is viewed as simply an added frill to creative writing. Philosopher Susanne K. Langer, however, sees metaphor as "The

law of growth of every semantic" (1957, p. 147). Her belief concurs with those of other philosophers and linguists who maintain that metaphor permeates nearly all discourse (Bartel, 1983; Goodman, 1978; Lakoff & Johnson, 1980).

That metaphor appears in subtle forms in nearly every verbal communication is easy to demonstrate. Consider, for instance, the number of words used outside of their original conceptual categories: foot of a mountain, eye of a needle, mouth of a river, leg of a chair; to horse around, to outfox one's enemies, to wolf one's food. Consider also the vast number of popular expressions that have become a permanent part of our language, the thousands of cliches that once began as comparisons: "Kick the bucket," "Fly off the handle," "Let the cat out of the bag," "Going to pot," "Bury the hatchet," "Bring home the bacon." In addition, metaphor characterizes slang expressions. Among the several hundred terms listed for "fail" in The American Thesaurus of Slang (Berrey & Van Den Bark, 1953), for instance, are "bite the dust," "fall flat," "fizzle," "flop," "go bang," "hit the skids," "lay an egg," "miss the boat," "strike out," and "take a dive."

Thus, metaphor, as represented in this gamut of everyday expressions, can be seen as an integral part of speech and thought.

Metaphoric competence. The ability to comprehend and produce figurative expressions. Metaphoric competence is based on a person's ability (1) to perceive similarities among objects, actions, or events that are similar only in certain respects and (2) to distinguish between literal and nonliteral similarities.

Simile. A comparison made between two essentially unlike things through use of a specific word of comparison such as "like," "as," "as if," "than," or "resembles." Through use of such connecting words, simile removes most of the uncertainty from a comparison, making it as clear as possible.

Assumptions

In conducting this research, the researcher assumed the following:

1. Children use metaphors that reflect their experiences, and they use these metaphors unconsciously.
2. The responses of the first graders participating in the pretest of the metaphor comprehension task would be common to the sample of children used in this study.

3. The children participating in this study would be available on scheduled interview days.
4. The children participating in this study would respond to the metaphor comprehension task by proffering individual interpretations of the selected metaphors.
5. Individual interpretations of metaphors would vary, reflecting children's background experiences and ethnicity.

Limitations

In conducting this research, the researcher was limited by and acknowledged the following:

1. The small number of children who participated in this study.
2. All children who participated in this study were drawn from the same first grade class.
3. The metaphors chosen for interpretation may have been more readily understood by children of one ethnic background.

Delimitations

In conducting this research, the researcher imposed the following limitations:

1. Children participating in the pretest of the metaphor comprehension task were limited to two children known to the researcher.
2. The pretested metaphor comprehension task was appropriate for use with 6- and 7-year-olds.
3. In-depth interviews incorporating the metaphor comprehension task were limited to ten children attending the same first grade class.

Statement of Significance

Contrary to what many think, metaphor is not a mere ornamental overlay to literal language. Rather, metaphor is a vital part of everyday thought and discourse: ". . . the way we think, what we experience, and what we do everyday is very much a matter of metaphor" (Lakoff & Johnson, 1980). In this view, people of all ages use metaphors daily to construct and to comprehend the world.

The present study augments a growing body of research on children's understanding of metaphor. The study supports the contention of metaphor as an essential part of thought and language that emerges early in a child's linguistic repertoire.

The prevalence of metaphor in everyday discourse, coupled with the belief that children can and do construct meaning from metaphors, argues for a comprehensive exploration of metaphor in elementary language arts programs. Too often, however, teachers limit the exploration of metaphor to those metaphors encountered in literature and overlook broader, real-life applications. Metaphor, for example, plays a fundamental role in categorization: ". . . metaphorical thinking can help children reorganize existing knowledge into new conceptual frameworks" (Vosniadou, 1987). Metaphor can also be viewed as a "vehicle for knowledge acquisition" in that it allows children to use prior knowledge to understand new phenomena (Vosniadou, 1987).

In short, this study, in conjunction with other studies on children's comprehension of metaphor, can provide teachers with insights into more specific and meaningful language instruction.

Chapter 2

REVIEW OF RELATED LITERATURE

Introduction

Young children's spontaneous production of metaphors in speech and play has been well documented (Billow, 1981; Britton, 1970; Carlson & Anisfeld, 1969; Chukovsky, 1968; Gardner & Winner, 1978; Geller, 1984; Piaget, 1962; Winner, 1979). Yet in studies assessing comprehension of metaphors, children tend to perform poorly (Cometa & Eson, 1978; Gardner & Winner, 1978; Winner, Rosenstiel, & Gardner, 1976). Some researchers now contend that this apparent disparity between fluent production and poor comprehension may be due to the kinds of materials and tasks used in early studies on metaphoric competence: ". . . when tasks and materials more sensitive to the knowledge level of the children are adopted, even preschool children can be found to understand metaphorical language" (Vosniadou, 1987).

The purpose of this research was thus twofold: (1) to test a seemingly age-appropriate task in order to assess 6- and 7-year-old children's comprehension of commonly used metaphors previously

unknown to them; and (2) to use the pretested task to determine individual interpretations of metaphors during in-depth interviews with ten first grade students.

The following questions were examined in this study:

1. What metacognitive strategies do children ages 6 and 7 use to comprehend commonly used metaphors previously unknown to them?
2. How do the findings of this study support/challenge those of previous studies of children's comprehension of metaphor?

Chapter Methodology

A survey of the literature addressing children's comprehension of metaphor was conducted at San Jose State University's Wahlquist and Clark libraries. The researcher used the descriptors "metaphor" and "figurative language" to locate related literature in the following indices:

Education Index, Current Index to Journals in Education, and Resources in Education.

In addition, the researcher utilized the bibliographies of books and articles from a graduate course in general semantics and those of pertinent books obtained through the National Council of Teachers of English.

In order to show the progression of thought in research on the development of metaphoric competence in children, the researcher included literature written over a 28-year period, from 1962 through 1990.

Chapter Overview

The survey of related literature is divided into two main sections: (1) children's production of metaphor and (2) children's comprehension of metaphor.

The survey begins with a discussion of the literature on metaphor production. The discussion focuses on the issue of whether "child" metaphors are "real" metaphors comparable to the ones produced by adults. The apparent decline of metaphor production with age is also addressed.

Next, the literature on metaphor comprehension is reviewed and some of the variables that affect children's comprehension are discussed. Particular attention is paid to how content, linguistic form, and context affect comprehension of metaphor.

Children's Production of Metaphor

The Debate: Are "Child" Metaphors "Real" Metaphors?

Young children are recognized as producing seemingly metaphorical utterances (e.g., Carlson & Anisfeld, 1969; Billow, 1981; Britton, 1970;

Piaget, 1962). Carlson's 2-year-old son, for instance, said "Cup swimming," while pushing a cup in the bathwater; "Look, red caboose," while dragging a noodle across his dinner plate; and "I'm a big waterfall," while sliding down from his father (Carlson & Anisfeld, 1969, pp. 570-571). When Britton's (1970) daughter tasted strawberries for the first time, she commented that "They are just like sweeties" and "They are like red ladybirds" (p. 72). Finally, Piaget's (1962) daughter, between the ages of 3 and 4, said of a winding river, "It's like a snake"; of a bent twig, "It's like a machine for putting in petrol"; and on noting the effects of ocean waves on ridges of sand remarked, "It's like a little girl's hair being combed" (pp. 227-228).

For more than two decades, researchers have debated whether these early spontaneous utterances, or "child" metaphors, are "real" metaphors comparable to the ones produced by adults (Vosniadou, 1987).

Superficially, at least, these early utterances have the appearance of metaphor in that (1) they refer to something by a name other than its literal name, and (2) they reflect similarity between objects belonging to different conventional categories (Vosniadou, 1987).

The debate, however, hinges on the deliberateness of the comparison:

It is not only the extension of a word to a novel referent on the ground of similarity that constitutes a metaphor: It is also the deliberate extension of this word across previously established category boundaries. A willful violation, an intentional breaking of the rules must be involved, and this can only be inferred if the rules are there, in the first place to be overridden (Winner, 1979, p. 472).

Thus, some researchers argue that early spontaneous metaphors are simply linguistic accidents, the results of faulty or immature understanding of semantic or classificatory principles (Chukovsky, 1968; Matter & Davis, 1975; Piaget, 1962). Chukovsky (1968), for instance, argues that the young child is so determined "to bring at least illusory order into his limited and fragmentary knowledge of the world" that he establishes "associations in a haphazard and spontaneous way," applying "false analogies" (p. 25). Matter and Davis (1975) also contend that early metaphorical expressions are "errors":

In early stages of language acquisition, children produce category errors and mistakes that can be taken as metaphorical expressions but are not. The child is in the process of learning to recognize and correct perceptual, cognitive, and conceptual "error" . . . As these "errors" are corrected, children develop a highly literal linguistic

behavior. In this intermediate stage children are getting their categories straight (p. 324).

Finally, according to Piaget (1962) preschool children are incapable of producing deliberate metaphors because they are incapable of forming the conceptual categories metaphors are supposed to violate. Noting the preoperational child's "facility for thinking in images" (p. 228), Piaget refers to early metaphor-like utterances as "preconcepts," reflecting "more of the imaged schema than of the true concept" (p. 228). In his view, such verbalizations represent a child's momentary link between a new object and a remembered mental image, rather than a conscious attempt to override conventional categories. Thus, when his daughter, at age 3, watched a sunset and commented, "I'd like to go for a ride in the rays and go to bed in sheets of clouds," Piaget called the expression "an example of a mere image" (p. 227).

Other researchers, however, claim that child metaphors do represent the deliberate violation of an established category and thus are truly metaphorical (Billow, 1981; Carlson & Anisfeld, 1969; Winner, 1979). Carlson and Anisfeld (1969), for instance, in their study of the speech patterns of a 2-year-old child, emphasize the "underlying competence" (p. 569) of the child's semantic deviations. They believe that the child was

aware of both appropriate and inappropriate semantic extensions. Further, they maintain that the child created metaphors deliberately, often during imaginative play.

Similarly, Winner (1979) believes that children at a very early age possess the capacity to use language metaphorically:

What . . . does it take to make a metaphor? To begin with, one must be able to perceive similarity; moreover, one must also be able to conceive of one object as if it were another. The young child is capable of both these cognitive activities (p. 486).

Using transcriptions of the spontaneous speech of one child between the ages of 2 and 4, Winner categorized all apparently nonliteral utterances as overextensions, anomalies, or metaphors. Establishing the criteria that metaphorical word usage must reflect (1) an awareness that the name given is not the object's literal name and (2) an intentional overriding of established boundaries, she judged the majority of unconventional word uses to be metaphors.

Winner also provides evidence of a developmental sequence of the types of metaphors produced. At age 2, metaphors based on pretend actions during imaginative play were most frequently produced. By age 4, the majority of metaphors were based solely on the properties of the

objects compared (i.e., shape, color, size, sound, motion, texture, function, or psychological properties), without the support of action. Winner concludes that early metaphors are more restricted in form than adult metaphors. Nevertheless, "This early capacity for renaming objects may be a necessary investment for later, full-blown forms of metaphor, many of which are, in fact, constructed along the same lines as child metaphor" (p. 489).

Finally, Billow (1981) conducted a study to determine whether spontaneous metaphors are a frequent part of child language and whether the child recognizes the metaphoric relation created. To this end, Billow observed 73 children, ages 2 to 6, during regular school days. He recorded all utterances that referred to an object, feeling, or event by a term that would not ordinarily be used for that referent. The utterances were scored as metaphors if they were based on perceptible similarity.

Billow interpreted the results as providing clear evidence that preschool children do make consistent use of metaphorical language: "While the child's language is a reflection of his or her cognitive status, and, therefore, the vehicles are rather mundane and often related to topics of immediate objects, events, and emotional situations, there are,

nonetheless, obvious uses of words and phrases in a metaphoric manner" (p. 441).

In addition, Billow reports that in response to inquiry, children supplied evidence of metaphoric awareness 43% of the time. Evidence of metaphoric awareness consisted of either the child's knowledge of the conventional term for the renamed object or the child's articulation of a rationale for the verbal substitution.

Billow concludes that these findings suggest a "nascent metaphoric competence" (p. 444) in the preoperational child: "It appears that the very young child deliberately rather than accidentally uses words and objects to stand for quite different objects, and that the use involves a dimension of similarity which is clear and fitting" (p. 442).

Is There a Decline in Metaphor Production with Age?

There is some evidence that children's production of spontaneous metaphors decreases with age (Billow, 1981; Gardner & Winner, 1978; Matter & Davis, 1975). Matter & Davis (1975) argue that linguistic development is manifested in three distinct stages: (1) very young children produce metaphor-like utterances as a form of "linguistic error testing"; (2) children then enter an "intermediate stage," turning to highly literal uses of language in an attempt to get "their categories straight"; and (3) children

once again "enter the world of category mistakes, intentionally--they discover metaphor" (p. 324).

Gardner and Winner (1978) also note the "carefree linguistic experimentation" (p. 134) of preschool children. They believe this linguistic creativity declines sharply as children reach elementary school age: "These . . . children, mired in what we have come to term the 'literal' stage, actively reject invitations to metaphorize and cling instead to the most literal modes of language use" (p. 131).

Similar to the "stages" theory of Matter and Davis, Gardner and Winner propose that the development of metaphor production follows a U-shaped curve, with production of metaphor common during the preschool years; declining during the elementary school years, as children consolidate conventional categories; and increasing in the years preceding adolescence.

Billow (1981), too, notes a steady decline in the number of spontaneous metaphors produced by preschoolers as age increases. He disagrees, however, that children go through a "literal" stage during which they "resist any engagement whatsoever in various metaphoric games" (Gardner & Winner, 1978, p. 134). Rather, Billow believes that the option of metaphor production remains open to the developing child, but as "just one of a rapidly increasing number of mental options available" (p. 442).

Although spontaneous production of metaphor may become secondary to other cognitive activities for a time, Billow maintains that the capacity for metaphor production remains intact and may be brought forth "on demand" (p. 443).

Children's Comprehension of Metaphor

The Early Studies

The results of early studies on children's comprehension of metaphor were interpreted as indicating that children are unable to understand figurative language until late childhood or early adolescence (Cometa & Eson, 1978; Gardner & Winner, 1978; Winner, Rosenstiel, & Gardner, 1976). Explanations for children's failure to comprehend metaphors include a literal stage hypothesis (Gardner & Winner, 1978; Winner et al., 1976) and the Piagetian claim that metaphoric competence presupposes certain classification abilities that are not mastered until children reach the stage of concrete operations (Cometa & Eson, 1978).

In a study focusing on "the question of whether a regular sequence of understandings (or misunderstandings) precedes a full comprehension of metaphor," Winner et al. (1976) used two tasks to assess children's ability to comprehend metaphors. Children ranging in age from 6 to 14 years

were asked either to explain a metaphoric sentence or to select one of four possible paraphrases.

The results were interpreted as indicating a clear developmental trend. The younger children, ages 6 and 7, most frequently selected or offered literal interpretations of the metaphors. The 6- and 7-year-olds, for example, often altered the relationship between the compared objects. Thus, "The prison guard had become a hard rock" was interpreted as "The guard worked in a prison with hard rock walls." By age 8, the children were able to discern similarities between the compared objects but usually focused on physical traits (e.g., "The prison guard had muscles as hard as a rock"). Finally, at about age 10, the children were able to discern psychological traits as the ground of the metaphor (e.g., "The guard was mean and did not care about the prisoners").

Based on these results, the researchers concluded that "children do, indeed, interpret metaphors in a concrete manner until middle childhood" (in Gardner & Winner, 1978, p. 129).

Cometa and Eson (1978) also note "the difficulty which children seem to have in interpreting and explaining metaphors prior to ages 9-11" (p. 650). In an interpretation of Piagetian theory, Cometa and Eson argue that metaphor comprehension requires the ability to create an

intersectional class, a class which represents the overlap of two distinct classes in terms of a shared attribute. Because intersectional classification is more complex than other forms of classification, Cometa and Eson maintain that children can be expected to comprehend literal sentences prior to metaphors. Further, because intersectional classification is not mastered until the later phase of concrete operations, it follows that metaphor comprehension should not emerge until children are well into the stage of concrete operations.

To test their contention, Cometa and Eson administered a battery of Piagetian tasks to 60 children in grades K, 1, 3, 4, and 8. Based on the results, the children were classified as preoperational, concrete operational, intersectional, or formal operational. Next, during individual interviews, each child was asked to paraphrase seven metaphors. If the child provided an adequate paraphrase, he or she was then asked to explain the dual function of the metaphoric term (e.g., "Why do we use the word 'dance' to say that leaves are 'moving'?").

Cometa and Eson concluded that "preoperational children were totally unable to paraphrase (much less explain) metaphors in a manner acceptable to adults" (p. 657). The results of the study were viewed as supporting the contention of metaphor comprehension as an ability based

on the development of intersectional skills, a development which does not occur until the stage of concrete operations, somewhere between the ages of 7 and 11.

Recent Research

Certain researchers now believe that the ability of young children to understand metaphorical language has been underestimated: "Recent research on metaphor comprehension has shown that the late emergence of metaphoric understanding was due, to a large extent, to a confounding of metaphor comprehension with certain other abilities that are independent of metaphor comprehension" (Vosniadou, 1987, p. 871).

Research on children's comprehension of metaphor has often suffered from one or more of three common problems (Vosniadou, Ortony, Reynolds, & Wilson, 1984). First, children's failure to understand metaphors is sometimes confounded with lack of relevant background knowledge. Second, children are often asked to respond to metaphorical statements removed from situational and linguistic contexts. Third, children's comprehension of metaphors is frequently measured in terms of the quality of a paraphrase or explanation.

Thus, by using tasks and materials more appropriate for the knowledge level of young children, recent researchers have provided

evidence of the early emergence of metaphoric understanding (Gentner, 1988; Pearson, 1990, Vosniadou & Ortony, 1983; Vosniadou et al., 1984). Vosniadou and Ortony (1983), for instance, found that 4-year-old children could distinguish between literal and metaphorical comparisons if the children were very familiar with the terms compared (e.g., "Rain is like snow" versus "Rain is like tears"). In addition, based on the results of a categorization task, Vosniadou and Ortony determined that the 4-year-olds were aware that the terms from the metaphorical comparisons belonged to different conventional categories.

Vosniadou and Ortony do note that young children's comprehension of metaphors relies almost entirely on the recognition of perceptual similarities and is thus "likely to be rather limited" (p. 160). They speculate, however, that "as children gain more experience of the world, the richness of their knowledge begins to permit the production and comprehension of nonliteral comparisons which do not rely solely on descriptive properties of objects but on properties of a more abstract and relational nature" (p. 160).

Vosniadou et al. (1984) also obtained evidence of metaphor comprehension in preschool children. Believing that "the success or failure of comprehending metaphorical uses of language depends on the overall

difficulty of the comprehension task" (p. 1590), the researchers had 30 preschoolers act out their interpretations of metaphors using toy figures set up on a specially designed "toy world" board. Each metaphor was presented in the context of a story.

The results of the study were interpreted as suggesting that under certain circumstances even preschool children have some understanding of metaphorical language: "It seems that children can and do draw inferences from the information provided by the linguistic and situational context in which the metaphor occurs--inferences that help them understand the metaphor's implied meaning." Vosniadou et al. point out, however, that this early metaphorical understanding is less complete than that of an adult: "Metaphor comprehension is a progressive development that starts quite early and during which children become better able to perform successively more difficult metaphor-comprehension tasks" (p. 1601).

While Gentner (1988) maintains that some basic metaphoric ability is present at the outset of language use, she makes distinctions in the kinds of metaphors young children understand. Specifically, she argues that children understand metaphors based on attributional (or physical) similarity before they understand metaphors based on relational (or functional) similarity. When asked to interpret the metaphor, "A cloud is

like a sponge," for example, a young child is more likely to recognize the physical similarities between the compared objects (i.e., both are soft and fluffy) than the functional similarities (i.e., both can hold and give off water).

To test her contention, Gentner elicited verbal interpretations of 24 metaphors from ten subjects in each of three age groups: 5- and 6-year-olds, 9- and 10-year-olds, and college students. While the older children and adults tended to produce interpretations based on relational similarities, the younger children tended to produce interpretations based on physical attributes. Gentner interpreted the results as showing a marked increase in relational interpretations with age. She does, however, acknowledge a possible limitation in the use of verbal interpretations, noting that "Children's ability to give an explicit verbal account of their knowledge typically lags behind their ability to demonstrate that knowledge in other ways" (p. 53).

Finally, Pearson (1990) employed an elicited repetition task to demonstrate preschoolers' understanding of metaphors. Citing two decades of research on elicited repetition, Pearson argues that comprehension precedes the ability to imitate: children "generally cannot imitate what they have not already given evidence of in their spontaneous speech" (p. 188).

Pearson's study poses the question of whether children perform with as great an accuracy in their repetitions of metaphorical sentences as compared to their repetitions of semantically well-formed literal sentences, or whether their accuracy in repeating metaphorical sentences more closely parallels their accuracy in repeating anomalous sentences. To answer this question, Pearson had 52 preschoolers, ages 3 to 4, repeat 30 sentences, ten each metaphoric, literal, and anomalous. Anomalous sentences had the same structure as the metaphoric and literal sentences (i.e., subject-verb-object-prepositional phrase), but they combined words that created hard-to-interpret situations (e.g., "Someone climbed a night ship in the refrigerator" or "The rain ate with three voices").

Pearson found that the majority of children showed a clear pattern of approximately equal errors in their repetition of literal and metaphorical sentences, compared to a much greater number of errors in their repetitions of anomalous sentences. These results led Pearson to conclude that "Children are not strangers to metaphor. They are here seen processing the figurative sentences on a par with the literal" (p. 197).

Variables Affecting Comprehension of Metaphors

The early emergence of metaphoric understanding does not mean that this development is complete; rather, children's ability to comprehend figurative language improves throughout the elementary school years (Vosniadou, 1987). What, then, are the variables that affect children's comprehension of metaphor? Researchers have identified content, linguistic form, and context as critical to the understanding of nonliteral language (Gardner & Winner, 1978; Gentner, 1988; Reynolds & Ortony, 1980; Vosniadou, 1987).

Content. The content of a metaphor is, without a doubt, an important determiner of comprehension: "Children can understand only those metaphorical expressions based on conceptual distinctions that they have mastered" (Vosniadou, 1987). Although children, as well as adults, have difficulty understanding metaphors comparing items they know little about, knowledge of the metaphorical vehicle appears to be more important than knowledge of the topic: "Metaphors often introduce an unfamiliar topic in terms of a familiar one; in these cases, it is the knowledge of the familiar vehicle that gets transferred to the less familiar topic" (Vosniadou, 1987). Thus, a child might gain insights into jet

propulsion (an unfamiliar topic) by seeing it in terms of air escaping quickly from a balloon (a familiar vehicle).

Content should also be considered in terms of knowledge of physical attributes versus knowledge of relations. Gentner (1988) contends that young children understand metaphors based on physical similarity before they understand metaphors based on functional similarity. This finding, however, is questioned by Vosniadou (1987). Citing one of the metaphors used in Gentner's study, "Plant stems are drinking straws," Vosniadou states that "It is highly debatable whether one should expect a 5-year-old to know that plant stems have liquids running through them, whereas the knowledge that both plant stems and straws are relatively tall and thin is readily available" (p. 880). Vosniadou then suggests that when the knowledge level is controlled, relational metaphors are as accessible to young children as those based on physical similarities.

Linguistic Form. For young children whose knowledge of language is limited, the linguistic form of a metaphor can sometimes hamper comprehension: "Some of the difficulties children have with metaphors may arise not from their inability to understand nonliteral similarity but from their failure to understand that predicative statements should sometimes be interpreted as comparisons" (Vosniadou, 1987). Similes,

unlike predicative metaphors, contain an overt signal that a comparison is to be made. Thus certain researchers suggest that when metaphorical expressions are presented as similes, children are more likely to understand that a nonliteral interpretation is appropriate (Reynolds & Ortony, 1980; Vosniadou, 1987).

Context. Context is a major factor in comprehension; yet many studies assessing children's comprehension of metaphors utilize tasks requiring the interpretation of metaphorical expressions presented with little or no context (Reynolds & Ortony, 1980). Vosniadou (1987) finds that because young children have limited conceptual and linguistic knowledge, they depend heavily on contextual information to interpret metaphors. Her findings concur with those of Gardner and Winner (1978), who state that "Children are much more likely to decode metaphors successfully if they encounter them in some kind of situational context than if they have to draw, in isolation, upon their knowledge of the meanings of the words which constitute the trope" (p. 130).

Chapter Summary

Major Findings

Many early studies on the development of metaphoric competence seemed to indicate that children master metaphor well after the mastery of literal language (Chukovsky, 1968; Gardner & Winner, 1978; Matter & Davis, 1978; Piaget, 1962). Indeed, the dominant position among early researchers was that the ability to understand metaphors emerges during late childhood or early adolescence (Cometa & Eson, 1978; Gardner & Winner, 1978; Winner, Rosenstiel, & Gardner, 1976).

More recently, however, metaphoric competence has been viewed as a continuous process that emerges during the preschool years and develops gradually until late childhood when the child's conceptual and linguistic knowledge approximates that of the adult (Billow, 1981; Vosniadou, 1987; Vosniadou & Ortony, 1983). Children's comprehension of metaphors is seen as constrained primarily by limitations in their conceptual knowledge and linguistic skills. Thus, one can find evidence of metaphor comprehension in preschool children if the metaphors used are simple and if they occur in appropriate context (Gentner, 1988; Pearson, 1990; Vosniadou & Ortony, 1983; Vosniadou, Ortony, Reynolds, & Wilson, 1984).

Implications of the Findings

The findings of the most recent research support the contention that children can and do construct meaning from metaphor given age-appropriate content and linguistic form. It is this contention upon which the researcher based the present study of children's comprehension of metaphor. Because the findings provide insights into the variables affecting comprehension of metaphor, they were instrumental to the researcher in the selection of metaphors and in the development of a metaphor comprehension task for use in this study.

Chapter 3

RESEARCH METHODOLOGY

Introduction

Recent research indicates that the materials and tasks used in many early studies assessing children's comprehension of metaphor were inappropriate to children's background knowledge and linguistic skills; as a result, the ability of children to understand metaphorical language has been underestimated (Gentner, 1977, 1988; Pearson, 1990; Vosniadou & Ortony, 1983; Vosniadou, Ortony, Reynolds & Wilson, 1984).

The purpose of this research was twofold: (1) to test a seemingly age-appropriate task in order to assess 6- and 7-year-old children's comprehension of commonly used metaphors previously unknown to them; and (2) to use the pretested task to determine individual interpretations of metaphors during in-depth interviews with ten first grade students.

The following questions were examined in this study:

1. What metacognitive strategies do children ages 6 and 7 use to comprehend commonly used metaphors previously unknown to them?

2. How do the findings of this study support/challenge those of previous studies of children's comprehension of metaphor?

Universe and Sample

The students who participated in this study were selected from the same first grade class at one of ten elementary schools in an urban district in the vicinity of San Jose, California. The particular school was selected because of its ethnic diversity. A total of 545 students attend the school, with ethnic distribution as follows: 29% Asian, 24% Caucasian, 22% Hispanic, 15% Filipino, 8% Black, 1% Pacific Islander, and 1% Native American.

Approximately half of the children in attendance are English-as-a-Second-Language (ESL) students. Of these students, 94, or 17% of the total school population, are limited- or non-English speaking. ESL students are classified as Level 1 through 5 according to the Language Assessment Scale (Avila & Duncan). Students in Levels 1 through 3 are designated Limited-English Proficient (LEP) and participate in an ESL pull-out program. Students in Levels 4 and 5 are designated Fluent-English Proficient (FEP) and are fully mainstreamed into regular classes.

The particular first grade class was selected because of the teacher's practice of incorporating into her daily lessons a wide range of literature

and writing activities, providing her students with a broad base of language experiences. Ten students, five boys and five girls, were selected from the total class population of 28. Selection was made (1) from those students who had parental permission to participate in the study and (2) according to the ethnic distribution of the class. Thus, the sample included three Hispanic, three Caucasian, two Asian, one Filipino, and one Black student. Two students were classified as Level 3 and one as Level 5 ESL. Nine students were age 6; one was age 7.

Tools/Instrumentation

A list of 60 commonly used metaphors (see Appendix B) were compiled from the following sources:

1. Poetry collections for children, including The Sun Is a Golden Earring (1962); Reflections on a Gift of Watermelon Pickle (1966); and Sing a Song of Popcorn (1988);
2. Poetry written by children in Koch's Wishes, Lies, and Dreams (1970);
3. A previous study assessing children's comprehension of metaphors, "The Sun Is a Wounded Deer: Children and Metaphor" (Kazemek & Rigg, 1987);

4. Children's speech as recorded by Geller in "Exploring Metaphor in Language Development and Learning" (1984), by Rico in Writing the Natural Way (1983), and by the researcher in day-to-day observations of young children.

From the original list of 60 metaphors, the following 15 were selected for use in the pretest of the metaphor comprehension task:

1. The road is a snake.
2. An anthill is a city.
3. A butterfly is a flying rainbow.
4. The train is a dragon.
5. The storm is a galloping horse.
6. Snowflakes are feathers.
7. Eyes are windows.
8. The steam shovel is a dinosaur.
9. Rain clouds are elephants.
10. The moon is a smiling mouth.
11. Tree branches are arms.
12. Time is a snail.
13. The sky is a warm blanket.
14. Hummingbirds are tiny helicopters.

15. The stars are a necklace.

The preceding metaphors were chosen because they (1) compare objects likely to be familiar to first grade students and (2) allow for a range of interpretations.

Picture and/or contextual prompts were selected for use in conjunction with each metaphor (see Appendix E).

Task Sequence

Based on the review of related literature (Gardner & Winner, 1978; Gentner, 1988; Kazemek & Rigg, 1987; Vosniadou, 1987), the researcher determined the following steps for use in eliciting individual interpretations of the selected metaphors:

1. The child will be asked to describe each object compared in the selected metaphors. If the child is non-responsive, a picture prompt will be shown, and the child will be asked to describe the picture.
2. Once the researcher has determined that the compared objects are in the child's conceptual framework, the child will be asked to interpret one of the selected metaphors.

3. If the child does not offer an interpretation or responds in a literal manner, the metaphor will be restated as a simile, and the child will be asked to interpret the simile.
4. If the child still does not offer an interpretation or responds in a literal manner, the simile will be presented in conjunction with a picture and/or contextual prompt.
5. If after three attempts the child still does not offer an interpretation of the metaphor or maintains a literal response, the research will proceed to the next metaphor.

Sample Task Using the Metaphor, "The Train Is a Dragon"

1. The child is asked to describe "train" and "dragon."
2. After the child has adequately described the two objects, the child's interpretation of the metaphor, "The train is a dragon," is elicited by the researcher in the following manner: "[Child's name], we're going to play a game with language. I'm going to read a sentence aloud, and I'd like you to explain what it means. There is no right or wrong answer. I'm interested in finding out what the sentence means to you."
3. If the child responds "I don't know" or interprets the metaphor in a literal manner (e.g., "There is a dragon beside a train"), the

metaphor is restated as a simile: "What do you think it means when I say, 'The train is like a dragon'?"

4. If the child still offers no response or interprets the simile in a literal manner, a picture prompt is shown and/or a situational context is given: "Let's look at a picture of a train. The train is charging down the hill, huffing and puffing. Clouds of steam are billowing from its smokestacks. The train is like a dragon . . . What do you think that sentence means?"
5. If the child still does not offer an interpretation or maintains a literal response, the researcher proceeds to the next metaphor.

Pretest of Metaphors and Task Sequence

The appropriateness of selected metaphors and task sequence was pretested during in-depth interviews with a 6-year-old girl and a 7-year-old boy known to the researcher. Their responses were tape-recorded and transcribed (see Appendix C).

Based on the results of the pretest, 10 of 15 metaphors were selected for the metaphor comprehension task:

1. The road is a snake.
2. An anthill is a city.
3. A butterfly is a flying rainbow.

4. The train is a dragon.
5. The storm is a galloping horse.
6. Snowflakes are feathers.
7. The steam shovel is a dinosaur.
8. Rain clouds are elephants.
9. Tree branches are arms.
10. Hummingbirds are tiny helicopters.

Criteria for selecting the preceding metaphors included the children's familiarity with the compared objects, their range of interpretations for a single metaphor, and their apparent interest in specific comparisons.

Task sequence was judged successful in facilitating the children's understanding of the task and in eliciting nonliteral interpretations of the metaphors. The children who participated in the pretest interpreted the metaphors without the aid of picture or contextual prompts (Step 4 of the metaphor comprehension task). However, the researcher decided to retain this step, allowing for the possibility that children who are limited-English speaking or who have scanty background information may require additional aid in interpreting the metaphors.

Data Collection

The pretested metaphor comprehension task was administered orally and individually to ten first grade children during two in-depth interviews held one week apart. During the first interview, children were asked to describe the 20 objects compared in the selected metaphors. During the second interview, children were asked to interpret the metaphors. Responses were tape-recorded and transcribed (see appendix D).

Treatment of Data

Individual interviews with each of ten first graders were reported and discussed. Interpretations of metaphors were then collectively analyzed according to literal, figurative, and incomplete responses at each step of the metaphor comprehension task. Next, interpretations were analyzed to determine the metacognitive strategies children use in their attempts to gain meaning from metaphors. In this analysis, two main areas were considered:

1. What kinds of resemblances were noted by the first graders?

Specifically, did the first graders focus on physical attributes (i.e., shape, color, size, touch/texture, sound, motion), functional attributes, or both, in determining nonliteral similarities between compared objects?

2. What firsthand experiences, background information, and/or logical processes did the children apply in interpreting the metaphors?

Finally, these data were discussed in terms of supporting or challenging previous studies on children's comprehension of metaphor.

Chapter 4

DISCUSSION OF DATA

Introduction

The purpose of this study was to assess 6- and 7-year-old children's comprehension of commonly used metaphors previously unknown to them. To this end, in-depth interviews utilizing a pretested metaphor comprehension task were conducted individually with ten first grade students.

The research addressed the following questions:

1. What metacognitive strategies do children ages 6 and 7 use to comprehend commonly used metaphors previously unknown to them?
2. How do the findings of this study support/challenge those of previous studies of children's comprehension of metaphor?

To guide the reader through the discussion of data, the metaphors offered for interpretation and the steps of the metaphor comprehension task are here restated.

Metaphors Used. The first graders were asked to interpret each of the following age-appropriate metaphors:

1. The road is a snake.
2. An anthill is a city.
3. A butterfly is a flying rainbow.
4. The train is a dragon.
5. The storm is a galloping horse.
6. Snowflakes are feathers.
7. The steam shovel is a dinosaur.
8. Rain clouds are elephants.
9. Tree branches are arms.
10. Hummingbirds are tiny helicopters.

Task Sequence. The following steps were used in eliciting interpretations of the preceding metaphors:

1. The child was asked to describe each object compared in the selected metaphors. If the child was nonresponsive, a picture prompt was shown, and the child was asked to describe the picture.
2. The child was asked to interpret one of the selected metaphors.
3. If the child did not offer an interpretation or responded in a literal manner, the metaphor was restated as a simile, and the child was asked to interpret the simile.

4. If the child still did not offer an interpretation or responded in a literal manner, the simile was presented in conjunction with a picture and/or contextual prompt.

In-Depth Interviews

Interviews with each of ten first grade students are reported and discussed. (For transcripts of the interviews, see Appendix D.) The discussion of each interview opens with the student's personal data, including age, ethnicity, and language spoken in the home. Next, student performance during Step 1 of the metaphor comprehension task, the vocabulary check, is discussed. Finally, the kinds of interpretations given by the student during Steps 2 through 4 of the metaphor comprehension task are considered.

Student #1: Debra

Debra is 7 years old and of Hispanic descent. English is her first language and is spoken by both parents in the home.

During Step 1 of the metaphor comprehension task, the vocabulary check, Debra demonstrated a wide range of firsthand experiences and background information. She stated, for example, that she'd seen a "steam shovel" at her "dad's work--at construction"; that her grandmother feeds

hummingbirds "from jars"; that she'd seen "a garden snake" at the park; and that she'd petted a horse with "big yellow teeth" at a farm.

When asked to interpret the first two metaphors, Debra gave literal responses. "The road is a snake," for instance, was interpreted as "The snake is going on the road." When the metaphors were restated as similes, however, Debra readily understood that nonliteral interpretations were expected. She thus determined that the road is like a snake because "it would be slippery and sort of slimy." Debra then gave appropriate nonliteral interpretations for six of the eight remaining metaphors on the first attempt.

No picture or contextual prompts were used.

Student #2: Jennifer

Six-year-old Jennifer is Caucasian (Portuguese). Both English and Portuguese are spoken in the home. Although Jennifer was classified as Level 3 ESL at the end of her kindergarten year, her first grade teacher believes her to have a good command of English and does not have her participate in an ESL pull-out program.

During the vocabulary check of the metaphor comprehension task, Jennifer gave short responses that revealed little of her firsthand experiences or background information. For three terms--"anthill,"

"hummingbird," and "steam shovel"--she either gave no response or responded "I don't know." For those terms, she was shown a picture prompt and was asked to describe the picture.

Jennifer's interpretations of the metaphors focused almost entirely on the colors of the compared objects. Rather than looking for shared attributes, Jennifer frequently gave a color for only one of the objects compared in the metaphor. When asked to interpret "The storm is a galloping horse," for example, she responded, "It's blue."

Picture and/or contextual prompts were used in conjunction with four of the metaphors. The prompts, however, had little effect on Jennifer's responses. For instance, when shown a picture of a steam shovel in conjunction with the simile "The steam shovel is like a dinosaur," Jennifer's response was once again limited to naming colors: "It has red, pink, yellow."

Student #3: Alicia

Alicia is 6 years old and of Hispanic descent. English only is spoken in the home.

During the vocabulary check of the metaphor comprehension task, Alicia gave vivid, detailed descriptions. For instance, she described a road as "cement that has spots with lights on them and lines" and an elephant as

having "teeth sticking up and a nose coming down and big ears and big feet."

When asked to interpret individual metaphors, Alicia readily made nonliteral connections between compared objects. Alicia gave a literal response for only one metaphor, "An anthill is a city." When this metaphor was restated as a simile, Alicia gave an appropriate nonliteral interpretation.

Alicia sometimes used gestures and play-acting in her interpretations. When interpreting, "The storm is a galloping horse," for instance, she stated that both are "shaky" and then demonstrated this shared shakiness first by making lightning zigzags through the air with her finger and then by pretending to be a galloping horse.

No picture or contextual prompts were used.

Student #4: Kenny

Six-year-old Kenny is Japanese. English only is spoken in the home.

During the vocabulary check of the metaphor comprehension task, Kenny demonstrated adequate background information. He talked, for instance, of seeing an elephant at the zoo, horses at a fair, hummingbirds at his "auntie's," and a snake in his kindergarten class. As he described the objects, Kenny sometimes used metaphors of his own invention. He stated,

for example, that a butterfly "looks like two hearts put together" and that feathers "look kind of like leaves."

When asked to interpret the first two metaphors, Kenny either gave no response or responded in a literal manner. When the metaphors were restated as similes, however, Kenny provided appropriate nonliteral interpretations. He found, for instance, that an anthill is like a city because "The ants walk around the anthill, and people walk around a city." He then readily interpreted seven of the eight remaining metaphors in a nonliteral manner on the first attempt.

No picture or contextual prompts were used.

Student #5: Michael

Michael is 6 years old and of Hispanic descent. Both English and Spanish are spoken in the home. Michael was classified as level 5 ESL, or Fluent-English Proficient, upon kindergarten entrance.

During the vocabulary check of the metaphor comprehension task, Michael demonstrated a wide range of firsthand experiences and background information. Michael described, for example, the ant farm he has at home, the life cycle of a butterfly, and the snakes he had seen at a local pet shop.

When asked to interpret individual metaphors, Michael gave literal responses for seven out of ten metaphors. "The road is a snake," for example, was interpreted as "You saw a big snake on the road."

When the metaphors were restated as similes, Michael maintained a literal response four out of seven times. Thus, "The train is like a dragon" was interpreted, "The train would be on the dragon, and the dragon would be standing up blowing fire."

In Michael's case, picture and/or contextual prompts were effective in eliciting nonliteral interpretations. For example, when shown a picture of an anthill in conjunction with the simile, "The anthill is like a city," Michael responded, "It has grownups and babies and roads and passages like a city."

Student #6: Diane

Six-year-old Diane is Asian. Chinese is her first language and is spoken exclusively in the home. Diane was classified as Level 1 ESL upon kindergarten entrance. At the beginning of first grade, Diane was classified as level 3 ESL. Her first grade teacher believes her sufficiently English proficient to be fully mainstreamed in the regular class and does not have her participate in an ESL pull-out program.

During the vocabulary check of the metaphor comprehension task, Diane gave brief descriptions of the objects, demonstrating some background knowledge. When asked to describe a storm, for example, she stated, "It rains. There's lightning. I'm scared of lightning, and my mom is too."

In some cases, Diane's phrasing or word choices were indicative of English used as a second language. When asked to describe a dinosaur, for instance, she responded, "People are scared of. They look scary." She described a train as consisting of "squares," a tree branch as "something used to climb," and said of a rainbow, "That's when it stops the rain."

When asked to interpret individual metaphors, Diane gave no response on the first try six out of ten times. When the metaphors were restated as similes, she gave an appropriate nonliteral interpretation four out of six times.

Picture and contextual prompts were used in conjunction with the remaining two metaphors. In both cases, Diane used contextual clues from the prompts to formulate an interpretation based on nonliteral similarities. After hearing a poem about a steam shovel, for instance, Diane used a line directly from the poem to explain how a dinosaur is like a steam shovel: "Because he snorts and roars like the dinosaurs."

Student #7: Robert

Robert is 6 years old and Caucasian. English is spoken in the home.

During the vocabulary check of the metaphor comprehension task, Robert demonstrated a wide range of firsthand experiences and background information. He talked, for example, of his visits to two museums "that have fake dinosaurs that move," of learning about snow "crystals" while watching "Mr. Wizard's World" on television, of learning about steam shovels when his mother read Mike Mulligan aloud to him.

When asked to interpret the first three metaphors, Robert either gave no response or responded in a literal manner. When the metaphors were restated as similes, Robert still responded "I don't know" or "I'm not sure."

Picture prompts were then used in conjunction with the similes. For two out of three similes, Robert used clues from the pictures to formulate interpretations based on nonliteral similarities. Thus, for the simile, "The road is a snake," Robert studied a picture of a curvy road and responded, "It has a lot of turns in it. And it looks like it's slithering."

Robert then gave appropriate nonliteral interpretations for five of the seven remaining metaphors on the first attempt.

Student #8: Justin

Justin is 6 years old and Caucasian. English is spoken in the home.

During the vocabulary check of the metaphor comprehension task, Justin gave imaginative, detailed descriptions, revealing a wide range of firsthand experiences and background information. When asked to tell about a dinosaur, for instance, Justin stated, "They live in the mountains. The tyrannosaurs rex is a beast. And the birds that fly around are dangerous, too. They died many years ago, like one thousand years." After describing a rain cloud as "Something that drops rain," he went on to say that "If the clouds turn yellow that means a tornado is going to come--I saw that on 'Rescue 911.'"

When asked to interpret individual metaphors, Justin either gave literal responses or said, "I don't know," for the first four metaphors. In fact, Justin was adamant in his refusal to see nonliteral similarity. When asked to interpret, "The road is a snake," for example, Justin responded, "It means it's wrong . . . the road isn't a snake, it's cement." When the metaphor was restated as a simile, Justin still maintained a literal response: "I'd say, 'No way.' I'd say, 'It looks like a street.'" When shown a picture prompt, Justin grudgingly admitted that the road might resemble a snake: "It looks like a maze. It's making all the snake's forms."

When asked to interpret the remaining six metaphors, Justin readily noted nonliteral similarities. He nevertheless kept his interpretations firmly rooted in the concrete. When interpreting "The train is a dragon," for instance, he replied, "Both go fast--they could go faster than a speeding bullet. But I don't think a dragon's really like a train."

Student #9: Lakia

Six-year-old Lakia is black. English is spoken in the home.

During the vocabulary check of the metaphor comprehension task, Lakia gave brief, but adequate, descriptions of the objects. Her responses revealed some firsthand experiences and background information. She talked, for instance, of seeing dinosaurs "in books and pictures and on boxes," of sledding with her aunt at Lake Tahoe, and of the time her "little baby cousin fell off a horse."

When asked to interpret individual metaphors, Lakia gave brief, but appropriate, nonliteral responses for six of the ten metaphors. Picture and/or contextual prompts were used in conjunction with three metaphors. In all three cases, the prompts aided Lakia in determining nonliteral similarities between compared objects. After hearing a poem about a storm, for instance, Lakia determined that a galloping horse is similar to a storm because "it runs, and the wind goes, too."

Student #10: Alan

Alan is 6 years old and Filipino. English is his first language.

During the vocabulary check of the metaphor comprehension task, Alan demonstrated a wide range of firsthand experiences and background information. He described, for instance, a caterpillar making "a cocoon so it could sleep. Then it turns into a butterfly or a moth." When asked to describe a dragon, he responded, "Something that puts fire from its mouth to burn towns and cities and fight warriors. They're not real."

When asked to interpret the first three metaphors, Alan either gave no response or responded in a literal manner. When the metaphors were restated as similes, Alan gave appropriate nonliteral interpretations for two out of three similes. He then gave appropriate nonliteral interpretations for seven of the remaining eight metaphors on the first attempt.

Picture prompts were used in conjunction with two metaphors. In one case, the picture aided Alan in discerning nonliteral similarities. Thus, when shown a picture of an anthill, Alan determined that an anthill is like a city, "'Cause they can walk down to their homes, and people walk to their homes on sidewalks. They carry food like people and have babies like people."

Figurative Versus Literal or Incomplete Responses

The first graders' interpretations of individual metaphors were classified as literal, figurative, or incomplete responses. Definitions and examples of each type response are given in Table 1 on the following page.

Interpretations of metaphors were then collectively analyzed according to literal, figurative, and incomplete responses at each step of the metaphor comprehension task. The number of times each type of response was given by the students at each step of the task is presented in Table 2, page 62.

Step 1 of the metaphor comprehension task consisted of a vocabulary check during which first graders were asked to describe the objects compared in the selected metaphors. Because this step did not involve the interpretation of metaphors, it was not included in the analysis of literal, figurative, and incomplete responses.

During Step 2 of the metaphor comprehension task, first graders were asked to interpret selected metaphors. The majority of children's responses (54 out of 100) were classified as figurative.

During Step 3 of the metaphor comprehension task, metaphors interpreted in a literal or incomplete manner were restated as similes. The children were then asked to interpret the similes. Once again, the majority of responses (24 out of 46) were classified as figurative.

Table 1

Responses to the Sample Metaphor, "The Road is a Snake"

Type Response	Definition	Examples From Student Interviews
Literal	The child (a) denies the connection between compared objects; (b) maintains the literal meaning of the sentence by creating a magical world; (c) maintains the literal meaning of the sentence by altering the relationship between compared objects.	a) The road isn't a snake, it's cement. b) The road moves, and it has fangs. c) There's a big snake on the road.
Figurative	The child offers a nonliteral interpretation based on similarities between compared objects.	The road is slippery and sort of slimy. They're both long and black. The road has a lot of turns, and it looks like it's slithering. The road makes all the snake's forms.
Incomplete	The child (a) does not respond or responds, "I don't know"; (b) offers an interpretation that focuses on only one of the objects compared in the metaphor.	a) I don't know; I'm not sure. b) The snake is all green.

Table 2

Number of Literal, Figurative, and Incomplete Responses
at Each Step of the Metaphor Comprehension Task

Step	Total # of Responses	Type of Response		
		Literal	Figurative	Incomplete
Step 1: Descriptions of compared objects	--	--	--	--
Step 2: Interpretations of metaphors	100	13	54	33
Step 3: Interpretations of similes	46	6	24	16
Step 4: Interpretations of similes in conjunction with prompts	21	1	13	7

Finally, during Step 4 of the metaphor comprehension task, similes interpreted in a literal or incomplete manner were presented in conjunction with picture and/or contextual prompts. Children were once again asked to interpret the similes. A majority of responses (13 out of 21) were classified as figurative.

Findings. The first graders gave a majority of appropriate figurative responses at each step of the metaphor comprehension task. Thus, for the most part, the children in this study are seen as comprehending age-appropriate metaphors.

The task sequence--moving from the interpretation of metaphor, to the interpretation of simile, to the interpretation of simile in conjunction with picture and/or contextual prompt--was clearly a learning tool. During the individual interviews, four children (Debra, Kenny, Justin, and Alan) gave literal or incomplete responses when asked to interpret the first few metaphors. When the metaphors were restated as similes, however, the children readily understood that nonliteral interpretations were expected. They then gave appropriate nonliteral interpretations for the majority of remaining metaphors.

In addition, picture and/or contextual prompts were particularly effective in helping three children (Michael, Robert, and Lokia) discern nonliteral similarities. After using prompts two or three times, the children gave appropriate figurative interpretations for the majority of remaining metaphors on the first attempt.

Research Question #1: What metacognitive strategies do children ages 6 and 7 use to comprehend commonly used metaphors previously unknown to them?

Metacognition implies an active and conscious persuance of meaning. For the purpose of this research, metacognitive strategies are those strategies self-determined for use by the first graders in their attempts to gain meaning from the metaphors.

Despite the range of the first graders' responses to the metaphors, from limited literal interpretations to interpretations based on the noting of highly imaginative relationships, certain patterns of strategy use emerged. The discussion of strategy use thus addresses two main areas: (a) the kinds of resemblances noted by the first graders in their attempts to find nonliteral connections between compared objects, and (b) the firsthand experiences, background information, and/or logical processes applied by the first graders in interpreting the metaphors.

A. Similarities Noted by the First Graders

When asked to interpret the metaphors, the first graders focused on specific physical and/or functional attributes in determining similarities between compared objects. Table 3 presents the number of times a particular aspect (i.e., shape, color, size, sound, touch/texture, motion, or

Table 3

Similarities Noted by First Graders

Metaphor	Physical Attributes						Functional Attributes
	Shape	Color	Size	Sound	Touch/ Texture	Motion	
The road is a snake.	4	4	3		2	1	
An anthill is a city.	5		1				5
A butterfly is a flying rainbow.	2	10					
The train is a dragon.	3	1	3	1		3	7
The storm is a galloping horse.		1		4		5	
Snowflakes are feathers.	3	5			4	6	
The steam shovel is a dinosaur.	6		3	2		4	3
Rain clouds are elephants.	5	7	2	1			1
Tree branches are arms.	5	1	1			4	3
Hummingbirds are tiny helicopters.	3	1		1		2	7
Subtotals	36	30	13	9	6	25	26
Totals						119	26

function) was used as the basis of comparison in the first graders' nonliteral interpretations of each metaphor.

For the most part, the first graders focused on physical similarities between compared objects. Indeed, the children made references to physical similarities four times more frequently than references to functional similarities. However, this focus on physical similarities may relate more to the particular metaphors offered for interpretation, than on any predisposition on the part of the first graders to discern physical rather than functional similarity.

In fact, certain metaphors (e.g., "The train is a dragon," "An anthill is a city," and "Hummingbirds are tiny helicopters") lent themselves to an interpretation based on function. In these cases, children frequently noted both physical and functional similarities. Thus, when asked to interpret, "The train is a dragon," various children responded, "They're both big, long. And they both blow out steam"; "The train spits flames and the dragon spits fire"; "Cause it could put up smoke. A dragon uses fire--it comes out of his mouth. Both move--a train uses wheels and the dragon has legs to move."

Interpretations based on function were also given for the metaphor, "An anthill is a city." Such interpretations included, "People live in a city,

and ants live in the anthill" and "It's where ants get things to eat. We get something to eat in a supermarket in the city."

Finally, children determined that hummingbirds are like helicopters because "They both fly, and some helicopters can be blue like hummingbirds" and "They both have wings . . . and feet--the helicopter's feet and the bird's feet--they both land."

Children also noted functional similarity in some unusual interpretations. One child, for instance, determined that rain clouds are elephants "Because elephants could drink water and splat it out of their trunks. That's like a rain cloud drops rain." Another child found that a steam shovel is like a dinosaur because "both can make tracks."

B. Application of Firsthand Experiences, Background Information, and/or Logical Processes

The metacognitive strategies used by the first graders to gain meaning from metaphors included the application of firsthand experiences, background information, and/or logical processes to discern nonliteral similarities between compared objects. Table 4, on the following page, presents the number of times each strategy was applied by the first graders in their interpretations of individual metaphors.

Table 4

First Graders' Application of Firsthand Experiences, Background Information, and/or Logical Processes in Their Interpretations of Metaphors.

Metaphor	Firsthand Experience	Background Information	Logical Processes
The road is a snake.	9	5	1
An anthill is a city.	7	3	2
A butterfly is a flying rainbow.	10	1	
The train is a dragon.	4	9	1
The storm is a galloping horse.	8	1	2
Snowflakes are feathers.	10	3	1
The steam shovel is a dinosaur.	2	9	1
Rain clouds are elephants.	10	1	1
Tree branches are arms.	8		
Hummingbirds are tiny helicopters.	9		
Totals:	77	32	10

Firsthand experiences were revealed during Step 1 of the metaphor comprehension task as students described the objects contained in the metaphors. Students mentioned, for example, their visits to zoos, parks, farms, museums, fairs, and pet shops. Several children told of firsthand experiences with a "green" snake belonging to their kindergarten teacher. Others spoke of watching hummingbirds feed, of seeing "steam shovels" and cranes at construction sites, and of taking trips on trains. One child mentioned having an ant farm and gathering feathers for his art collection; another talked of seeing "cracks in the sky" during a storm and of seeing a rainbow "shine up."

As evidenced in Table 4, the first graders applied these firsthand experiences in a majority of their interpretations of the metaphors. A child who had watched a "steam shovel" at a construction site, for example, coupled this experience with prior knowledge of dinosaurs to determine that a steam shovel "would make loud noises, and it would try to eat stuff" like a dinosaur. A first grader who reported hearing a hummingbird "hum" decided that hummingbirds are tiny helicopters "Because helicopters could make noise like the hummingbirds." Another first grader who described the "really quick" hummingbird he had seen in his aunt's yard determined that hummingbirds are tiny helicopters "Because their wings go fast like the

top of the helicopter." A child who had visited San Francisco applied her knowledge of that city in determining shape as the attribute shared by an anthill and a city: the anthill "would be pointy . . . some cities have a pointy ending on the top. Sometimes in San Francisco the buildings are pointy on top." Finally, a child who reported seeing snakes that "look like ropes" at the zoo determined that the road is a snake because the road "looks like it's slithering."

In other instances, children relied on background information--on information gleaned from such secondhand sources as television programs, books, and class discussions--to help them make sense of the metaphors. In setting up Table 4, background information was in some cases inferred, particularly in the first graders' interpretations of metaphors involving dinosaurs and dragons. Information applied through use of a picture and/or contextual prompt was also considered background information. Most frequently, however, children revealed background information during Step 1 of the metaphor comprehension task as they described the objects compared in the metaphors.

Several children, for example, told of learning about dragons from storybooks. One child told of learning about steam shovels while listening to his mother read Mike Mulligan. Two children described the life cycle of

the butterfly, information recalled from their study of silk worms in kindergarten. Children also referred to television programs such as "Rescue 911," "Mr. Wizard's World," and the science fiction program, "The Flash."

The first graders applied this background information in their interpretations of the metaphors. One child, for example, used knowledge of storybook trains and dragons to determine that "the train has the same as the dragon's fire. The train spits flames, and the dragon spits fire." A child who reported seeing a steam shovel on television coupled this experience with prior knowledge of dinosaurs and found that a steam shovel "has a mouth like a dinosaur and a long neck like a dinosaur. And it gets rocks like a dinosaur--it moves like a dinosaur." Also, a child who reported learning that snowflakes are crystals while watching "Mr. Wizard's World" determined that snowflakes are feathers because "They both have points."

Finally, in a majority of responses, logical processes were revealed as children used a step-by-step progression in reaching an interpretation. Thus one child, concentrating on a functional connection between a steam shovel and a dinosaur, decided that "They both move--one has wheels, and the other has legs. And both can make tracks."

Another child arrived at both speed and sound as attributes shared by a storm and a galloping horse in this manner: "Both are fast. Lightning and thunder are fast. And they make lots of noise like a horse. Once the horse goes fast it's like thunder, like "Clump, clump." This same child first discerned softness as the attribute common to snowflakes and feathers. He then progressed to a connection between a snowball fight and a pillow fight: "Once you rip the pillow, feathers come out, and that looks like snow."

A child who was having difficulty understanding that nonliteral interpretations were expected came to this realization upon being shown a picture of a meandering road: "There's lots of designs. It looks like a maze (tracing the picture of the road with his finger). It's making all the snake's forms."

A last note of interest is the way certain children determined similarities between compared objects but then qualified their interpretations by noting differences. Thus one first grader found that snowflakes are feathers because "They're both white, and they're both tickly. But ice melts, and the feather still lasts." Another first grader found that hummingbirds are tiny helicopters because both fly, but added that "the helicopter can't drink water, but a hummingbird can." This same first

grader determined that a tree branch is like an arm "Cause it has little fingers . . . the end that holds the leaves. But they're five times longer than fingers." There is a pattern of thought behind these interpretations, a willingness to engage in the "game" of finding nonliteral similarities as long as conventional categories are kept firmly in sight.

In sum, the first graders in this study are seen as consciously pursuing meaning from metaphors. The metacognitive, of self-determined, strategies used by the students to gain meaning from metaphors included the application of firsthand experiences, background information, and/or logical processes to discern similarities based on the physical and/or functional attributes of the objects compared.

Research Question #2: How do the findings of this study support/challenge those of previous studies of children's comprehension of metaphor?

For the most part, the first graders in this study constructed meaning from age-appropriate metaphors through the application of firsthand experiences, background information, and/or logical processes. The majority of their responses to the metaphors were figurative as opposed to literal or incomplete. These findings challenge those of earlier studies indicating that children interpret metaphors in a concrete manner until late

childhood or early adolescence (Cometa & Eson, 1978; Gardner & Winner, 1978; Winner, Rosenstiel, & Gardner, 1976).

The first graders in this study did not "actively reject invitations to metaphorize" (Gardner & Winner, 1978, p. 131). Indeed, they often used metaphors rather than literal language in their descriptions of objects and in their interpretations of metaphors. Thus, at various times, children referred to lightning as "cracks in the sky"; said of a feather, "It looks like a leaf"; of a butterfly, "It looks like two hearts put together"; of snakes, "They look like ropes"; and of a curvy road, "It looks like a maze."

Children also used figurative expressions to explain the metaphors they were asked to interpret. Thus one first grader determined that a road is a snake because "It looks like it's slithering." When asked why the storm is like a galloping horse, another first grader responded, "The rain falls on umbrellas and makes sounds like feet stomping." Finally, a first grader found that a train is a dragon because "Both go fast--they could go faster than a speeding bullet."

While certain children did seem mindful of conventional categories in their interpretations (e.g., snowflakes are feathers because "They're both white, and they're both tickly. But ice melts, and the feather still lasts"), all the children in this study were willing to engage in the metaphoric "play"

initiated by the researcher. This finding can be seen as supporting Billow's (1981) contention that metaphoric production and play can be brought forth "on demand" (p. 443) even as children strive to consolidate conventional categories during the elementary school years.

The first graders did tend to focus on physical attributes in their interpretations of the metaphors (Gentner, 1988). Nevertheless, for certain metaphors (e.g., "The train is a dragon," "An anthill is a city," and "Hummingbirds are tiny helicopters") children frequently gave interpretations based on functional similarity. Thus, as Vosniadou (1987) suggests, when the knowledge level is controlled, metaphors based on function are accessible to young children.

Finally, although Aristotle asserted that "to be master of metaphor . . . is the one thing that cannot be learnt from others" (Poetics, Chapter 22), the success of the task sequence in eliciting nonliteral responses shows metaphor comprehension to be a learning process. For the most part, children who gave literal responses when asked to interpret the first few metaphors, readily understood that nonliteral interpretations were expected when the metaphors were restated as similes. They then applied this new knowledge to the task, giving appropriate nonliteral responses for the remaining metaphors.

In sum, the children in this study are seen as comprehending metaphors given age-appropriate content, linguistic form, and contextual information. The findings thus support the view of recent researchers who contend that children's comprehension of metaphors is constrained primarily by limitations in their conceptual knowledge and linguistic skills (Gentner, 1988; Pearson, 1990; Vosniadou & Ortony, 1983; Vosniadou, Ortony, Reynolds, & Wilson, 1984).

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Recent research indicates that the materials and tasks used in many early studies assessing children's comprehension of metaphor were inappropriate to children's background knowledge and linguistic skills; as a result, the ability of children to understand metaphorical language has been underestimated (Gentner, 1977, 1988; Pearson, 1990; Vosniadou & Ortony, 1983, Vosniadou, Ortony, Reynolds, & Wilson, 1984).

The purpose of the present study was to assess 6- and 7-year-old children's comprehension of commonly used metaphors previously unknown to them. To this end, in-depth interviews utilizing a pretested metaphor comprehension task were conducted individually with ten first grade students. During the interviews, each child was asked to interpret ten age-appropriate metaphors. The following task sequence was used: (1) The child was asked to describe the objects compared in each metaphor; (2) The child was then asked to interpret a metaphor; (3) If a literal or incomplete response was given, the metaphor was restated as a simile, and the child was asked to interpret the simile; (4) If a literal or incomplete

response was given, the child was asked to interpret the simile in conjunction with a picture and/or contextual prompt. Interviews were tape-recorded and transcribed.

Interpretations of the metaphors were collectively analyzed to determine the number of literal, figurative, and incomplete responses given at each step of the metaphor comprehension task. Next, interpretations were analyzed to determine the metacognitive strategies used by the children to comprehend the metaphors. Finally, the data were discussed in terms of supporting or challenging previous studies on children's comprehension of metaphor.

Conclusions

For the most part, the children in this study are seen as actively constructing meaning from age-appropriate metaphors. The metacognitive, or self-determined, strategies used by the children included the application of firsthand experiences, background information, and/or logical processes to discern similarities based on the physical and/or functional attributes of the objects compared.

The majority of the first graders' responses to the metaphors at all steps of the metaphor comprehension task were figurative as opposed to literal or incomplete. The sequence of the metaphor comprehension task--

moving from the interpretation of metaphor, to the interpretation of simile, to the interpretation of simile in conjunction with picture and/or contextual prompt--was clearly a learning tool in helping children understand that nonliteral interpretations were expected.

The findings of this study support the view of recent researchers who contend that children's comprehension of metaphors is constrained primarily by limitations in their conceptual knowledge and linguistic skills (Gentner, 1988; Pearson, 1990; Vosniadou & Ortony, 1983; Vosniadou, Ortony, Reynolds, & Wilson, 1984). Thus, given age-appropriate content and simple, direct tasks, children can and do construct meaning from metaphor (Vosniadou, 1987).

Recommendations

Classroom Implications. The prevalence of metaphor in everyday discourse, coupled with the belief that children can and do construct meaning from metaphor, argues for a comprehensive exploration of metaphor in elementary language arts programs. It is disappointing, however, to see how metaphor is dealt with in many classrooms, as too often teachers view metaphor only in its most restrictive sense as an ornament to creative writing. They treat metaphor as an academic skill

that requires formal instruction, rather than as an integral part of language accessible to children of all ages.

Teachers should thus broaden the exploration of metaphors to include not only those metaphors encountered in literature but those found in real-life situations. For instance, students might become aware of the pervasiveness of metaphor in everyday speech and writing by exploring the connotative uses of such dichotomous pairs as "up" and "down," "cool" and "hot," "black" and "white," "deep" and "shallow," "in" and "out." In addition, students might keep a journal of metaphors encountered in television commercials, product labels, newspapers, and popular music. Such activities will help students (and teachers) become aware of the importance of metaphor in defining our everyday realities--in determining the ways we experience life and the ways we think of ourselves and others.

One of the primary functions of metaphor is to promote understanding. Indeed, children spontaneously use metaphor as a bridge between old and new experiences (e.g., a 6-year-old finding that an earthquake "felt like giant cans were rolling under the house"). Teachers can thus make use of metaphor to help students grasp content area concepts. During a geology lesson, for instance, a teacher might make use of a picture book by Lisa Westberg Peters, The Sun, the Wind, and the

Rain (1988). This book makes clear the geological evolution of a mountain by presenting it in terms of the building and erosion of a child's sand "mountain" on the beach.

Finally, metaphor can be seen as a reflection of culture. Teachers might have students explore metaphors from other cultures as presented in Natalia Belting's The Sun is a Golden Earring (1962). Teachers might also have students explore conventional metaphors that help to structure our cultural realities. Not all cultures, for example, share the mainstream American view that "Time is money." Many Native Americans, for instance, view time not as a valuable commodity but as a landscape through which one travels (Kazemek & Rigg, 1987).

In short, metaphor can be a valuable tool in helping children understand the world around them. The first step, however, is for teachers themselves to develop an awareness and understanding of the pervasiveness of metaphor in everyday thought and language.

Possible Further Studies. While the present study examined the metacognitive strategies used by 6- and 7-year-old children to gain meaning from metaphors, a further study might use the Gesell assessment to establish the developmental level of each child. The study could then examine any correlations between developmental level and the type of

strategies employed by children in interpreting metaphors. Do children at a higher developmental level, for instance, make a greater use of logic in their interpretations?

The present study touched upon the physical and/or functional aspects noted by children in determining nonliteral similarities between compared subjects. A further study might specifically examine the aspects children compare given age-appropriate dual metaphors, or those metaphors that lend themselves to interpretations based on both physical and functional similarities. Thus given the metaphor, "A cloud is like a sponge," are children more likely to discern similarities based on physical attributes (i.e., both clouds and sponges are soft and fluffy) or similarities based on functional attributes (i.e., both clouds and sponges can hold and give off water)?

In the present study, children interpreted similes in conjunction with picture prompts during the final step of the metaphor comprehension task. A further study might specifically examine the contextual clues children glean from pictures and apply in their interpretations of metaphors. A researcher might, for example, have children interpret age-appropriate metaphors and then, after perhaps a week, have the children interpret the same metaphors in conjunction with picture prompts. Do the children

maintain or modify their original interpretations after being shown a picture prompt? Do they, for instance, move from literal to figurative interpretations of the metaphors? Do they focus on different physical or functional attributes in discerning similarities between compared objects?

Another study might examine the way children depict age-appropriate metaphors through original artwork. Do the children's pictures represent literal or figurative interpretations of the metaphors? The children's own explanations of their artwork could be tape-recorded and transcribed, providing further insights into the children's perspectives.

Finally, given the multicultural nature of our schools, further studies might examine the role played by cultural orientation in children's understandings of metaphor. One study, for instance, might determine the firsthand experiences and prior knowledge applied by children of various ethnic/cultural backgrounds in interpreting age-appropriate metaphors drawn from mainstream American discourse. Another study might involve ascertaining age-appropriate metaphors from various cultures worldwide. Interpretations of the metaphors could then be elicited from children of differing ethnic/cultural backgrounds. What patterns of thought and strategy use are common to the interpretations? What differences in the children's responses reflect cultural orientations?

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APPENDIX A

February 6, 1991

Dear Parents,

Next week, a graduate student from San Jose State University will visit our classroom to complete her research on first grade students' understandings of metaphor. Her name is Kathy Conradson, and I have attended many classes with her at the university. She is a teacher with a valid California State teaching credential and a Reading Specialist credential. She would like your permission to interview your child about metaphor. The interview will take place in our first grade office. She will read a metaphor (The cloud is a cotton ball. The lawn is a carpet.) and ask your child what it means. She will tape-record your child's response to each of ten metaphors. The time involved is only about ten minutes.

Your child's responses will be included in her Master's thesis. Your child will be identified as Student A or by his or her first name only, not by his or her full name. She needs to include at least ten students in her research. I hope that you will agree to have your child participate in this project.

Thank you for your help,

Theresa Bernal

Theresa Bernal

-----Please cut here and return the permission slip by Friday 2/8-----

I grant permission to Kathy Conradson and Theresa Bernal to include my child, _____, in the research on metaphors to be conducted in February 1991.

Signature of Parent or Guardian

APPENDIX B

SIXTY AGE-APPROPRIATE METAPHORS

The following metaphors were gleaned from children's literature, from poems written by children, and from children's speech. They were selected as age-appropriate for this study because they compare objects likely to be familiar to first grade students.

1. Butterflies are flying rainbows.
2. The moon in a smiling mouth.
3. The moon is a banana.
4. The moon is an orange.
5. The moon is a white cat.
6. The moon is a sister.
7. The sun is a yellow balloon.
8. The sun is a golden earring.
9. The sun is a towel.
10. Stars are eyes.
11. The stars are a necklace.
12. A star is a flower without a stem.
13. Lightning is a fish darting through the sea.

14. Clouds are white sheep.
15. Clouds are soft pillows.
16. Clouds are ice cream.
17. Rain clouds are elephants.
18. The rainbow is a bridge.
19. The rainbow is a giant candy cane.
20. The wind is a horse.
21. The storm is a galloping horse.
22. Raindrops are tears.
23. Snowflakes are feathers.
24. The sky is a tent roof.
25. The sky is a warm blanket.
26. The road is a snake.
27. The hose is a snake.
28. The river is a snake.
29. An anthill is a city.
30. Spider webs are lace.
31. Ants are soldiers.
32. Fireflies are stars.
33. Bumblebees are baby thunders.

34. Mosquito bites are little volcanoes.
35. Turtle shells are igloos.
36. Lizards are miniature dinosaurs.
37. Hummingbirds are tiny helicopters.
38. Concrete mixers are elephants.
39. Whales are submarines.
40. Dandelion fluff is a parachute.
41. The steam shovel is a dinosaur.
42. The train is a dragon.
43. The toaster is a dragon.
44. Tree branches are arms.
45. Plant stems are drinking straws.
46. A nest is a house.
47. The lake is a mirror.
48. Grass is a carpet.
49. Eyes are windows.
50. My eyebrows are two bridges.
51. My nose is a tiny hill.
52. My shoe is a little boat.
53. The football is a rocket.

54. The roof is a hat.
55. The kite is a bird.
56. Hair is spaghetti.
57. Hair is hay.
58. My memory is a camera.
59. Time is a snail.
60. Time is a jet airplane.

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APPENDIX C

**RESPONSES OF TWO FIRST GRADE STUDENTS DURING
A PRETEST OF THE METAPHOR COMPREHENSION TASK**

STUDENT #1: JOSHUA

Vocabulary Check

anthill: It's sort of a hill. It has a hole and tunnels inside. Ants go in it--
it's their home.

arm: (Pointing) It's something on your body.

blanket: Something soft, furry. It keeps us warm.

butterfly: It has wings. It's an insect.

city: Lots of buildings and cars. Palo Alto is a city.

dinosaur: It's something really long and big like a triceratops or a
tyrannosaurs rex. They're extinct--I don't know how they got extinct,
but they are.

dragon: I think they're reptiles. Sometimes dragons are green and have
scales. They're really big, and they breathe fire.

elephant: It's gray and has really big ears and a trunk.

eyes: They're on our head, and we use them to see.

feather: It's furry, and it comes off birds. They can be all different colors.

helicopter: It's a vehicle. Something that flies in the sky.

horse: It's a mammal because it has hair. I got to see a horse--but not up close--when I went with Mrs. Fazzino's class to the farm.

galloping: I'm not sure. Maybe that a horse is riding really fast and jumps up a lot.

hummingbird: Their wings go really, really, really fast. They drink nectar. I've seen them in the backyard by the fish pond.

moon: It's white and can be round, like a full moon, or it can be half round. Sometimes you can see a man in the moon.

necklace: Something that you wear, like on a special occasion. It can be pearls or glass on a chain.

rainbow: A rainbow has pretty colors. If you're lucky, you see them in the sky when a rainstorm is.

rain cloud: They're big and black and up in the sky. They rain on the earth.

road: A road is for driving on.

sky: It's blue and up high.

smiling mouth: If you're happy you smile with your mouth--it sort of curves up.

snail: It has a round shell, and it's gooey on the inside. It slithers around and eats leaves. My grandma has me throw them onto the roof.

snake: A snake's a reptile. Like a rattlesnake. It's curvy and has rattles and lives in the desert.

snowflake: A little piece of white ice.

stars: Fire, way up in the sky.

steam shovel: It has shovels, one at the front and one at the end. Like in Mike Mulligan. He used it for digging a cellar.

storm: Big rain clouds and lightning and thunder and little drops of water.

time: It's like hours and years. It can be on a clock.

train: Trains chug around. They carry things, like cars. They have engines and coal cars and passenger cars and flat cars and hopper cars and box cars and cattle cars and cabooses. Oh, and smokestacks and whistles. And the engineer and the passengers ride in them.

tree branches: They hang out of trees and have blossoms on them.

window: Well, it's glass or plastic. It's to see out of.

Interpretations of Metaphors

The road is a snake.

Well, a car could kill a snake on the road. [What do you think it means when I say, "The road is like a snake"?] Well, snakes can be

bumpy, and roads can be bumpy. And snakes can have stripes on them, and roads can have stripes. You know, the yellow lines.

The anthill is a city.

They're each homes. One's a home to the ants, and one's a home to the people. Anthills have holes that ants go out of. People have doors they get out of. And some tunnels are sort of like stairs, and people have stairs.

A butterfly is a flying rainbow.

That means like a rainbow, doesn't it? Well, they both have pretty colors.

The train is a dragon.

They both breathe fire. You know how the smoke comes out of the engine? They both breathe fire.

The storm is a galloping horse.

Let me think. You know how the lightning goes really fast? Well, the lightning goes fast like a horse.

Snowflakes are feathers.

Snowflakes and feathers can both be white. [Anything else?] No.

Eyes are windows.

You can see out of a window, and you can see out of your eyes.

Oh, and both let light in.

The steam shovel is a dinosaur.

They're both big. The steam shovel looks sort of like a brontosaurus. They both have long necks and long tails. [Long tails?] Well, I've seen pictures where steam shovels have a big shovel at the end also.

Rain clouds are elephants.

They can both be gray. And they're both big. Oh, and the elephant makes a loud noise with its trunk. [A loud noise?] Well, it could sound like thunder in the clouds.

The moon is a smiling mouth.

Well, people say there's a man in the moon. [What if I say, "The moon is like a smiling mouth"?] Well, they can both be curved, like happy. The moon is curved halfway and your mouth is curved halfway.

Tree branches are arms.

Trees have long sticks like our arms. Our arms move around, and branches can blow around in the wind. Oh, and tree branches can hold nests, and I can hold a nest and other stuff.

Time is a snail.

Well, time can be slow, and snails can be slow. Minutes are really slow because they're sixty seconds. [What if I say, "Time is a jet airplane"?] Time can go fast, like one second goes fast.

The sky is a warm blanket.

It's sort of like a blanket. A blanket can be blue, and the sky is blue. I can't do much with this one.

Hummingbirds are tiny helicopters.

Both go really fast. Hummingbirds flap their wings really fast, and helicopters have blades that go really fast. Both can stand still in the air. Like when the hummingbird gets nectar. And a helicopter might have to rescue a person on a sinking ship.

The stars are a necklace.

Stars can be in a circle, and necklaces can be in a circle. If you take apart the chain, all the pieces are little circles--sort of like round stars.

STUDENT #2: ANNVocabulary Check

anthill: Where ants dig. Like a small hill.

arm: This is an arm (pointing). It has my hand at the end.

blanket: They're warm and soft. I have a blue blanket on my bed.

butterfly: They have a body like a stick and wings. They fly from flower to flower.

city: A place. I don't live in a city. They're bigger. They have more people.

dinosaur: They don't live anymore, but they were huge. Some had very long necks, and some had wings and could fly.

dragon: They're pretend. Big with long tails and mean sometimes.

elephant: It has a big trunk--that's its nose. They're big and gray, and their skin looks wrinkly.

eyes: Well, you look at things with your eyes. I have brown eyes.

feather: Birds have feathers. They're soft. Sometimes I pick them up at the beach.

helicopter: Like an airplane but the top goes 'round.

horse: Horses are big and have manes and tails, and people ride on them. My sister and my mom have horses. I used to have a pony, but he

died. And I have riding pants and riding boots, and I'm going to take riding lessons this summer.

galloping: Like when a horse canters--he goes fast. I've cantered before.

hummingbird: Little birds that go "whirrrr" when they fly.

moon: It's up in the sky at night, and it's round and white.

necklace: You put them around your neck. I have about five or six in my jewelry box.

rainbow: They have lots of colors and go in a curve.

rain cloud: They're real puffy and gray.

road: Like in front of my house. Cars go on them.

sky: It's outside. It's blue and has the sun in it, and sometimes it's cloudy or foggy.

smiling mouth: When your mouth goes like this (demonstrating a smile).

snail: It's like a slug, only it has a shell. They get in our house sometimes and go in the heater vent.

snake: Its body goes in a straight line with a head and with two eyes and with a mouth at the end.

snowflake: They're made of snow, and you try to catch them on your tongue when they fall.

stars: They come out at night, like a lot of lights.

steam shovel: A big machine. It makes a lot of noise and digs in the dirt.

storm: When it rains a lot and the wind blows hard.

time: Like one o'clock, two o'clock. It ticks on a clock.

train: They're long and go "whooo, whooo." They go on tracks.

tree branches: They stick out from the tree and have leaves and twigs on them.

window: They're square, and they open and close. I can look out of them.

Interpretations of Metaphors

The road is a snake.

It's wiggly. [Wiggly?] It's curvy. The road is curvy.

An anthill is a city.

It has ants in it. [What if I say, "An anthill is like a city"? What does that mean to you?] They're both a place. [They're both a place. Anything else?] Nope.

A butterfly is a flying rainbow.

(Long pause. Sigh. No response.) [How about if I say, "A butterfly is like a flying rainbow"?] Well, they're kind of the same. [How are they the same?] They disappear, and they come back.

The train is a dragon.

It makes terrible noises like a dragon. [Anything else?] They . . .
That's all.

The storm is a galloping horse.

It sounds like a galloping horse. [What sounds like a galloping horse?] The rain thumping on the cement on the road. I've been galloping . . . no, cantering . . . on a horse before. I ride each summer, and my sister's teacher teaches me.

Snowflakes are feathers.

Because they fall down just like feathers (making fluttering motions with her hand).

Eyes are windows.

Because they blink. Up and down and sideways. (Pointing to a window.) See, the window opens sideways.

The steam shovel is a dinosaur.

Because it makes the same noises as the footsteps when it goes up and down. [When what goes up and down?] The steam shovel. It makes loud noises like a dinosaur. And . . . That's all.

Rain clouds are elephants.

Because they look like elephants. They're real puffy and big, and they're dark gray.

The moon is a smiling mouth.

Because the moon looks like a mouth, and it's shaped like one. And if you just put it upside down, it looks like a smiling mouth.

Tree branches are arms.

Because they stick out of the tree, and they have twigs on the end of them. [Twigs?] Like fingers.

Time is a snail.

Because it has this round shell, and it looks like there's a clock on the shell. [What if I say, "Time is like a snail"?] Because it goes really slowly. Like at one o'clock in the morning. If I wake up. [What do you think it means if I say, "Time is a jet airplane"?] It goes really fast. Like on Christmas when we ripped all the presents.

The sky is a warm blanket.

Because it looks like a blanket, and the sun's out, and it's really hot, and it feels like you're under a blanket.

Hummingbirds are tiny helicopters.

Because they're really tiny, and they go really fast, and they've got a nose that looks like a helicopter top (making a circular motion with her finger)--it goes 'round. Hummingbirds scare me. [Why?]

Because they go, "Whirrrr," and I don't know that it's a hummingbird.

The stars are a necklace.

Pearls. Because they look like pearls. I had a pearl necklace, but it broke.

APPENDIX D

**TRANSCRIPTS OF IN-DEPTH INTERVIEWS
WITH TEN FIRST GRADE STUDENTS**

STUDENT #1: DEBRA

Vocabulary Check

anthill: It's like a hill. The ants climb up it.

arm: You can pick stuff up with it and move it.

butterfly: It's a thing that has lots of colors on it, and it flies up in the air.

city: It's where cars go, and there's lots of hotels and places. I live in a neighborhood, not a city.

dinosaur: It's this big, humongous thing, and it crawls around and looks for food. I know one name for a dinosaur--a brontosaurus.

dragon: It's this big thing that has wings and spits fire out.

elephant: It's this big gray thing with big ears and a long trunk. I've seen an elephant at the zoo.

feather: It's this thing that comes off a bird, and it feels soft and tickles people.

helicopter: It's this thing that's big and has like wings with cuts out of them on top, and they go in circles. It goes up in the air and flies around.

horse: It's brown or all different colors. It has a tail and ears and big yellow teeth. I saw a horse at the farm. I got to pet him.

galloping: Making noises? (Was shown picture prompt, Martin, pp. 26-27.) Oh, it means running or skipping.

hummingbird: It's a bird, and it has a long beak, and it likes to look for food when nobody's out. It picks up food with its beak. It gets food from jars--people fill it up for them. My grandma feeds them.

rainbow: It's this thing when it's raining or you put on water. It has all different colors.

rain cloud: It's when it's starting to get really rainy. A cloud comes in and pours rain down. They're gray.

road: It's what people drive on. Cars go on it.

snake: It's this long thing. They're green, and they slither. If you get close to one, it sticks its tongue out. I saw one at the park. It was a garden snake.

snowflake: When it's snowing it comes down. They're all different shapes.

steam shovel: I've seen them at my dad's work--at construction. When you're building stuff and want to get the dirt out, it picks it up and puts it in another place.

storm: When the rain comes, and then there's thunder and lightning and weird sounds.

train: A thing that you can go on. It makes noises. Stuff--sort of like water--steam--comes out of the engine.

tree branch: It sticks out of a tree and has all these leaves on it.

Interpretations of Metaphors

The road is a snake.

The snake is going on the road. [What if I say, "The road is like a snake"?] It would be slippery and sort of slimy. [The road would be slippery and slimy?] Yes.

An anthill is a city.

There is a big anthill in a city. [What if I say, "An anthill is like a city"?] The anthill would be sort of tall, and it would have big windows in it. [Big windows?] Like the holes.

A butterfly is a flying rainbow.

The butterfly would have a lot of colors, and it flies up and around like this (making an arch with her hand).

The train is a dragon.

The train would blow out steam and fire. It would make noises, and it would have a big, long tail. [How does a train have a tail?] The parts of the train that stick out behind.

The storm is a galloping horse.

It would make noises like a horse, like, "hee haw, hee haw." And noises like when the feet make scuff marks on the ground.

Snowflakes are feathers.

They are white, and they come down like feathers. And they sort of have little edges pointing out, and the feathers have edges pointing out.

The steam shovel is a dinosaur.

The steam shovel would make loud noises, and it would try to eat stuff like plants. And it would have big feet and make things shake like a dinosaur.

Rain clouds are elephants.

They would have big trunks and big ears and a face like an elephant. [What if I say, "Rain clouds are like elephants"?] The rain clouds make noises like an elephant. [What kind of noises?] Like thunder.

Tree branches are arms.

They would have fingers. [Fingers?] (No response.) [What if I say, "Tree branches are like arms"?] They both move and can hold stuff.

Hummingbirds are tiny helicopters.

They both fly in the air, and they both have wings. They both have long stuff sticking out, like their tails. And feet--the helicopter's feet and the bird's feet--they both land.

STUDENT #2: JENNIFER

anthill: I don't know. (Was shown picture prompt, Dorros, p. 16.) It's big and made out of mud. Ants live in them.

arm: A hand (pointing to whole arm).

butterfly: It flies. It looks like a bird. I've seen one that was black and gold.

city: It's a big place. People live in it.

dinosaur: It's a monster.

dragon: It's a monster.

elephant: Big and gray.

feather: It looks like leaf.

helicopter: A plane.

horse: It's brown. I think I saw one at Marine World.

galloping: Running.

hummingbird: (No response.) (Was shown picture prompt, Heller, p. 2-3.)

It's a bird that has a long, sharp nose.

rainbow: It has colors. I saw one at my house.

rain cloud: It's a cloud that rain comes out of. It's white.

road: It's a street. People ride on them.

snake: It's green. It goes places.

snowflake: It comes from snow.

steam shovel: I don't know. (Was shown picture prompt, De Regniers, p. 80.) It's hard and green, and it crunches rock.

storm: It's thunder. It makes flashes.

train: It goes on roads. My brother has a toy train. It's red.

tree branch: It stands. It's made out of wood.

Interpretations of Metaphors

The road is a snake.

It would be all green. [The road is all green?] Yes. [What if I say, "The road is like a snake"?] The road could be different colors like a snake.

The anthill is a city.

It would be big. [What would be big?] The anthill. [Anything else?] It would have windows. [Windows?] (No response.)

A butterfly is a flying rainbow.

The butterfly is different colors.

The train is a dragon.

The train will be green. [What if I say, "The train is like a dragon"?]
It would be some colors. [Anything else?] The train would be big.
[Let's look at a picture of a train (Crews, pp. 14-15) . . . Now, what do you think it means when I say, "That train is like a dragon"?]
(No response.)

The storm is a galloping horse.

It's blue. [What if I say, "The storm is like a galloping horse"?] I don't know. [Let's look at a picture and read a poem about a storm (De Regniers, pp. 34-35) . . . Now, what do you think it means when I say, "The storm is like a galloping horse"?] Both are black.
[Anything else?] (No response.)

Snowflakes are feathers.

They would be white. [Anything else?] The feather has holes, and the snowflake has holes.

The steam shovel is a dinosaur.

They can be different colors. [What if I say, "The steam shovel is like a dinosaur"?] It would be green with different colors. [Let's look at a picture and read a poem about a steam shovel (De Regniers, p. 80) . . . Now, what do you think it means when I say, "The steam shovel is like a dinosaur"?] It has red, pink, yellow.

Rain clouds are elephants.

They're blue. [Anything else?] They're white. [What if I say, "Rain clouds are like elephants"?] They're both gray. The cloud looks like it has a big nose.

Tree branches are arms.

They're both green. [What if I say, "Tree branches are like arms"?] (No response.) [Let's look at a picture (Kellog, pp. 2-3) . . . Now, what do you think it means if I say, "Those tree branches are like arms"?] They both have brown.

Hummingbirds are tiny helicopters.

They're both green. (What if I say, "Hummingbirds are like tiny helicopters"?] They're both green and white.

STUDENT #3: ALICIA**Vocabulary Check**

anthill: I'm not sure I know that. (Was shown picture prompt, Dorros, p. 16.) A hill, I guess, with ants walking on it. Maybe to have a home.

arm: Your hand and arm. Right here (pointing). You write with it, and you move it.

butterfly: A butterfly is a worm that turned into a butterfly. It has big wings and all the colors on its back.

city: A city is like a whole bunch of homes and places where people live at and work at.

dinosaur: An animal that has stuff on his back and has sharp teeth and a short tail or sometimes a long tail. They all died.

dragon: A dragon spits fire out and has a long tail that he swishes around. Someone read a book about a dragon to me in kindergarten.

elephant: An elephant has teeth sticking up and a nose coming down and big ears and big feet. I've seen an elephant in a picture.

feather: A feather has soft colors, and it tickles you.

helicopter: A helicopter has a little round thing right there (pointing to her head) and has a tail and a window, and it flies.

horse: An animal that has long, soft hair, and you ride it.

galloping: It means running.

hummingbird: A bird that has a long beak, and it hums. They come at my home and get food in our little red things.

rainbow: A rainbow is different colors, and it goes in many places. It shines up.

rain cloud: A cloud that rains. It's white and kind of blue in the middle. It drips rain.

road: Cement that has spots with lights on them and lines. People drive on it.

snake: A snake is slimy and has a long tongue. I saw a snake on TV. It was green.

snowflake: It has snow on it, which is water, and it drips down on the ground.

steam shovel: I'm not sure. (Was shown picture prompt, De Regniers, p. 80.) I've seen those on TV. Some are tractors that put cement on the ground and build the streets.

storm: A cloud that gets black, and it rains really hard, and you see cracks in the sky.

train: A train has a little bell that goes, "Choo, choo." A train is big and round.

tree branch: Tree branches are brown and skinny, and sometimes people cut them off.

Interpretations of Metaphors

The road is a snake.

The road would be slippery. And . . . um . . . wet. [Anything else?]

No.

An anthill is a city.

It would be like ants crawling on the city, and the ants would go in your house. [What if I say, "The anthill is like a city"?] It would be pointy. [Pointy?] 'Cause some cities have a pointy ending on the top. Sometimes in San Francisco the buildings are pointy on top. And the anthill is like sand right here (making a circle with her hands) and then a point right there on top.

A butterfly is a flying rainbow.

It would be a lot of colors, a colorful butterfly, and the rainbow has colors.

The train is a dragon.

A train and a dragon are kind of the same because the train is round and the dragon is kind of round. [Anything else?] Yeah. A train has, you know, one of those things sticking out on the front, and a dragon has this tongue. And the train has the same as the dragon's fire. The train spits flames, and the dragon spits fire.

The storm is a galloping horse.

The storm is shaky, and the horse is shaky. [They're both shaky? What do you mean by that?] Um . . . The lightning goes like that (making a zigzag with her finger), and the horse goes like this (pretending to be a galloping horse).

Snowflakes are feathers.

They're both white, and they're both tickly. But the ice melts, and the feather still lasts.

The steam shovel is a dinosaur.

Um . . . What's a steam shovel? [Let's look at a picture of a steam shovel (De Regniers, p. 80).] Oh, yeah. I've seen those on TV. It

has a mouth like a dinosaur and a long neck like a dinosaur. And it bends down and gets rocks like a dinosaur--it moves like a dinosaur.

Rain clouds are elephants.

They're fat--rain clouds are fat, and an elephant is fat. [Anything else?] Sometimes the rain clouds make shapes like the elephants.

And . . . That's all.

Tree branches are arms.

They stay straight. And they have fingers like trees. [Fingers?]

They're like little stems.

Hummingbirds are tiny helicopters.

The nose. [The nose?] It's pointy like a helicopter. And the helicopter, it flies, and the hummingbird flies.

STUDENT #4: KENNY

anthill: It's just a hill, kind of. Ants live there.

arm: This (pointing). You write with it.

butterfly: It's an animal that flies around. It looks like two hearts put together.

city: Where all the cars go. It's a big place.

dinosaur: An old animal that used to be. It has three horns. They're big.

dragon: Fire comes out of their mouths, and they're big, and they look like dinosaurs.

elephant: A big, gray animal. I saw one at a zoo.

feather: Things that come off birds. They look kind of like leaves.

helicopter: Things like airplanes, but a different shape. They fly.

horse: Those animals that are at a fair. They're brown.

galloping: They run.

hummingbird: A bird that flies around really quick, and their wings go quick. I've seen one at my auntie's--it was going to the red food.

rainbow: The things with all the colors. I've seen one at my house. They come out after the rain and when you squirt water out of a hose.

rain cloud: Gray things up in the sky.

road: What cars go on.

snake: An insect that is long. My kindergarten teacher had a snake, and she showed it to us. It was big and green.

snowflake: Things that come down when it's snowing.

steam shovel: It's kind of like a machine. You pick up rocks with it.

storm: When a lot of rain comes down.

train: It's a thing that goes on a train track. It's big; it's long.

tree branch: It's just a big, long stick on a tree.

Interpretations of Metaphors

The road is a snake.

(No response.) [What if I say, "The road is like a snake"?] They're both long and black. [Anything else?] No.

An anthill is a city.

They have mountains. [What if I say, "The anthill is like a city"?]
The ants walk around the anthill, and people walk around a city.

A butterfly is a flying rainbow.

They're both pretty. They have all different colors.

The train is a dragon.

They're both big, long. And they blow steam out.

The storm is a galloping horse.

Because it goes fast. [What goes fast?] The lightning.

Snowflakes are feathers.

They're light, and sometimes they're both white. [Anything else?]

No.

The steam shovel is a dinosaur.

They're big, and they have long necks. Oh . . . both have these big mouths.

Rain clouds are elephants.

They're both big. They're tall. They're gray.

Tree branches are arms.

They're brown. They can move around a lot. They touch stuff and hold stuff. [Tree branches or arms?] Both.

Hummingbirds are tiny helicopters.

(No response.) [What if I say, "Hummingbirds are like tiny helicopters"?] Because their wings go fast like the top of the helicopter. [Anything else?] No.

STUDENT #5: MICHAEL

Vocabulary Check

anthill: Where ants live. It's made out of sand, and they make little holes so they can go traveling in there. I have a box with sand at home for the ants to make homes in. I look at it everyday.

arm: An arm is this (pointing). You can touch things and feel things and pick up things with your arm.

butterfly: A fly that has two wings. When it's a little creature, it makes a cocoon. Then a moth comes. Then it forms into a butterfly.

city: A place where everybody lives in. It has houses and cars and streets and signs. Oh, and people.

dinosaur: A creature that's big and tall, and it lives by volcanoes. The dinosaurs died a year ago. A brontosaurus is a big dinosaur.

dragon: It looks like a dinosaur, but it's not. It has a horn on the top, and it blows out fire.

elephant: A big creature with a long nose. It can do tricks at a circus.

feather: Something that comes off a bird, and you can find them wherever you go. I have two at home. I save them for my art collection.

helicopter: A thing that flies. It isn't a bird. It has propellers on it.

horse: Something that you ride on. It looks like a pony, but it's not. It can ride you to somewhere you want to go.

galloping: Running and putting up dirt.

hummingbird: Something that gets honey from a flower.

rainbow: When the rain stops, the rainbow comes out. It has different colors and goes in an oval.

rain cloud: A cloud that throws rain down. It's black and big.

road: Something that you drive on. It's only dirt sometimes.

snake: Something that has fangs. It could poison you if it's a cobra or a killer snake. I've seen a snake at the Berryessa Pet Shop.

snowflake: When winter is here, and snowflakes fall.

steam shovel: It picks up dirt and puts it in a hole where the manager wants it to be.

storm: Rain that is very bad and makes floods.

train: They carry people and bring them where they want to go. A train has a pipe that's big and metal and blows out steam.

tree branch: A tree has a branch on it, and birds can make nests on it.

Interpretations of Metaphors

The road is a snake.

You saw a big snake on the road. [What if I say, "The road is like a snake"?] The road moves, and it has fangs. [Let's look at a picture of a road (Kraus, pp. 26-27) . . . Now, what do you think it means when I say, "The road is like a snake"?] The road is the color of a snake, and it's real long.

An anthill is a city.

It would have dirt. [What if I say, "The anthill is like a city"?] Ants could move around a city. [Let's look at a picture of an anthill (Dorros, p. 16) . . . Now, what do you think it means when I say, "The anthill is like a city"?] It has grownups and babies and roads and passages like a city. I have a box of ants at home. They made a house in the sand.

A butterfly is a flying rainbow.

A butterfly has colors on it.

The train is a dragon.

The train has the face of a dragon on it. [What if I say, "The train is like a dragon"?] The train would be on the dragon, and the dragon would be standing up blowing fire. [Let's look at a picture of a train (Crews, pp. 14-15) . . . Now, what do you think it means when I say, "That train is like a dragon"?] Both have smoke coming out, and both go fast.

The storm is a galloping horse.

It would rain and go. [What if I say, "The storm is like a galloping horse"?] I don't know. (Let's look at a picture and read a poem called "Windy Nights" (De Regniers, pp. 34-35) . . . Now, what do

you think it means when I say, "The storm is like a galloping horse"?] They're both black. And the rain falls on umbrellas and makes sounds like feet stomping.

Snowflakes are feathers.

They'll be soft, and they'll fall. Snowflakes have six points, and feathers have one point.

The steam shovel is a dinosaur.

It has a pouch that picks up dirt. [What if I say, "The steam shovel is like a dinosaur"?] It has teeth like a dinosaur and a long neck and a body like a dinosaur.

Rain clouds are elephants.

The cloud has a shape like an elephant. [What if I say, "Rain clouds are like elephants"?] They're big and fat like an elephant and the color of an elephant.

Tree branches are arms.

The wind moves tree branches so they can touch things. The branches can pick up apples and things that you eat.

Hummingbirds are tiny helicopters.

They would be like toys. [What if I say, "Hummingbirds are like tiny helicopters"?] Both move their wings and fly.

STUDENT #6: DIANE**Vocabulary Check**

anthill: Ants live in the anthill.

arm: (Pointing to arm) You use it to move.

butterfly: They can fly, and they're scared when you walk to them. I saw a white one.

city: When you want to buy something, you go to a city.

dinosaur: People are scared of. They look scary.

dragon: They had fire in them.

elephant: They have a long nose. They have a little tail. They are big and gray. I saw one at the San Francisco Zoo. When I was 3 or 4, I went there.

feather: They're furry.

helicopter: I saw one by E Street. It had a tail and a back. People fly in them.

horse: I saw a brown horse at the zoo. It was big.

galloping: Go fast.

hummingbird: They're little. They eat the flowers.

rainbow: That's when it stops the rain. It's lots of colors.

rain cloud: A cloud that rains. They're white.

road: The cars go on it, and people walk on it.

snake: They stick their tongues out. My mom saw one, and she told me
all about it.

snowflake: They fall when it snows. At winter.

steam shovel: (No response. Was shown picture prompt, De Regniers,
p. 80.) They get rocks. They get all the heavy things.

storm: It rains. There's lightning. I'm scared of lightning and my mom is
too.

train: It has squares. People ride on it. It looks fun.

tree branch: Something used to climb.

Interpretations of Metaphors

The road is a snake.

(No response.) [What if I say, "The road is like a snake"?] They
can't walk. The road is very long, and a snake is very long.

An anthill is a city.

(No response.) [What if I say, "The anthill is like a city"?] It's
where ants get things to eat. We get something to eat in a
supermarket in the city.

A butterfly is a flying rainbow.

They're colorful.

The train is a dragon.

(No response.) [What if I say, "The train is like a dragon"?] (No response.) [Let's look at a picture of a train (Crews, pp. 14-15) . . . Now, what do you think it means when I say, "That train is like a dragon"?] Smoke comes out of the train, and fire comes out of the dragon.

The storm is a galloping horse.

(No response.) [What if I say, "The storm is like a galloping horse"?] They both go fast--the horse and the wind.

Snowflakes are feathers.

They're both white. [Anything else?] (Started to speak, then shook head.) [Let's look at a picture (Hader, pp. 34-35) . . . Now, what do you think it means when I say, "Snowflakes are feathers"?] (No response.)

The steam shovel is a dinosaur.

(No response.) [What if I say, "The steam shovel is like a dinosaur"?] (No response.) [Let's look at a picture and read a poem about a steam shovel (De Regniers, p. 80) . . . Now, what do

you think it means when I say, "The steam shovel is like a dinosaur"?) Because he snorts and roars like the dinosaurs (responded directly from the poem).

Rain clouds are elephants.

(No response.) [What if I say, "Rain clouds are like elephants"?)
They're both gray. [Anything else?] (Shook head.)

Tree branches are arms.

Tree branches stick out, and our arms could stick out straight like a branch. Sometimes they move when the wind blows.

Hummingbirds are tiny helicopters.

They can fly. They both have a tail at the back.

STUDENT #7: ROBERT

Vocabulary Check

anthill: Ants store their food in it. I've seen ants carrying eggs before.

arm: It's something you can reach with.

butterfly: Like a bird with long wings. They have a whole bunch of colors.

city: A place where lots of stores are. I live on a corner, and when you go around the corner you're in a city.

dinosaur: A big animal. I've been to two museums that have fake dinosaurs that move. Some are called tyrannosaurs rex, triceratops, and brontosaurus.

dragon: It's an animal that spits fire.

elephant: An animal with a long nose. I saw one at a zoo.

feather: It's something that's on a bird. It feels soft.

helicopter: Something that flies with long propellers.

horse: Big and brown. People go riding on them.

galloping: I'm not sure. Chasing something maybe.

hummingbird: A bird that goes fast. I see a lot at my house. We have a feeder, but we don't have any stuff in it.

rainbow: It's a half circle that has colors.

rain cloud: A dark cloud that gets heavy with water and puts the water down.

road: Something that cars run on.

snake: Poisonous. I've seen them at zoos. They look like ropes.

snowflake: A crystal. I know because I watch "Mr. Wizard's World."

steam shovel: It picks up dirt. My mom's read Mike Mulligan to me.

storm: When it rains hard. It thunders and lightnings.

train: A fast car. It travels on train tracks. I went on a preschool trip to the park on a train.

tree branch: It's brown with sticks. It's good for climbing.

Interpretations of Metaphors

The road is a snake.

(No response.) [What if I say, "The road is like a snake"? What does that mean to you?] I don't know. [Let me show you a picture (Kraus, pp. 26-27) . . . Now, what do you think it means when I say, "That road is like a snake"?] It has a lot of turns in it. And it looks like it's slithering.

An anthill is a city.

It has bumps. [The anthill?] Yes. [What if I say, "The anthill is like a city"?] I don't know. [Let's look at a picture of an anthill (Dorros, p. 16) . . . Now, what do you think it means when I say, "That anthill is like a city"?] I don't know.

A butterfly is a flying rainbow.

(No response.) [What if I say, "A butterfly is like a flying rainbow"?] Because they both . . . um . . . I'm not sure. [You started to tell me

something. What if I show you this picture (Carle, pp. 24-25) and say, "That butterfly is a flying rainbow"?] Because it has lots of colors like a rainbow.

The train is a dragon.

Because they both have smoke. [Anything else?] No.

The storm is a galloping horse.

There's lightning and thunder [What if I say, "The storm is like a galloping horse"?] I don't know. [Let's look at a picture and read a poem about a storm (De Regniers, pp. 34-35) . . . Now, what do you think it means when I say, "The storm is like a galloping horse"?] I don't know.

Snowflakes are feathers.

They fall. [Anything else?] No.

The steam shovel is a dinosaur.

They both have long necks. [Anything else?] No.

Rain clouds are elephants.

They're both gray. [Anything else?] No.

Tree branches are arms.

Because they're both long. [Anything else?] Both move sometimes.

Hummingbirds are tiny helicopters.

I don't know. [What if I say, "Hummingbirds are like tiny helicopters"?] They both fly.

STUDENT #8: JUSTIN

Vocabulary Check

anthill: Ants crawl on the hill. They hide food, and they hide eggs so no one can steal them.

arm: This (pointing). You could eat with it; you could control the Nintendo with it.

butterfly: It's kind of like a bird, but it has different wings and has pretty colors on its wings. It just flies around.

city: It has lots of beautiful flowers. It has sidewalks so no one could get runned over. Cars go by. They have stop and caution and go lights. And they have speed limits. If they break the speed limit, they'll get a ticket.

dinosaur: They live in the mountains. The tyrannosaurs rex is a beast.

And the birds that fly around are dangerous, too. They died many years ago, like one thousand years.

dragon: It breathes fire, or it could be nice and help you once you're in danger. I've seen one in a book--it was a big green one breathing really dark red fire.

elephant: It's dangerous. It's a wild animal. It belongs in the zoo. He could sit on you. They're gray and big and fat. They eat a lot of grass.

feather: Sometimes it's silver, gray, or copper. They come from birds, or you could find some.

helicopter: It's something that flies around. It could be a bad helicopter that drops bombs or a police helicopter that watches for dangerous things that could happen.

horse: It's brown and has strong legs. It runs fast. It could help you get away. You could jump on it and ride it.

galloping: The horse runs fast.

hummingbird: It takes water and flies around and smells flowers. It's a pretty blue bird. Once I saw a hummingbird. There was a pipe that it drank out of.

rainbow: It has lots of pretty colors like pink, yellow, orange, blue, and jungle green.

rain cloud: Something that drops rain. Sometimes it could cause thunder.

If the clouds turn yellow that means a tornado is going to come--I saw that on "Rescue 911."

road: Something for cars to drive on. People push a button and then walk across the street.

snake: Very, very dangerous--like rattlesnakes and cobras. A veterinarian can catch them.

snowflake: It comes on Christmas Eve. You can build a snowman with them or have a snowball fight. I've never had a snowball fight.

steam shovel: Something that could crunch rocks, stones. It could break through mountains and drive through hot lava.

storm: It has thunder, lightning. It could have rain.

train: Something that runs fast, but not faster than the Flash (a TV character). It has lots of people and travels to faraway places. It has lots of windows and can be any color.

tree branch: It's wood. It's something you can play on, hang on.

Interpretations of Metaphors

The road is a snake.

It means it's wrong. [Wrong? How is it wrong?] 'Cause the road isn't a snake, it's cement. [What if I say, "The road is like a snake"?] I'd say, "no way." I'd say "It looks like a street." [Let me show you a picture (Kraus, pp. 26-27). What if I say, "That road is like a snake"? What do you think I mean?] Because there's lots of designs. It looks like a maze (tracing the picture of the road with his finger). It's making all the snake's forms.

An anthill is a city.

Because it's like a city--but a city doesn't have that much dirt. And people don't lay eggs, and they don't store food in a secret spot. [What if I say, "The anthill is like a city"?] Well, they both could walk--no, ants crawl, and people walk. They're not the same.

A butterfly is a flying rainbow.

I don't know. [What if I say, "A butterfly is like a flying rainbow"?] It has lots of pretty colors. The colors match their wings.

The train is a dragon.

I don't know. [What if I say, "The train is like a dragon"?] Because it's long. Both go fast--they could go faster than a speeding bullet.

But I don't think a dragon's really like a train.

The storm is a galloping horse.

Both are fast. Lightning and thunder are fast. And they make lots of noise like a horse. [How do they make noise like a horse?] Let me remind you. Once the horse goes fast it's like thunder, like, "Clump, clump."

Snowflakes are feathers.

Because they're both soft. [Anything else?] Well, you could have a snowball fight. And once you rip the pillow, feathers come out, and that looks like snow.

The steam shovel is a dinosaur.

The dinosaur's neck is long, and so is a crane's neck. I saw a crane on TV. They're both big, but the crane is twice as big.

Rain clouds are elephants.

That's because they're both gray and white sometimes. Sometimes it looks like the clouds could form different shapes like it could make an elephant.

Tree branches are arms.

'Cause it has little fingers. [The tree branch?] Yeah, the end that holds the leaves. But they're five times longer than fingers.

Hummingbirds are tiny helicopters.

The helicopter can't drink water, but a hummingbird can. [What if I say, "Hummingbirds are like tiny helicopters"?] Because they both fly, and some helicopters can be blue like hummingbirds.

STUDENT #9: LAKIA

Vocabulary Check

anthill: It's made out of dirt. Ants live there.

arm: (Pointing). You throw, you eat, you write with them.

butterfly: I saw a purple butterfly. It was flying.

city: A city has houses, streets, speed bumps, and stores.

dinosaur: I've seen one in books and pictures and on boxes. They're dead.

dragon: They're big with big heads and tails, and they're green.

elephant: They're gray. They walk. They're big. I saw one at the zoo.

feather: A bird has feathers. They're gray and black.

helicopter: It flies. It can bring people somewhere.

horse: I saw a black horse. It walks. It has four legs. My little baby cousin fell off a horse.

galloping: I don't know. (Was shown picture prompt, Martin, pp. 26-27.) Running.

hummingbird: They fly.

rainbow: They come out at the rain. They have colors.

rain cloud: They rain. They're white.

road: For driving. They're made of rock.

snake: Snakes are black. They don't have legs.

snowflake: It's made of snow. I saw snowflakes at Lake Tahoe. I went on a sled with my aunt. I got to steer.

steam shovel: I don't know. (Was shown picture prompt, De Regniers, p. 80.) It's for rocks and dirt. It's a machine.

storm: Rain and thunder.

train: It goes on a train track. It's brown and long.

tree branch: It stands. It's made of wood.

Interpretations of Metaphors

The road is a snake.

A snake? Because it has black on it. [What if I say, "The road is like a snake"?] I don't know [Let's look at a picture of a road (Kraus, pp. 26-27) . . . Now, what do you think it means when I say, "The road is like a snake"?] Because the road goes different ways like a snake.

An anthill is a city.

It isn't. [What if I say, "The anthill is like a city"?] People live in a city, and ants live in the anthill.

A butterfly is a flying rainbow.

Because it has colors on it.

The train is a dragon.

Because a train is black, and a dragon's black. And they're both big. [Anything else?] No.

The storm is a galloping horse.

I don't know. [What do you think it means if I say, "The storm is like a galloping horse"?] Nothing. [Let's look at a picture and read a poem about a storm (De Regniers, p. 34-35) . . . Now, what do

you think it means when I say, "The storm is like a galloping horse"?] Because it runs, and the winds goes, too.

Snowflakes are feathers.

I don't know. [What if I say, "Snowflakes are like feathers"?] I don't know. [Let's look at a picture of snowflakes (Tresselt, p. 1) . . . Now, what do you think it means when I say, "Snowflakes are like feathers"?] Because they both fly.

The steam shovel is a dinosaur.

'Cause they both run. 'Cause they crunch cement.

Rain clouds are elephants.

They're white and gray. Nothing else.

Tree branches are arms.

Because they can stick out like arms. [Anything else?] No.

Hummingbirds are tiny helicopters.

Because they fly. [Anything else?] No.

STUDENT #10: ALAN

Vocabulary Check

anthill: The ants crawl around it and look for food.

arm: (Pointing). It's to move your hand.

butterfly: It's a caterpillar that makes a cocoon so it could sleep. Then it turns into a butterfly or a moth. It has wings so it could fly, and it has different colors.

city: A town where you live. With houses and cars and stores.

dinosaur: A dinosaur is big and has sharp teeth to eat. Triceratops is a dinosaur. Some were meat eaters. They all died.

dragon: Something that puts fire from its mouth to burn towns and cities and fight warriors. They're not real.

elephant: It has two tusks and a round body.

feather: A feather is something from a bird. You can write with it--use ink to write. They tickle.

helicopter: Something you fly in. I have a picture of a helicopter at home. It has missiles and guns.

horse: Is something that you ride on.

galloping: I'm not sure. (Was shown picture prompt, Martin, pp. 26-27.) Running real fast.

hummingbird: It has wings that fly real fast, and it hums.

rainbow: A rainbow has a pot of gold at the end. It has different colors and goes around.

rain cloud: Something that rains for the trees and plants that need water to drink.

road: Something that you can drive on, and kids cross the street.

snake: Something that slithers. It's green. The teacher has a cobra snake --it's a stuffed animal one.

snowflake: A snowflake is something that falls on the snow.

steam shovel: I think it's something that grabs dirt.

storm: Thunder that hits some wire. The storm has rain coming down from it.

train: Something that carries people and food and cargoes. I rode on a train at Great America.

tree branch: Something that you can climb.

Interpretations of Metaphors

The road is a snake.

Hmmm (shrug). [What if I say, "The road is like a snake"?] They could curve.

An anthill is a city.

So ants could live under the dirt and gather some food if it's winter.

[What if I say, "The anthill is like a city"?] Ants could live in people's houses. [Let's look at a picture of an anthill (Dorros, p. 16) . . . Now, what do you think it means when I say, "An anthill is like a city"?] 'Cause they can walk down to their homes, and people walk to their homes on sidewalks. They carry food like people and have babies like people.

A butterfly is a flying rainbow.

(No response.) [What if I say, "A butterfly is like a flying rainbow"?] I think that they both curve over. [Curve over?] The butterfly flies in a curve, and the rainbow goes in a curve. [Anything else?] A butterfly has different colors.

The train is a dragon.

'Cause it could put smoke up. A dragon uses fire--it comes out of his mouth. [Anything else?] Both move--a train uses wheels, and the dragon has legs to move.

The storm is a galloping horse.

The storm can make noise, and the horses could sound like the storm.

Snowflakes are feathers.

Snowflakes could drop, and the feathers could drop from birds.

[Anything else?] No.

The steam shovel is a dinosaur.

Because one could grab dirt and the other one could grab some food. [Anything else?] They both move--one has wheels, and the other has legs. And both can make tracks.

Rain clouds are elephants.

Because elephants could drink water and splat it out of their trunks.

That's like a rain cloud drops rain.

Tree branches are arms.

Because they could stand up. [What if I say, "Tree branches are like arms"?] They could drink water--no, that's the roots. [Let's look at a picture (Kellogg, pp. 2-3) . . . Now, what do you think it means when I say, "Tree branches are like arms"?] They could grow apples. We can't grow apples, but we can grow up to be big people.

Hummingbirds are tiny helicopters.

Because helicopters could make noise like the hummingbirds hum.

[Anything else?] No.

APPENDIX E

PICTURE AND/OR CONTEXTUAL PROMPTS

The following prompts were selected for use with each of fifteen pretested metaphors.

1. **The road is a snake:** Whose Mouse Are You? by Robert Kraus, pp. 26-27.
2. **An anthill is a city:** Ant Cities by Arthur Dorros, p. 16.
3. **A butterfly is a flying rainbow:** The Very Hungry Caterpillar by Eric Carle, pp. 24-25; The Reason for a Flower by Ruth Heller, p. 5.
4. **The train is a dragon:** Freight Train by Donald Crews, pp. 14-15.
5. **The storm is a galloping horse:** "Windy Nights" by Robert Louis Stevenson (in De Regniers' Sing a Song of Popcorn, pp. 34-35); Knots on a Counting Rope by Bill Martin Jr. and John Archambault, pp. 26-27.
6. **Snowflakes are feathers:** The Big Snow by Berta and Elmer Hader, pp. 34-35; White Snow, Bright Snow by Alvin Tresselt, p. 1.
7. **Eyes are windows:** Direct student's attention to a window in the interview room.
8. **The steam shovel is a dinosaur:** "The Steam Shovel" by Rowena Bennett (in De Regniers' Sing a Song of Popcorn, p. 80).
9. **Rain clouds are elephants:** The Elephant's Child by Rudyard Kipling (1986 version published by Alfred A. Knopf), p. 42; Bringing the Rain to Kapiti Plain by Verna Aardema, pp. 10-11.
10. **The moon is a smiling mouth:** Knots on a Counting Rope by Bill Martin Jr. and John Archambault, pp. 2-3.

11. **Tree branches are arms:** Johnny Appleseed, retold by Steven Kellogg, pp. 2-3.
12. **Time is a snail:** Frog and Toad Are Friends by Arnold Lobel, pp. 57-64.
13. **The sky is a warm blanket:** "Sunflakes" by Frank Asch (in De Regniers' Sing a Song of Popcorn, p. 26).
14. **Hummingbirds are tiny helicopters:** The Reason for a Flower by Ruth Heller, pp. 2-3.
15. **The stars are a necklace:** A Golden Guide to Stars by Herbert Zim and Robert Baker, pp. 40-41.