SCIENTIFIC DISCOURSE IN EARLY CHILDHOOD: READING ALOUD AND RESPONDING TO NONFICTION IN A KINDERGARTEN COMMUNITY OF LEARNERS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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ABSTRACT

This qualitative study described the nature of young children’s responses to science-related nonfiction books that were read-aloud in an interactive classroom setting. The classroom was a kindergarten community of learners situated in a suburban elementary school. Discourse data for this sociocultural teacher research project were gathered through a reflection journal, audio- and videotapes of read-aloud and small group writing sessions, and text analysis of eight selected nonfiction books.

Analysis of these data made use of three interrelated perspectives: (a) a view of science as a particular discourse community and of the classroom as a particular community-institutional setting, (b) a view of the face-to-face interactions of students and their responses to works of nonfiction, and (c) a view of the response profiles of three focal students. This triangulated analysis of the discourse data revealed a classroom culture in which purposes for activities, language modes, and curricular areas blended together through day-to-day activities and routines. Analysis also revealed that students responded to several features of the read-aloud text and context, particularly the pictures in the books and the verbal contributions of other students.
Additionally, the text and context evoked 10 different response types through which the students co-constructed the activity of the read-aloud as a collaborative meaning-making endeavor and connected books to their prior personal and shared experiences. Together, the categories embodied the nature of the students’ response to nonfiction and reflected a classroom scientific discourse. The response types and the text-context features that elicited them occurred in the response profiles of the three focal students in different combinations and to varying degrees.

The study of the particular kindergarten community of learners led to insights about the dialogic relationship of children’s ideas and the ideas represented in the words and pictures in the nonfiction literature selections. The nonfiction books in this case mediated the intermingling of scientific and everyday concepts and contributed to the construction of a classroom discourse of science. Through reading aloud and responding to nonfiction, teachers may support their young students in participating in the social and cultural practice of science in early childhood and later in life.
Dedicated to my family
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CHAPTER 1

INTRODUCTION

This dissertation is the report of a teacher research project designed to describe and interpret the responses of young children to science-related nonfiction books. The project was a case study in which I examined my own class of 19 kindergarten students. The primary focus of the investigation was the discourse constructed within the context of 16 interactive read-aloud sessions—full-class meetings during which I read aloud selected books and allowed or invited children’s open responses. Analysis of the discourse was based on a sociocultural perspective of learning and development. In this chapter, I will describe the background of this classroom-based project, explain the professional significance of this case study, identify the critical questions, and summarize the methodology. I will conclude this chapter by indicating the delimitations and defining some specific terms used in this report.

Background of the Study

Factors that contributed to the conceptualization of this study included professional and societal developments as well as trends in educational theory and research. This early childhood classroom-based study was undertaken in a time of an increasing emphasis on standards-based instruction and assessment, the continually expanding influence of
science and technology in the everyday lives of people, and widening theoretical perspectives on the development of literacy and of classroom science. The combination of these factors indicated a need for a cross-curricular examination of classroom teaching and learning. Particularly significant across the societal, professional, and research-related background of this study were the social and cultural aspects of science teaching and learning. These aspects indicate that classroom discourse is worthy of investigation.

Classroom science discourses occur as people work and communicate in order to make meaning of shared science experiences within the classroom. This social interaction is one way in which classroom science can reflect the practice of science outside the classroom (Gallas, 1995; Lemke, 1990, 1993). Further, such classroom language is an aspect of the National Science Education Standards (National Research Council, 1996).

A focus on the language aspects of science is an important condition for standards-based teaching and for the construction of a scientific discourse within the classroom. Scientific discourse is a specialized way of speaking or writing to communicate a specialized way of knowing. Access to this way of knowing is vital for all students because of the increasing number and significance of decisions they will make as consumers in a technological world and as citizens in a democratic society (Halliday & Martin, 1993; Lemke, 1990; National Research Council, 1996).

Another aspect of the professional climate influencing this study was the widening and overlapping lenses through which the teaching and learning of science and of literacy were examined beginning in the last decades of the 20th century. Studies involving children’s literature in the classroom have become increasingly naturalistic in
methodology and have reported findings that consider children’s words and actions in relation to greater depth and breadth of social and cultural meanings (Martinez & Roser, 2003). In the field of science education, an interest among theorists and researchers in an anthropological perspective has contributed to a broadened view of the discipline of science as more than a static and culturally neutral body of knowledge (Cobern & Aikenhead, 1998). Scholars have come to assert that school science should reflect real science and that real science is the work of people who communicate in order to understand and transform their world and their minds (Lemke, 1993; Sutton, 1998). I will address this theoretical and research background more fully in the review of literature in Chapter 2.

Professional Significance of the Study

The design, implementation, and analysis of this study were rooted in theoretical connections between the classroom practices of (a) reading aloud and interacting with and about literature and (b) participating in discussions during and about science experiences. Further, the study was rooted in connections between (a) the role of language in human development and in the sociohistorical development of science and (b) the genre of nonfiction literature and the language aspects of science. I will identify and further investigate these key links in the review of literature.

These links demonstrate that rich and varied language experiences within communities of learners mediate the activity of learning (Vygotsky, 1978; see also Ashton, 1996 and Dixon-Krauss, 1996) and engage children in the social and cultural work of science (Cobern & Aikenhead, 1998; Gallas, 1995; Lemke, 1990. 1993). Such connections contribute to the significance of this study, as they are the basis for the
description and interpretation of socially interactive classroom events. From this analytical perspective toward the life of the classroom community, I aim to offer a useful and integrated view of classroom discourse and to contribute to an ongoing conversation in early childhood education. My intent is to build upon the fundamental links between young children’s response to literature and the development of scientific discourse in the classroom.

In addition to this integrated perspective of literature response and of classroom scientific discourse, this study is professionally significant because it focuses on the construction of a classroom discourse through a context that is familiar to teachers of young children—reading aloud and responding to books. Built upon an intersection between theory and practice and between classroom science and children’s literature, the findings from this research and the sociocultural perspective through which I have examined children’s response to nonfiction could be useful to other early childhood educators and to curriculum developers in making standards-based and learner-centered decisions. Descriptions of particular instances of classroom interaction about, with, and through a particular genre of literature, along with my interpretations of these interactions as a teacher and as a researcher, may involve readers of my research report in “living through” these classroom experiences and reflecting upon their own (Glesne, 1999).

Purpose of the Study and Research Questions

The purpose of this study was to describe and interpret children’s responses to science-related nonfiction books within a kindergarten community of learners. Data collection and analysis were based upon the following questions:
1. What is the role of science-related nonfiction books in constructing scientific discourse in an early childhood classroom? What graphic and verbal features of such a book affiliate it with science? What graphic and verbal features of the book elicit response within the community of learners?

2. What is the nature of children’s responses to science-related nonfiction books read aloud in a community of learners? What is the function and content of children’s talk during socially interactive read-aloud sessions involving such books?

3. In what ways do individual members of the community of learners transform their participation in socially interactive learning activity involving science-related nonfiction books? What is the content and function of the talk of an individual student (focal student) within these contexts?

These questions relate to interdependent and simultaneous developmental processes of sociocultural activity and are based upon a theoretical perspective that I will discuss in the review of literature in Chapter 2. In Chapter 3, I will describe the methodology used in this study and explain the relationship between this theory and the questions addressed. Below is a brief description of this theoretical perspective along with an overview of the type of research this study represents and the methods used.

Overview of Methodology

I have discussed throughout this introduction the role that connections across disciplines and theories have played in the background and the critical questions of this study. The research questions emerged from the interrelationships I perceive primarily between a transactional theory of literature (Rosenblatt, 1978, 1995) and a sociohistorical theory of learning and development (Vygotsky, 1978, 1986). The particular framework
through which I have identified these connections is Rogoff’s (1995, 2003) three-plane model for observing and analyzing sociocultural activity. I will further discuss this framework in the review of literature. Also, I will make use of the model later in structuring a description of the methodology and in presenting the findings of this study. Rogoff’s perspective of sociohistorical theory is suitable for observing and analyzing children’s responses to nonfiction as the sociocultural activity of engaging in a classroom scientific discourse.

Because of this theoretical orientation, I employed qualitative methods of data collection and an interpretative analytical stance for this naturalistic case study. The critical questions addressed in this study reflect an interpretivist paradigm and thus required careful observation and analysis of multiple face-to-face interactions over time (Glesne, 1999). The purpose of this long-term examination was to create a picture, or tell a story, of one classroom community’s socially constructed and culturally-historically situated development of a discourse of science.

The particular case involved in this study was my own class of 19 kindergarten students. I gathered data within the naturalistic classroom contexts of interactive read-aloud sessions of nonfiction books and small-group writing sessions by way of note taking and audio and video taping. I developed elaborated field notes by transcribing the audio- and videotapes, and I maintained a teacher-researcher reflection journal throughout the data collection period. I analyzed the texts produced through my transcription of recorded data and the published nonfiction texts used during the read-aloud sessions. I will report and discuss findings from these analyses of the qualitative data in Chapters 4 and 5 of this dissertation.
Delimitations

The purpose of this study was to describe and interpret young children’s responses to science-related nonfiction books within a kindergarten community of learners in which I was both teacher and researcher. My purpose in this dissertation is to tell the story of the case of this particular group of learners and to describe how we constructed a discourse about and with a particular genre of children’s literature. Because of this interest in the particular, generalization of findings from this study is not the goal. Rather, the goal of this report is to sufficiently describe the study and its findings so that readers can recognize the ways in which my situated observations and interpretations may or may not be relevant to their own work as teachers, researchers, or early childhood curriculum developers (Stake, 2000).

The prolonged engagement and persistent observation inherent to my role as teacher in the research site contributed to my ability to interpret and report classroom activities and social interaction. In addition, because of my role as teacher, my unique subjectivities played a key role in the orchestration of this learning activity through my ongoing assessment and instructional decision-making. My subjectivities were important to my interpretation of classroom events and of the meaning that my students made of them.

My teacher researcher reflection journal was a useful tool in addressing these subjectivities. I used the journal to make explicit the theory- and experience-based thinking that contributed to the actions I took in the classroom and my interpretations of talk and text. Additionally, I transcribed my own contributions to the classroom talk
during activities involving nonfiction. In presenting the findings of this study, I will overtly address my subjectivities by including myself in the written story of the case of this particular kindergarten community of learners.

Definition of Key Terms

The purpose of this section is to indicate the precise meanings of some terms used throughout this report. Because of the range of possible meanings for these terms in the related professional and academic literature, I will provide a definition for each word or phrase as well as a brief description of its use in this report. Rather than organizing the list of terms alphabetically, I have grouped them in sets based upon relationships among them, and I have organized the list overall to somewhat reflect the order that the terms first appear in this dissertation.

- Community of Learners: a group of people in a shared setting who build trusting relationships and engage in socially interactive learning activities that make use of a range of ideas. These ideas are shared through spoken and written language and are used to develop a shared understanding ("make meaning") of the learning activities. Further, the ideas that play a role in the shared meaning-making have a range of histories, such as the personal experiences of the people involved, the discipline of science as a school subject, the practice of science among scientists, the language and information portrayed in nonfiction books, and shared classroom community events (Cazden, 2001; Rogoff, Matusov, & White, 1996).

In this study, the community of learners is a classroom setting with one teacher and 19 kindergarten students. I use the phrase community of learners throughout this report,
beginning with the statement of purpose for the study. The term reflects a perspective that people participate in classroom learning activity through social interactions and that what people do and say in the classroom is culturally meaningful.

- **Response (to literature):** readers’ or listeners’ spoken or written words and physical actions (e.g. art projects, gestures, and facial expressions) evoked by a reading/listening experience (Hickman, 1981; Rosenblatt, 1978).

- **Transaction:** the interaction between readers/listeners, text, and the multifaceted social-cultural event created when readers/listeners and text come together; the dialogic relationship among the multiple perspectives that intermingle when diverse readers/listeners interact with, about, or through text (Rosenblatt, 1978, 1995).

As I use these terms in this report, *response* refers more to children’s actual actions in the educational setting of reading aloud books, and *transaction* refers to the theoretical relationship between readers/listeners and the literature being read aloud.

- **Sociohistorical:** pertaining to the particular theory of human learning and development rooted in the theoretical and empirical writings of Lev S. Vygotsky, whose work was, in turn, rooted in the particular historical, cultural, social, political, and economic situation in which he lived and worked in early 20th century Russia (Vygotsky, 1978, 1986; see also Dixon-Krauss, 1996b; Rogoff, 2003; Wertsch, 1985).
• **Sociocultural**: pertaining to practices and theories in which the inward and outward behaviors of human beings are considered to be carried out for social purposes and are considered to be rooted in culture; this term is more widely used in professional and academic literature in education because it is less particular than *sociohistorical* (Dixon-Krauss, 1996b; Rogoff, 1990, 2003; Wertsch, 1985).

I use these terms throughout this report according to the above definitions; I do not use them interchangeably. I use *sociohistorical* when specifically referring to Vygotskian theory and *sociocultural* when discussing a theoretical perspective as well as classroom contexts and activities.

• **Culture**: a particular way of knowing, thinking, doing, and interacting with people and with the physical world, developed over time as people interact with one another and with their physical surroundings to make meaning of life in that situation and to share that meaning-making with others who have less experience and knowledge in the particular situation, such as novices, learners, students, children (Rogoff, 2003).

• **Discourse**: a way of speaking or writing that is affiliated with a particular way of thinking, doing, knowing (Gee, 1999; Lemke, 1990).

These definitions reflect a broad conceptualization of *culture*. Throughout this report, I refer to science in and out of the classroom as a particular culture and to the spoken and written language of science as a particular type of *discourse*. 
• **Appropriation**: the process by which ways of thinking and doing that are related to a particular culture are transformed through use by unique individuals whose own ways of thinking and doing, in turn, become transformed to reflect affiliation with the particular culture. A person has appropriated a particular way of thinking, for example, when he or she has in some way personalized that way of thinking and is able to make deliberate use of it in interacting with others or with the physical environment (Dixon-Krauss, 1996b; Rogoff, 1990).

• **Mediation**: the process in which ideas or concepts interact and influence one another on (a) an intra-psychological plane as a person consciously considers multiple perspectives or multiple ways of approaching a given situation in the social or material world and (b) an inter-psychological plane as the person participates in overt social or physical actions that reflect the person’s own ideas as well as the ideas of others who are actually present in the situation or present through memories or objects with cultural meaning (artifacts). Language is the key to mediation, according to Vygotskian theory—that is, human language mediates human activity (Vygotsky, 1978, 1986; see also Dixon-Krauss, 1996b).

In this report, I describe the process of mediation primarily when I discuss how my students and I interact with and about nonfiction books as I read aloud. My students’ responses to the nonfiction selections during the read-aloud sessions over time provide evidence of how these young children began to appropriate scientific discourse. This use of the terms *appropriation* and *mediation* reflects my assumption that learners’ outward words and actions provide information about their thinking as well as my belief in the importance of spoken and written language in early childhood teaching and learning.
I will provide further explanations for these words and phrases within the theoretical framework and review of literature in the next chapter, and I will make continued use of them throughout my discussion of the methodology in Chapter 3 and the presentation of findings in Chapter 4. As the next three chapters indicate, these key terms represent ideas upon which the purpose and procedures for this study were based. I will revisit them and their key role in the study as I summarize and discuss this teacher research project in Chapter 5.
CHAPTER 2

THEORETICAL FRAMEWORK AND REVIEW OF THE LITERATURE

In Chapter 1 of this dissertation, I stated that my research questions emerged primarily from connections between the role of classroom talk in science instruction and children’s responses to literature. The foremost perspectives influencing my view of these two aspects of classroom discourse are Vygotsky’s (1978, 1986) sociohistorical theory of development and Rosenblatt’s (1978, 1995) transactional theory of literature. In this chapter, I will discuss these theories and address ideas relevant to the planning, implementing, and reporting of this classroom research project.

Furthermore, I will describe the specific model through which I make meaning of these theoretical perspectives. This model, Rogoff’s (1995, 2003) conceptualization of a sociohistorical theory, extends the work of Vygotsky and provides a framework for observing and analyzing sociocultural activity. Engaging in classroom social interaction with and about nonfiction literature and constructing a classroom scientific discourse are examples of the sociocultural activity that I have investigated in this study.

In addition to developing the theoretical framework upon which I have based my teaching practice, my research questions, and my interpretations in this study, I will review empirical literature in the fields of science education and of children’s literature.
The purpose of the review of empirical literature is to indicate the ways in which prior research has shaped the current study and the ways in which my study extends threads of meaning that have begun to weave together the teaching and learning of science and the role of spoken and written language in early childhood development. The overall structure of this chapter consists of two main sections representing the key areas of theory and research that are the foundation for this study: (a) the role of talk in science teaching and learning and (b) the role of nonfiction children’s literature in early childhood learning and development.

The Role of Talk in Science

In this section, I will describe the sociohistorical role of language in science and in learning and development according to a Vygotskian perspective. I will then review studies that have examined talk in science teaching and learning.

Vygotsky’s Sociohistorical Theory of Learning and Development

Vygotsky’s (1978, 1986) multifaceted theory of human psychology focuses on the historical development of (a) the conceptual understandings of an individual person; (b) the social practices, beliefs, and communication systems of cultures; and (c) the higher psychological functions of humankind throughout history. According to this theory, human cognitive development is rooted in social activity; social activity is rooted in culture; and culture emerges from the goal-driven actions of individuals in society. Culture, through the interactions of unique individuals, transforms people, and people transform culture as they engage in social interaction with others who are physically present or present through cultural artifacts, such as text (Rogoff, 2003; Vygotsky, 1978, 1986; Wertsch, 1985).
According to a Vygotskian theory of learning and development, language is the primary means of constructing knowledge among people in a socially interactive context as well as within an individual learner in the context of cognitive development. As a psychological tool, language gives people control over their mental and social functions as they think and as they communicate with others (Vygotsky, 1978; see also Dixon-Krauss, 1996). In the early years of formal schooling, social speech plays a particularly significant role in the development of conceptual understanding because young children are also just beginning to develop abilities in reading and writing print. Further, the ability to engage in talk with peers and adults is one that most children bring to the primary classroom, although with varying degrees of experience and with diverse cultural meanings.

Another principle that emerges from Vygotsky’s theory of learning is the idea of spontaneous and scientific concepts. Spontaneous, or everyday, concepts are ideas or understandings which are primarily based upon direct experience with the physical and social world. They are constructed “bottom-up” through everyday concrete experiences. Scientific, or non-spontaneous, concepts develop “top-down” as they are based upon abstractions represented by the language of a particular culture (Dixon-Krauss, 1996). They are systematically developed and are less bound to a particular time and space than spontaneous concepts. The primary difference between scientific and spontaneous concepts, thus, lies in their historical development within the individual learner and within society (Vygotsky, 1986).
For example, I recall an instance from my own teaching experience when one of my kindergarten students stated that an acorn would become a squirrel. The situation in which she shared this idea was the reading aloud of a book about how living things grow and change. The child’s experiences of seeing squirrels and acorns in seasonal stories and information books, on fall decorations, and in first-hand observations around the neighborhood or in parks perhaps contributed to this misconception. The book provided brief information about the acorn becoming an oak tree. Further, over time, my student’s experience-based everyday idea came into contact with schooled concepts through our classroom and outdoor investigations of animals, plants, life cycles, seasons and habitats. Her experience-based concepts were interacting with scientific concepts.

In Vygotskian psychology, rather than confrontational in nature, concept development is dialogic; everyday and scientific processes are interdependent (Vygotsky, 1986). Scientific concepts become more concrete, more meaningful, as they are mediated by an individual’s everyday concepts. Everyday understandings are reorganized as a learner develops scientific concepts that allow the child to more systematically define and have deliberate control over his or her everyday concepts (Dixon-Krauss, 1996).

According to Vygotsky (1986), “instruction is one of the principal sources of the schoolchild’s concepts and is also a powerful force in directing their evolution” (p. 157). In fact, scientific or non-spontaneous concepts are most accurately represented in English by the term schooled concepts because they develop within the socially and historically situated context of formal education (Gallimore & Tharp, 1990). In Western societies, schooling is a primary means by which culture transforms individuals and individuals transform culture. Learners appropriate the scientific concepts of the school culture(s),
and the everyday concepts of diverse learners mediate the construction process (Dixon-Krauss, 1996; Rogoff, 1990). As an aspect of the socially interactive contexts of classroom learning activity, talk has the potential to be uniquely powerful in helping young learners to transform their thinking and their social environments (Ashton, 1996; Gallas, 1995).

A Sociohistorical Perspective of School Science

One aspect of the unique role of talk in learning is how it is used to communicate and to transform ideas in culturally significant activity. Science is such an activity. It is one of many social-cultural ways of viewing and understanding the world, and “talking science” is a particular culturally meaningful way of talking about the world (Lemke, 1990).

One implication of this perspective toward science is that talking about scientific ideas, which are experienced in the classroom through such activities as hands-on investigations and the reading aloud of books, is a means of constructing a culture of science in the classroom. Furthermore, in a classroom in which all children’s voices are honored and understanding of diverse languages and perspectives is sought, talking about scientific ideas alongside students’ various conceptions may contribute to “culturally relevant teaching”. Culturally relevant teaching refers to instructional situations that are truly opportunities to engage with new schooled ideas through and with one’s own culturally-based everyday concepts (Ladson-Billings, 1994).

Because of its role as a learning tool and its power to help diverse young learners make sense of science through the cognitive and social use of their own everyday ideas, classroom talk is worthy of intense study. In recent years, the study of the teaching and
learning of science has begun to focus on classroom discourse (Gallas, 1995; Lemke, 1990, 1993). This focus is consistent with the significance of language in the “real world” of scientists where “communication is an attempt to create a community of thought, a shared understanding” (Sutton, 1998, p. 28). According to Cobern and Aikenhead (1998), these contributions coincide with research trends that have developed over the last 20 years, during which an anthropological perspective of learning has gained popularity. This perspective has broadened the view of disciplines such as school science to recognize that they are more than static bodies of knowledge. This trend is evident in the assertion that school science should reflect real science and that real science is the work of women, men, boys, and girls engaging in communication in order to develop a shared and evidence-based understanding of the natural world (Gallas, 1995; Lemke, 1993; Sutton, 1998).

In this section, I will discuss theoretical writings about science and classroom science in order to link sociohistorical theory to an evolving perspective of science education. Later, I will review research in the field of science education to highlight the role of language in the teaching and learning of science and to empirically illustrate a sociohistorical perspective of school science.

The communicative and constructive role of language.

In recent years, researchers and theorists in the field of science education have begun to focus on the sociohistorical development of school science and the ways that scientific knowledge is presented in the classroom. According to these scholars, science has often been misrepresented in school because social, linguistic, and cultural aspects are not significant features of classroom science activity (Aikenhead & Jegede, 1999; Cobern &
Aikenhead, 1998; Halliday & Martin, 1993; Lemke, 1993, 2000; Sutton, 1998). The purpose of this subsection is to describe a perspective of science as a culture with specialized ways of speaking, writing, and interacting with the social and material world.

From this sociocultural perspective, science is a well-defined system of historically and socially situated activity. People construct meaning of science activity as they make use of various tools of science. These tools include concrete objects, or “hands-on” materials, as well as discourse, gestures, formulas, diagrams, and various procedures, or “minds-on” features (Cobern & Aikenhead, 1998; Lemke, 1990, 2000).

Corresponding to this cultural view of science is an emphasis on a realistic portrayal of science in the classroom and the key role of language. Scholars who focus on science as a culture assert that some practices of traditional science instruction, such as recipe-like experiments, rigid question-answer sessions, and lessons conducted solely with a textbook, do not adequately represent the work of scientists. The science presented to children in the classroom is often only the end product of much science work; that is, the creative and social aspects of authentic science are often missing in science instruction (Gallas, 1995; Halliday & Martin, 1993; Lemke, 1990, 1993; Sutton, 1998). Social interaction among colleagues, a combination of creative and critical thinking, fascination based on personal experiences, and an overlap of subjective and objective ideas are characteristics of science experiences among scientists that are frequently not included in science experiences among learners in school (Gallas, 1995).

Language is the primary issue in this misrepresentation. The spoken and written language of traditional school science frequently contributes to a distorted view of science among teachers and students (Halliday & Martin, 1993; Lemke, 1993; Sutton,
The interpretive uses of language may be neglected as authentic, experience-based questions are not asked and ideas are not expressed as thoughts but as statements of unchanging fact. In other words, the language of school science is often focused on transmitting information rather than on constructing knowledge. According to the theoretical perspective discussed previously in this chapter, such a focus neither effectively supports concept development nor represents culturally relevant teaching. Thus, science instruction that portrays science as a static and culturally neutral body of knowledge may alienate many learners.

Such alienation may be avoided when science teaching and learning is approached as an opportunity to engage in “cultural border crossing” (Aikenhead & Jegede, 1999). Cultural border crossing refers to participating in different cultures, “moving” socially and cognitively between one’s everyday life-world and the culture of science. Learning in this perspective is a construction process in which the experiences, beliefs, and conceptual development of a learner are considered to be significant and active in addition to the expert voice of scientific knowledge and processes. The everyday and the scientific aspects of this learning process interact with one another in the thoughts and actions of learners.

The concept of cultural border crossing is related to my discussion of spontaneous and schooled concepts earlier in this chapter. Students’ everyday ideas, or spontaneous concepts, may be interpreted as aspects of their home and community cultures. The schooled, or scientific concepts, which education seeks to have children develop, may be considered aspects of the institution of school science (Vygotsky, 1978; see also Ashton, 1996; Dixon-Krauss, 1996). Children make meaning of schooled concepts as (a) they
transform the ideas through participation in classroom learning activity guided by their everyday concepts and (b) the schooled concepts simultaneously transform learners’ own everyday concepts. Cultural border crossing—the seeing of multiple perspectives and the making of deliberate choices among the possibilities—is an aspect of developing scientific literacy.

Schooling that supports self-regulated cognitive, social, and physical actions is important to development in early childhood and to the life-long process of becoming scientifically literate. Children’s experiences with school science that reflects the culture of “real” science contribute to their development of scientific literacy. Such experiences may also contribute to students’ later equitable access to opportunities related to science and to their ability to “cross the border” into scientific ways of thinking when necessary in making decisions as consumers and citizens. Teaching that supports the crossing of cultural borders between the everyday and the scientific ideas involved in socially interactive classroom communities is culturally relevant teaching (Aikenhead & Jegede, 1999; Ladson-Billings, 1994).

Science teaching and learning as apprenticeship.

Sociocultural activity is human behavior—thoughts, words, actions—carried out within or among people for social purposes and with cultural meaning. Such activity is the central concept of Vygotsky’s psychology (Ashton, 1996). For young children, play and learning are leading activities of development; that is, children develop as they participate in particular play or learning situations. According to Rogoff (2003), development is the qualitative changes in how people participate in sociocultural activity. Development in early childhood is, therefore, the transformation of learners’ participation
in the play and learning activities of their communities, such as their classrooms, and the transformation of their community contexts by way of the learners’ words and actions.

A primary goal of science education is developing scientific literacy, or the increasingly flexible use of the cognitive, social, and material tools of science (Cobern & Aikenhead, 1998; Lemke, 1990). Additionally, the sociocultural activities in which a person participates become the thinking processes with which he or she approaches future activity (Vygotsky, 1978; see also Ashton, 1996). Therefore, opportunities to participate in activities that make use of a range of scientific tools, including spoken and written language, are essential in the classroom. According to a sociohistorical perspective, language mediates learning in the context of sociocultural activity; it shapes thought and it shapes the social context.

The idea of apprenticeship (Rogoff, 1990, 1995, 2003) is a model that bridges the theoretical perspectives of sociocultural activity and the actual practice of creating and engaging in classroom learning activity. Applied to teaching and learning, this model provides an interpretative framework for understanding what children and teachers do and say in the classroom and how their activity constructs and is constructed by the culture(s) of school science. The model of science instruction as apprenticeship considers the multiple factors involved in such instruction: (a) the culture and language of science and the institutional settings of schooling; (b) the socially interactive classroom community of learners, including the students, teacher, physical environment, and routines; and (c) the individual learner.
Apprenticeship, then, is a perspective on the human relationships that play a role in sociocultural activity, such as science teaching and learning in the classroom. In this way, apprenticeship is an aspect of a larger interpretative framework constructed by Rogoff (1990, 1995, 2003). According to this framework, sociocultural activity consists of simultaneous, mutually constituting processes known as apprenticeship, guided participation, and participatory appropriation. These processes are “visible” by way of three planes of analysis; respectively, these planes are the community-institutional, the interpersonal, and the personal plane.

To consider the interdependence of the analytical planes along with the significance of the “position” of the observer of sociocultural activity, I conceptualize Rogoff’s (1995, 2003) three planes as constituting a theoretical pyramid. The pyramid as a whole represents a sociocultural activity. As Figure 1 indicates, the personal, interpersonal, and community-institutional planes together form the pyramid. All three planes are necessary for the formation of the pyramid, as all three processes of sociocultural activity are essential to the activity. However, just as people may position themselves to view a particular side of a pyramid, teachers or researchers may choose one plane of analysis through which to focus on, or foreground, a particular aspect of sociocultural activity. The other processes, though, are still in action in the background.
When the personal plane is in the foreground, processes of participatory appropriation are visible as individuals transform their degree of social and cognitive participation and become increasingly prepared for participation in future similar activities. The cultural values-guided social interaction between people who may be physically present or present through memories or artifacts, such as books, is evident when the interpersonal plane is in the foreground; these processes are what Rogoff (1990, 1995, 2003) calls guided participation in the activity. The community-institutional plane of analysis reveals apprenticeship, which is the process of diverse learners participating in culturally significant activity while taking increasing cognitive, social, and physical responsibility. In a school setting and in this study, features of the institution of schooling and of the discipline of science are aspects of the community-institutional plane. In Chapter 3, I will further indicate the types of activities and processes that were my focus when I was gathering and interpreting data from the perspectives of the three different planes of analysis.

Figure 1: Rogoff’s (1995, 2003) three-plane sociocultural framework.
Teaching and learning as apprenticeship in the historical and cultural practices of science focuses on the interdependent processes of individual transformations through guided participation in community activity. According to Rogoff (1993),

the notion of apprenticeship focuses attention on the active role of children in organizing development, the active support and use of other people in social interaction and arrangements of tasks and activities, and the socioculturally ordered nature of the institutional [e.g. school] contexts, technologies, and goals of cognitive activities (p. 133).

Based upon this view, language is a vital aspect of science instruction in terms of content and process. Language-rich science instruction mediates the schooled concepts of science and the everyday concepts of the learners; that is, it supports dialogic interaction among ideas within the classroom community. Further, spoken and written science-related language, or classroom scientific discourse, (a) facilitates the transformation of learners as they appropriate the cognitive and social tools of science and (b) contributes to the transformation of the community of learners itself.

Scientific discourse in the classroom.

Spoken and written discourse among scientists has particular culturally meaningful and historically developed ways of using words to represent highly complex ideas and to construct understandings among members of a community (Lemke, 1990, 1993, 2000; Sutton, 1998). Scientific discourse is a specialized way of speaking or writing to communicate a specialized way of knowing. It is identifiable by features that include technical terminology and grammar, and it has been developed over a long history of use in the human practice of investigating the natural world. To reduce scientific discourse in the classroom to the printed words on the page of a science textbook or to a brief explanation by a teacher distorts the central role that language has in the real work of
scientists and limits students’ access to science learning (Halliday & Martin, 1993). The model of teaching and learning as apprenticeship is one way of translating authentic science practice into meaningful science instruction.

People construct scientific discourse within classrooms as they interact with materials, ideas, and one another within the framework of an apprenticeship relationship (Gallas, 1995; Rogoff, 1990, 1995, 2003). The spoken and written language of the teacher, of peers, of expert others by way of previous experiences or cultural artifacts (e.g. science materials and informational text) are among the factors that guide children’s participation in using the tools of science. The development of classroom apprentice-expert relationships among teachers and students is consistent with goals for science education as expressed by the *National Science Education Standards* (National Research Council, 1996). The thread of language weaves together the content and processes delineated in the *Standards*. In the classroom, it should be the foundation for creating a community of learners in which science is an aspect of what people know and are able to do.

**Studies of Classroom Science Talk**

The studies included in this section contributed to the research questions and the theoretical perspective of the current classroom study. I selected and read these previous studies according to the sociohistorical view of teaching and learning and of school science described in this chapter. Together the studies provide empirical illustrations of the role of language in making meaning of school science experiences, creating shared understandings among members of learning communities, and constructing scientific concepts.
This collectively diverse illustration of the sociocultural processes of teaching and learning science is related to the different ways that classroom science talk is featured in the studies. Talk was evidence of students’ conceptual understandings in some studies (Panofsky, John-Steiner, & Blackwell, 1996; Shepardson, 1997; Tunnicliffe, 1997; van Zee, Iwasyk, Kurose, Simpson, & Wild, 2001). In others, the primary focus of analysis was science discourse, or the talk related to science as a particular sociocultural way of knowing and doing (Crawford, Kelly, & Brown, 1999; Gallas, 1995; Kurth, Kidd, Gardner, & Smith, 2002; Pappas, Varelas, Barry, & Rife, 2003; Segal, 1997; Varelas & Pineda, 1999). Both roles of classroom talk in research are important to creating a picture of the role of talk in science learning because together they include the individual, interpersonal, and community-institutional aspects of learning and development (Rogoff, 1995, 2003).

In addition to this range of views of science talk, the studies I review also feature participants of varying ages. While my primary interest is in science teaching and learning in early childhood, I have included research in which the participants were in the intermediate elementary grades or higher because of the relevance of the theoretical perspectives or research methodologies. A key factor in including a study in the following review is that the research features language in its “building” function among humans—constructing scientific concepts within and among people and creating a science discourse within communities of learners.

**Talk as evidence of student thinking.**

In an ethnographic study of the understanding and use of taxonomic categories in a fifth-grade class, Panofsky, John-Steiner, and Blackwell (1996) analyzed the results of
two individualized classroom-based tasks—a sorting task and an oral retelling task. The researchers employed a sociocultural perspective based upon Vygotsky’s psychology. From this perspective, they observed and analyzed science talk as evidence of students’ internalization of scientific concepts during the open-ended experimental tasks. The classroom context of the study included students’ engagement in regularly scheduled teacher-led science discussions and their frequent participation in an instructional game involving animal classification. Animal classification was the instructional focus in this classroom during the study.

Because the purpose of the study was to understand child thought, the researchers analyzed quantitative data to examine relationships between the speaking and thinking of an individual (Panofsky, et al., 1996). They gathered these data by administering a series of the picture-sorting tasks to each child. Also, the researchers presented a film about the similarities and differences of the eyes of several animals and monitored the students’ attention to the film. The film-viewing was followed by a classroom discussion and a one-on-one retelling task. For the retelling task, each fifth-grade student described the content of the film to a younger student.

Throughout the discussion and the retellings, the adult researchers asked questions in order to prompt student talk. This was the talk that was analyzed. Each student’s performance on the two tasks was compared across task in order to relate an individual’s thinking with what he or she said when answering adult questions. In this search for understanding of child thought, Panofsky, et al. (1996) concluded that the development of the classification strategies they investigated could occur effectively within a “system of
discourse” (p. 266) and that through this classroom discourse, teachers can gather evidence about their students’ current level of conceptual development while providing instruction within a zone of proximal development.

Panofsky, et al. (1996) sought to understand students’ thinking by analyzing their talking, specifically their spoken answers to adult questions, during open-ended tasks. Similarly, van Zee, Iwasyk, Kurose, Simpson, and Wild (2001) examined talk as evidence of student thinking. According to this collaborative group of teacher researchers, students’ questions before, during, and after classroom science activity revealed the students’ understanding of and experiences with the physical science concepts involved in the activity. As teachers and as researchers, these authors assert that “when we invite students to ask questions…we are inviting them to display the knowledge they have available to formulate a question” (p. 184).

This research project consisted of case studies of the primary elementary to college level classrooms of the five authors. By analyzing the content of dialogue involved in instructional activities across cases, the authors identified patterns in questioning by students and in questioning by teachers. The authors delineated these patterns as a series of assertions focusing on features of the social and physical environments of the classrooms that tended to elicit student questions. Further, according to the authors, these features were related primarily to the actions of the teachers during instruction or to the contexts they had purposely co-constructed with their students (van Zee, et al., 2001).

These contexts included a variety of discourse structures, ranging from teacher-directed lectures and recitations to more interactive guided discussions between teachers and students and inquiry discussions based upon student-generated questions. Based
upon their interpretations of classroom talk within these various discourse structures, van Zee, et al. (2001) concluded that students asked questions when the teachers (a) engaged them in discourse practices that explicitly elicited questions, (b) engaged them in “conversations about familiar contexts in which they had made many observations over a long time period” (p. 168), (c) “created comfortable discourse environments in which students could try to understand one another’s thinking” (p. 171), and (d) involved the students in small collaborative groups.

In these supportive contexts, the teacher researchers employed question-asking techniques in their teaching to further support their students in developing the physical science concepts under investigation in the various classrooms. According to the authors, these techniques, like the assertions regarding student questioning, were consistent with the teaching practices advocated by the *National Science Education Standards* (National Research Council, 1996). The techniques included (a) asking questions to elicit students’ everyday experiences and (b) encouraging clarity about one’s own viewpoints, respect for the perspectives of others, and reflection on the meaning of the discussion and one’s own ideas about it. These assertions regarding student and teacher questioning before, during, and after classroom science experiences demonstrate the importance of both science content and discourse processes for effective science instruction. Further, the assertions illustrate classroom science talk that mediates a dialogic relationship between everyday and scientific concepts (van Zee, et al., 2001).

The work of van Zee, et al. (2001) indicates the widening lens by which science is perceived by some researchers and educators—as a continually evolving culture, a creative human endeavor in which people interact with their physical and social
environments and consciously consider and develop their thinking. One means of such interaction is questioning. Asking questions about various phenomena is a way a learner exerts control outwardly and inwardly (Vygotsky, 1986). This view of science and of questioning necessitates more open-ended treatment of talk in the classroom; analysis of classroom discourse must not be limited to the asking of questions by adults and answering by students.

In this way, a study examining young children’s spontaneous comments and exclamations is similar to that of van Zee, et al. (2001), who included in their data students’ talk (specifically, questions) that was not directly elicited by adult prompting. In the study, Tunnicliffe (1997) focused more fully on the spontaneous verbalizations of young children (nine years old and younger) visiting a zoo and of children visiting a farm. In order to compare the types of children’s comments evoked by viewing the animals within the different contexts of captivity and degrees of domestication and familiarity, the researcher recorded and transcribed conversations among children and child-initiated conversations between children and adults. She then analyzed the transcripts according to a coding system based upon the characteristics of the animals and the setting in which they were observed by the children. Her purpose was to determine the features and behaviors of the animals that prompted the children’s talk by identifying themes across the whole set of comments. As in the previous studies, talk was evidence of children’s thinking; however, Tunnicliffe (1997) primarily interpreted the content of students’ talk rather than its function.
Talk as mediator of classroom activity.

In another study involving young children, talk is presented as evidence of children’s thinking as well as a mediator of work among students engaged in collaborative small-group science activities (Shepardson, 1997). According to Shepardson (1997), “children’s understandings of scientific phenomena prior to schooling are shaped not only by their everyday experiences with the phenomena, but by the language and perspective others bring to explain the science phenomena at hand” (p. 873). From this social constructivist perspective, the author gathered and analyzed the talk of two randomly selected groups of four first graders. Data collection took place during small-group work on constructing life-cycle diagrams and during science journal writing. The groups were heterogeneous, and their eight members were key informants for the larger classroom groups.

Inductive analysis revealed that students’ talk with their peers helped the young learners to influence the thinking of others and to change their own ideas as they consciously considered them alongside those of their peers. Changes in students’ personal ideas about insect life cycles were evident in the journals of the focus students. The effect of the small group interaction was inferred through cross-referencing the primary data of the journals with the secondary data of field notes and videotapes.

Shepardson (1997) further investigated the connections he perceived through interviews with the eight individual informants. Talk, then, was primarily a source of data, but in the context of the small group interaction, talk was also conceptualized as a tool for learning—a way to bring ideas from the mental to the social setting in order to construct knowledge about a specific science concept. In this study and as discussed
earlier in this chapter, classroom science talk brings an individual’s ideas to the social context. The social interaction with and about those ideas may also serve to transform what is inside a student’s mind (Ashton, 1996).

This power of language to transform learners and their communities was the focus in the longitudinal classroom-based research of Gallas (1995). As in the work of van Zee, et al. (2001), questions were a critical aspect of science teaching and learning. In Gallas’ teacher research, however, questioning was not the object of study but the root of rich classroom discussions. These discussions were the focus of analysis. According to Gallas, such discussions are a way to maintain the sense of wonder that is an authentic part of science learning. She asserts that “the separation of creativity, imagination, and wonder from the pursuit of science is artificial and disruptive to the development of children at any age” (p. 102).

In the report of her long-term teacher research, Gallas (1995) states, “I am working to extend scientific literacy to all children by attending to the construction of a discourse in my classroom” (p. 99). Over the course of six years, Gallas and her young students created communities of learners in which the children’s everyday concepts became part of the shared cognitive and social fabric of the classroom through ongoing respectful, imaginative, playful, and science-focused dialogue. Her purposes as a teacher researcher were to (a) elicit students’ ideas and questions through oral language so that this language could be used as a tool for scientific concept development, (b) include all her students in the important task of building a classroom discourse of science, and (c)
analyze this classroom discourse for evidence that her students were indeed appropriating, or transforming and taking ownership of, “the language, attitude, mind, and psyche of the scientist” (Gallas, 1995, p. 99).

Based on these purposes, Gallas (1995) engaged groups of young students over time in regularly scheduled, child-structured discussions designed to focus on a well-defined topic. This topic was a question taken from the scientific social life of the classroom representing such depth that even professional scientists engaged in discussion would be challenged. A few examples of the questions are “How do plants grow?” (p. 21), “Does the universe end?” (p. 24), and “Is voice matter?” (p. 62).

According to Gallas (1995), discussing such questions empowers young students, with their diverse cultural backgrounds, in shaping the content of school science and de-emphasizes the central role of the teacher as the leader in “talking science.” Consistent with the cultural perspective of science discussed previously, Science Talks construct science as a particular way of talking about the world (Halliday & Martin, 1993; Lemke, 1990, 2000). Furthermore, in Gallas’ work, science discourse is a way of talking about the world in which even the youngest elementary students can participate fully, not simply to share their ideas and to gather information, but to transform ideas and to be transformed as learners (Gallas, 1995).

Gallas’ (1995) research demonstrates that by inviting children to participate in hands-on science activity and social interaction, educators and researchers can contribute to the construction of a discourse of science within the early childhood classroom. In the context of Science Talks, primary students and their teacher were able to do what scientists do—ask questions, propose theories, participate in the complexities of
investigating what fascinates and confuses them—even if they did not yet fully understand particular scientific information. According to Vygotsky (1978, 1986; see also Ashton, 1996), the activity in which a person participates becomes the thought structures with which he or she approaches future activity; this is development. Questioning and theory building are powerful and productive ways of thinking for children to begin to develop in the earliest years of their formal schooling. These thought processes are of value to children as learners in school and as learners and decision-makers in society.

Crawford, Kelly, and Brown (1999) also investigated the construction of science discourse processes and the appropriation of scientific practice in the classroom. Their investigation was an ethnographic study involving late primary and intermediate students with the same teacher over a two-year period. Like Gallas (1995), these researchers viewed the classrooms as communities of learners. Further, they employed an interpretative framework featuring science as a non-neutral, socially and historically constructed culture in which not all students participate easily.

Part of the role of science talk, according to Crawford, et al. (1999), is to bring to the classroom culture of science the multiple sociocultural perspectives of the learners. The role of the teacher in supporting such classroom science talk involves “orchestrating student conversations, considering issues of equity in small group work, and balancing the tensions between students’ ideas and disciplinary knowledge” (Crawford, et al., 1999, p. 11). These were aspects of the teacher’s practice featured in this study. Their
influence upon the science practices of her third grade students, who were her fourth
graders the following academic year, were the focus of the researchers’ observations and
analyses.

The findings indicate that in their third grade year, the student participants and their
teacher had co-constructed a scientific discourse and a shared set of scientific practices.
These practices included observation of phenomena, articulation of one’s own and others’
ideas, presentation of data, and consensus-building among the members of the
community of learners. The children’s words and actions demonstrated a growing
knowledge of scientific information and an increasing ability to engage in scientific
investigation. For example, in one particularly significant series of events during the
second academic year, these co-constructed ways of engaging in science practice were
observed and analyzed in the context of spontaneous individual and class investigations
of marine science questions. These questions were based upon students’ observations of
animals in the classroom aquarium during the regularly scheduled free time in the
classroom.

One student-initiated investigation was about a sea anemone and whelk and their
apparent physical attachment in the aquarium. This investigation put to use the range of
scientific capabilities of the learning community, including communicating with a
professional scientist and making a key decision based on scientific as well as ethical
factors (whether or not to separate the two creatures). Such classroom experiences, like
Gallas’ (1995) Science Talks, afford students opportunities to engage in the sociocultural
practice of science through classroom scientific discourse in which members of the community “articulate their ideas, explain their reasoning, and respect the ideas of their peers” (Crawford, et al., 1999, p. 27).

**Classroom discourse as a context for learning and development.**

In their longitudinal classroom studies, Gallas (1995) and Crawford, et al. (1999) focused on the construction of classroom scientific discourse. Their interests in their data collection and analyses involved examining the social and cultural processes that contributed to and that arose from the children’s and the teachers’ co-construction of these discourse practices. Kurth, Kidd, Gardner, and Smith (2002), Varelas and Pineda (1999), and Segal (1997) focus on sociocultural occurrences within the context of such discourse.

Through observations of the classroom community practice of “science circle” and subsequent focal-student interviews, Kurth, et al. (2002) gathered discourse data in which they identified two main forms of talk—paradigmatic and narrative. The authors describe narrative talk as sequenced stories based on particular personal experiences. In this research, students used a narrative form of talk to support their own comprehension of new experiences or ideas. Paradigmatic talk, according to the authors, is a more abstract and logical form and refers to universal knowledge or experiences rather than particular personal stories. The students in the study made use of paradigmatic talk to justify their positions through testing ideas or verifying information.

In the work of Kurth, et al. (2002), the context of Science Circle was a full-group discourse structure in which the teacher and first and second grade students discussed broad statements related to the ongoing science work of the classes. Examples of these
statements include “‘Sight is more important than hearing’” (p. 809) and “‘There is water in air’” (p. 797). These statements, like the questions posed in Gallas’ (1995) Science Talks, emerged from students’ classroom interactions with and about science experiences. They were topics that were open to a variety of interpretations and about which the teacher had observed some amount of disagreement among the students. The conversations that took place within the open social and physical space of the Science Circle were built upon the solid foundation of much reflective planning and modeling on the part of the teacher. Over time the Science Circle conversations came to be directed primarily by the young students (Kurth, et al., 2002).

Over the course of two years, Kurth, et al. (2002) found that the students demonstrated competence in their use of both forms of talk, as evidenced by the occurrence of both narrative and paradigmatic features in their conversations of complex topics throughout the study period. Further, narrative and paradigmatic features were often interwoven to make meaning of the topics, as the students used everyday concepts in order to make scientific ideas more comprehensible by connecting them to personal experiences. This dialogic relationship between narrative and paradigmatic features continued throughout the study, although the trend over time was toward the use of more paradigmatic than narrative features in science conversations. In reflecting upon these findings, the authors state:

Both teachers [whose classrooms were studied] encouraged students to use a wide variety of nonfiction knowledge sources in stating their reasons. Despite this freedom of potential language forms, students may have learned from other contexts, such as reading science textbooks, the standard tendency for scientific language to be expressed in a paradigmatic mode (Kurth, et al., 2002, p. 800).
In addition, as they link their findings to classroom practice, the authors suggest that teachers encourage student-initiated and student-centered discussions that allow or encourage the use of both narrative and paradigmatic forms of talk in students’ joint meaning-making. According to this study, doing so will enhance the development of scientific concepts, as personal narratives of particular experiences make the scientific concepts more concrete and comprehensible and as connections to “real life” support students’ life-long engagement with science (Kurth, et al., 2002).

A qualitative case study conducted by Varelas and Pineda (1999) is another project focusing on classroom science conversations. Specifically, this study centered on how the students made meaning of scientific concepts and how they constructed shared understandings of these concepts with their teacher. The setting for this study was the second author’s fifth grade classroom. As the teacher, he planned and implemented science lessons according to a sociocultural perspective of teaching and learning based mostly upon the work of Vygotsky (1978, 1986). Pineda’s main goal for science instruction was to assist his students in developing and taking ownership of ideas that also were consistent with accepted scientific views (Varelas & Pineda, 1999, p. 26). This goal was supported by dynamic classroom conversations that took place before, during, and after conducting experiments and gathering information related to the science concept under investigation. The instructional topic during this study was friction.

The primary goal of the action research project was related to the instructional goal. The ways in which students engaged in meaning making during classroom science conversations were observed and analyzed. The purpose was to determine the extent to which the teacher successfully balanced “on one hand, his need to actively involve his
students in making meaning, and, on the other hand, his need to help them construct predetermined understandings that have been scientifically accepted” (Varelas & Pineda, 1999, p. 25).

The authors use the term *intermingling* to describe the times when the teacher and students were successful in creating this balance between everyday and the scientific ideas through discourse. *Bumpiness* refers to those instances when the classroom community did not construct shared understandings. Such situations seemed to be related to how well the teacher was able to (a) understand the everyday, experience- and perception-based ideas of his students, (b) assist them in clarifying and extending their ideas, (c) organize the multiple ideas expressed by the group in order to make meaning of them collectively, and (d) collaborate with his students to build these ideas toward alignment with accepted scientific knowledge. Based upon these findings, the authors of this action research offer several suggestions for science instruction within the study classroom. One suggestion was to allow time for free exploration of a concept using various materials prior to engaging in full-class discussions of the concept. Another suggestion was to provide the fifth-graders with many opportunities to express their developing ideas privately in their own journals in addition to publicly through class discussion.

Varelas’ and Pineda’s (1999) instructional concern with supporting the intermingling of students’ everyday concepts with more widely accepted scientific concepts through classroom science discourse is similar to the idea of “transformational interactions.” Such interactions are a key feature of an earlier study of classroom science discourse.
among young children and their teacher (Segal, 1997). The research setting was a primary elementary classroom. As in Pineda’s classroom, instruction was planned and implemented according to a sociocultural perspective of teaching and learning.

Transformational interactions, according to Segal (1997), are conversational events in which a group of people develop a shared understanding of the event or context as their personal histories and ideas intermingle with one another and with scientific ideas. Transformational interactions are significant or may become significant to the learning and development of those who participate. Further, the experience of the interactions themselves is valuable to the people involved. Such interactions constituted the classroom discourse that was the focus of the qualitative investigation.

The purpose of Segal’s (1997) study was to observe and analyze classroom discourse in order to examine children’s appropriation of scientific concepts of light and shadow. These ideas were investigated over a long period of time through classroom conversations and student-generated informal inquiries. Science talk in this research, then, was the evolving discourse practices of the young children and their teacher. The teacher employed a model of teaching and learning that had been collaboratively developed according to the theoretical and pedagogical beliefs of both teacher and researcher.

This instructional model was known as the On-Going Thinking Model. In addition to the teacher’s belief that science in the classroom involves more than an adult-dominated lecture, as she had experienced in her own secondary schooling, the model was constructed upon principles delineated by the researcher. These principles focused on the
relationship between the teacher and students, the instructional contexts in which this relationship developed, and the role of multiple diverse ideas in developing scientific knowledge (Segal, 1997).

According to the findings, when instruction was planned and implemented within the framework of the On-Going Thinking Model, the classroom discourse focusing on light and shadow developed in five non-sequential, non-discrete phases in which the teacher and students worked together to:

1. make prior knowledge explicit (through engaging in discussion based upon a full-class read-aloud of an enjoyable story, listening carefully to one another, and beginning to build common knowledge).

2. articulate and understand ideas (by discussing ideas from classroom conversations in pairs).

3. participate in whole class discussion (by engaging in reflection-in-action, or reflecting on one’s own thinking and on the ideas of others expressed in the discussion; writing down and organizing knowledge and ideas; and building shared meaning).

4. participate in additional activities and reflection (by investigating student-generated questions based on the classroom concept focus and organizing data gathered in these investigations).

5. reflect on shared experiences and on one’s own learning over time, both short-term and long-term.

Throughout these phases and to varying degrees, the young children began to appropriate scientific ideas about light and shadows. Within the contexts of full-class conversations and hands-on testing of student-generated questions, the children engaged
in discourse that was mediated by multiple sociocultural factors. These included (a) the teacher’s role as respectful and creative facilitator in the classroom science discourse, (b) the students’ own understanding of the importance of their learning and its importance to their parents, (c) the emergent framework of the On-Going Thinking Model, (d) opportunities for students to ask questions, and (e) the practice of replicating others’ experiments to further investigate light in the classroom. According to Segal (1997), these mediators supported the young children’s appropriation of scientific concepts of light and shadow and a perspective of science “as a cognitive, social and emotional activity of personal value” (p. 37).

**Linking classroom scientific discourse and informational text.**

As the studies I have discussed illustrate, the empowering nature of socially interactive school science activity honors the voices of diverse students, setting them up for success in learning science concepts and in having a perspective of science as valuable and understandable. This is a highly significant attitude to possess in our increasingly complex world, where “more and more decisions that affect us all involve scientific and technical issues” (Lemke, 1990, p. 129). Science education rich in social interaction may, thus, transform learners, schools, and society through the words and actions of students who have become well qualified to make decisions that affect themselves, others, and their environment.

According to research highlighted in this review, the construction of a discourse of science within the classroom is one means of engaging in science teaching and learning that honors the diverse voices of learners and provides opportunities for dialogic interaction of scientific and spontaneous concepts. This review of research in science
education includes studies in which classroom science talk among students of various ages was perceived as evidence of their everyday and scientific knowledge (Panofsky, et al., 1996; Tunnicliffe, 1997; van Zee, et al., 2001).

Additionally, the review includes research that has widened the perspective on the role of talk in science teaching and learning. For example, in the Shepardson (1997) study, talk was both evidence of thought and a learning tool within a classroom of first graders. The studies conducted by Gallas (1995) and Crawford, et al. (1999) extended the idea of talk as a learning tool as well as evidence of student thinking. These studies of communities of young learners focused on the construction of science as a particular way of thinking and talking about the natural world, which the communities investigated through the students’ own questions.

Other studies in this review examined the social activity and the cultural transformations that occurred within classroom discourse communities (Kurth, et al., 2002; Segal, 1997; Varelas & Pineda, 1999). A final study in this review of research focusing on the role of talk in school science examined talk in the context of interacting about and with information books in two urban primary classrooms (Pappas, Varelas, Barry, & Rife, 2003).

From a theoretical perspective consistent with the sociocultural view of science and language discussed earlier in this chapter, Pappas, et al. (2003) investigated the verbal interactions of the teachers and students in a first grade and in a second grade classroom. These interactions constituted collaborative meaning-making of scientific concepts
during socially interactive read-aloud sessions of informational texts. The read-aloud sessions in the two classrooms made use of the same information books, which focused on the key ideas of an integrated science-literacy unit about states of matter.

The unit had been developed by the first two authors (researchers from a university) and the second two authors (the two teachers in two study classrooms). It was part of a series of similar, collaboratively developed units integrating science and literacy. These units featured:

(1) hands-on explorations, plus whole-class discussions around them; (2) read-aloud sessions using a range of children’s informational books on the topic being investigated; (3) many writing (and drawing) experiences related to the inquiries; (4) small-group literature circle inquiries using informational books; and (5) at-home parent-child explorations on the topic… (Pappas, et al., 2003, p.436).

Verbal contributions that were of particular interest in this action research were those that represented *intertextual connections*. According to the authors, intertextual connections are statements linking the text being read to other texts, such as other written texts, songs, charts, and oral accounts of personal experiences. Further, such connections are a primary means by which learners appropriate a discourse of science. Through intertextual connections, learners bring to the classroom science context their everyday ideas based upon their personal experiences within their homes and communities (Pappas, et al., 2003).

Applying concepts from the theoretical work of Bakhtin (1981, as cited in Pappas, et al., 2003) the authors describe the collaborative discourse during the read-aloud sessions as a “hybrid” of the students’ and teachers’ ideas and discourse styles. The collaborative read-aloud sessions were rich in instances of *heteroglossia*, or the coming together of aspects of the “official” curriculum associated with schooling and of the “unofficial
curriculum” of personal experiences of the teachers and learners. Particular categories of intertextual connections identified by the action research team were associated with these general themes of hybridization and heteroglossia (Pappas, et al., 2003).

The four main categories identified through this research project represent connections to a range of written, spoken, and experienced texts. This range included “written texts, other texts that are orally shared, other media, …prior classroom discourse…hands-on explorations…recounting events…[and] ‘implicit’ generalized events” (Pappas, et al., 2003, p. 443). The recounting of events within the context of the collaborative read-aloud were instances of participants’ use of narrative forms of talking, a type of talk also identified by Kurth, et al. (2002). Another similarity in findings between these two studies was that through both investigations the researchers recognized the contribution of personal narratives in making meaning of scientific discourse. In fact, Pappas, et al. (2003) described the recounting of events as “some of the clearest illustrations of how children use their ways of knowing as they attempt to make sense of ideas provided by the read-aloud information books” (p. 460).

This investigation of intertextual connections during the reading aloud of information books suggests the significance of children’s literature in science teaching and learning in early childhood (Pappas, et al., 2003). Further, the importance of personal narratives in meaning-making during the collaborative read-aloud sessions illustrates the dialogic relationship of spontaneous and schooled concepts (Vygotsky, 1986). The following section further examines the role of literature as mediator in classroom science discourse.
The section also constructs a theoretical bridge between the primarily Vygotskian-based sociocultural perspective of recent research in science education and a transactional theory of literature (Rosenblatt, 1978, 1995).

Nonfiction Literature in Early Childhood Teaching and Learning

As I have discussed, perspectives on the role of language in classroom science have changed in recent decades. Similarly, views of the role of children’s literature in teaching and learning have evolved. Changes in educational research methodologies and theoretical perspectives throughout the last several decades have constructed a widening lens through which to study the activity of teachers and children as they engage with children’s literature in various classroom contexts (Martinez & Rosen, 2003).

In this section of the theoretical framework and review of literature, I will discuss relevant research in the field of children’s literature, particularly regarding nonfiction books and children’s response to literature. I have organized the discussion to focus on the use of a particular genre in a particular type of classroom context among children of a specified age range. Further, I have organized this discussion to situate the critical questions of the present study within the evolving body of response theory and research.

Nonfiction Children’s Books and Genre Knowledge

A primary purpose of nonfiction books is communicating information and presenting knowledge in a factual manner. Nonfiction books for children organize and present information in a range of formats and styles. This variety provides useful ways to classify informational books in writing and talking about them in research and instructional contexts (Freeman & Person, 1998; Huck, Kiefer, Hepler, & Hickman, 2004). Much of the scholarly writing about this genre of children’s literature has used the
terms informational or information books rather than nonfiction. In the discussion that follows, I have retained the labels used by the authors; however, in this dissertation I use the term nonfiction to represent this diverse genre, in accordance with a recent trend in the field of children’s literature (Huck, et al., 2004).

Books of a variety of types represent the nonfiction genre. In a study of the extent to which such literature and other informational print materials were available to children in 20 first grade classrooms, Duke (2000) constructed a precise definition of her meaning of informational texts. Because her focus in this study was wider than informational books, Duke’s definition of informational texts states that they are texts or contexts having many or all of the following features: (a) a function to communicate information about the natural or social world, typically from one presumed to be more knowledgeable on the subject to one presumed to be less so; (b) an expectation of durable factual content; (c) timeless verb constructions; (d) generic noun constructions; (e) technical vocabulary; (f) classificatory and definitional material; (g) comparative-contrastive, problem-solution, cause-effect, or like text structures; (h) frequent repetition of the topical theme; and (i) graphical elements such as diagrams, indices, page numbers, and maps (p. 205).

Applying this definition of informational text, Duke (2000) investigated the availability of these particular genre features to children in 20 early childhood classrooms. The particular settings were 10 classrooms in districts with low socioeconomic status and 10 in districts with high socioeconomic status. The racial and ethnic background of the classes varied. The average number of years of teaching experience among the participating teachers was over 18. These features of the data collection setting reflect the author’s interest in students’ opportunities to gain semiotic capital, which she defines as the fluent use and understanding of discourses that are
valued in particular settings. Further, the author states that “the ability to read and write informational texts is one form of semiotic capital valued in multiple settings in advanced schooling, community, and work” (p. 205).

In order to investigate students’ opportunities to gain this semiotic capital in the 20 classrooms, Duke (2000) visited each class four times at different points throughout the school year. She observed the environments and cross-curricular activities of the children and teachers without directly participating in the life of the classrooms. Her purpose was to gather descriptive data about (a) the print displayed in the classrooms for the purpose of being read by students, (b) books and magazines available for student use in the classroom libraries, and (c) instructional activities involving reading and/or writing print. Duke and a second reader coded data according to the genre represented by print materials and the amount of time that the majority of class members engaged with different types of texts.

The results of these analyses indicated a scarcity of informational text available on display, in books and magazines, and through written language activities in the study classrooms, especially in the districts with low socioeconomic status. This shortage of informational print materials and lack of use of such texts across the first-grade curricula in the study classrooms led Duke (2000) to recognize a continuing need for increased attention to informational text among researchers and teachers. Without such attention, she warns of missed opportunities among young children for life-long engagement in literacy and for achievement in future academic, career, and daily life activities involving
informational reading and writing. In other words, a lack of experiences with informational text could reduce some students’ opportunities to gain the semiotic capital of non-narrative discourse.

Duke’s (2000) research made use of a well-defined understanding of informational text features in order to investigate an important issue in early childhood education and research. Such deep understanding of the particular genre involved in classroom instruction and in research is important to making meaning of children’s book-related words and actions because the text is an aspect of—or, a “participant” in—the reading event. The reader(s) or listener(s) and the meaningful “lived through” experience of the reading event exist in relationship with the text itself, and the text helps to determine the validity of a given response (Rosenblatt, 1978).

Research focusing on nonfiction connects books and learning through careful analysis of the genre itself for understanding of particular text elements and through interpretation of the talk of young children for evidence of tacit knowledge of these features (Duke & Kays, 1998; Pappas, 1987, 1993). When combined with Duke’s (2000) concern with children’s opportunities for achieving the semiotic capital of informational text, this focus on children’s development of genre knowledge provides further support for studies of the role of nonfiction in the early childhood classroom.

Pappas (1987, 1993) and Duke and Kays (1989) conducted such studies. Pappas’ investigations focused on (a) structural and linguistic features that are typical of information books and then (b) kindergartners’ demonstrated perceptions and preferences regarding information books. The overall findings of the latter study are echoed in a study by Duke and Kays (1998), who applied a slightly different research design in
gathering data and employed a broader interpretative framework in discussing their findings. Both research teams support the use of informational text in classrooms with young children and focus on the development of genre knowledge, with significant implications for young children’s ongoing growth as readers and writers. I will discuss these studies below.

As I stated earlier, an understanding of the genre that is featured in a particular study related to literature and its use with children is crucial in interpreting how children interact with the book(s) and what meaning they make of the work (Rosenblatt, 1978). Pappas (1987) analyzed the non-story written discourse of over 110 information books according to established genre definitions. Her goal was to identify structural patterns within the information book genre. She examined the texts according to features that must or may occur, that may or may not repeat, and that occur in a fixed sequence or variable order. Additionally, she studied the texts to determine if the features occurred as discrete elements in the text or if they were interspersed throughout other elements.

Through these analyses, Pappas (1987) identified three obligatory elements of the information book genre (topic presentation, description of attributes, and characteristic events) and three optional elements (category comparison, final summary, and afterword). By looking more closely at discrete and interspersed topic presentation elements, the researcher also recognized that the particular topic of an information book is generally presented as a class of places, items, or intangible processes or concepts. This study of information text itself revealed typical features, not a strict definition, of
information books and provided a foundation for later studies of information books and young children’s understandings of the genre. In fact, this work is reflected in Duke’s (2000) precise definition described above.

Whereas her earlier study focused on the features of information books, Pappas’ later genre investigation (1993) focused on children’s talk and how it reflected the language of the books involved in the study. To address the question “Is narrative ‘primary’?” the researcher examined the talk of 20 kindergarten students. The purpose of this examination was to identify features in their oral language that are typical of the written language of either picture storybooks or picture information books. While acknowledging the role that pictures in these books played in the children’s meaning-making, Pappas (1993) chose story and information books that were linguistically typical of their genres because “the characteristic generic structure of each text itself has a major role in supplying the clues to access meanings to that text” (p. 100).

Specifically, this study examined co-referentiality and co-classification patterns in children’s re-readings (“pretend readings”) of story and information books after hearing the books read aloud by an adult. Co-referentiality is the feature of narrative texts that traces the identity of a particular character throughout the story, forming a conceptual “identity chain”. A co-classification chain is constructed in informational text when, rather than a specific character, the focus is a class of animals, things, or people (Pappas, 1987).

Data regarding these patterns in the children’s language were gathered in one-on-one situations over three consecutive days. The individualized sessions involved adult readings of a selected storybook and information book followed by the child’s pretend
readings of each book. Additionally, during the second and third sessions, the children were invited to choose which book the adult would read first and to comment on the reasons for their selections. Overall, the children used a form of book talk (a “reading voice”) for their pretend readings that differed from their conversational talk. Further, their language indicated the children’s tacit awareness of the co-referentiality and co-classification patterns associated with the two different genres involved in the study (Pappas, 1993).

The use of everyday words in stories and of more technical vocabulary in information books was another major discourse feature relevant to the analysis in this study. The kindergartners’ pretend readings of stories and information books did reflect these differences in word usage. The children’s pretend readings, therefore, suggested success with “reenacting or taking on the discourse properties” of information books as well as storybooks (Pappas, 1993, p. 125).

Another study related to the issue of children’s knowledge of non-narrative language also examined kindergartners’ use of the language of information books. In this study, the researchers compared young children’s language across genre and time (Duke & Kays, 1998). Each of 20 kindergartners was asked to read aloud (pretend read) an unfamiliar fiction and an unfamiliar information book in September. These readings were compared across genre. Three months later, after regular read-aloud experiences with informational texts in their classroom, the children were asked to read the fiction and information books again. Comparisons were then made across time and genre.
An overall increase in the number of information book features in the children’s December pretend readings compared to the September readings indicated that the regular classroom read-aloud experiences played a role in the children’s genre learning. According to the stated purpose, this study, thus, contributes to a growing body of literature that suggests that young children are indeed able to engage meaningfully with non-narrative as well as narrative forms of text and that a balance of rich experiences with a variety of text types is important in developing genre knowledge (Duke & Kays, 1998).

An implicit factor in the work of Pappas (1993) and of Duke and Kays (1998) is the diversity of social purposes related to the reading and writing of different genres. People use narrative and non-narrative texts for different reasons, and the tacit genre knowledge that young children develop through multiple experiences with fiction and nonfiction literature is perhaps only one aspect of the literacy development supported by such rich experiences. Another aspect of the relationship between literacy development and children’s literature, besides learning the language of various types of texts, is that “being able to read literature is one basic reason for becoming literate and for making reading a lifelong habit” (Galda & Cullinan, 2003, p. 646). By engaging children daily in rich experiences with a variety of quality nonfiction and fiction, teachers not only prepare children for later school experiences, but they offer opportunities to young children for “full access” to literacy (Caswell & Duke, 1998; Galda & Cullinan, 2003; Pappas, 1991).

The Read-aloud Context

The context of reading aloud to children, while important to instruction and data collection in the studies previously reviewed, was not the primary focus of the research.
The focus was on questions of what to read in the classroom and why to read it with young children (Duke & Kays, 1998; Pappas, 1993). According to the findings of these investigations, the use of various texts in the classroom supports learning. The use of the read-aloud situation also fosters access to young children’s learning about literacy and literature, their world, and themselves. The context itself is rich in implicit and explicit meanings constructed among the participants in daily reading, listening, talking, and thinking activity (Friedberg & Strong, 1989; Rogoff, 1990).

Pappas and Barry (1997) studied the literature transactions of first grade students during the reading aloud of information books. This researcher-teacher team implemented this action research from the perspective that the read-aloud context is a curriculum genre—routine classroom practice in which the learning of new content is facilitated by being embedded in a particular familiar sociocultural context. Another perspective employed in designing and interpreting this classroom-based research was that reading transactions between young readers and text may occur with information books as well as with stories.

Within the context of their co-constructed read-aloud curriculum genre, the first graders and their teacher collaborated through talking about the text and about children’s responses to make meaning of the new information presented through a particular information book. Students’ responses to the literature were considered to be initiations-as-transactions. These transactions served the purposes of expressing children’s spontaneous responses during the reading aloud and of initiating teacher-scaffolded
A discussion of the topic at hand. Making meaning of the informational text was, thus, a collaborative effort within the read-aloud setting in this first grade (Pappas & Barry, 1997).

Harvey (1993) investigated such meaning-making, involving both text and context, in her naturalistic research of children’s uses of nonfiction within a class of kindergartners and their teacher. She noticed patterns in the teacher’s words and actions during read-aloud sessions of nonfiction books. The teacher in this setting made use of a variety of techniques to support her students’ understanding and connection-building during such read-aloud sessions.

While some of these techniques were the same as those she used while reading fiction, the meaning-making techniques that were different appeared to be verbal behaviors particularly fostered by the nature of nonfiction literature. These teacher behaviors included “questioning the children about the content of what was read; involving the children in the book through the use of models, demonstrations and movement; and omitting portions of the text” (p. 176). It is evident in Harvey’s findings that the socially interactive context of the teacher’s reading aloud, in addition to the text, provided opportunities for learning.

In their comprehensive examination of the role of reading aloud children’s literature, Friedberg and Strong (1989) state that reading aloud provides opportunities for children to enhance their “literary landscapes” through intertextual links across books and genres, to develop a “sense of story” and concepts about print, and to imagine. Another
opportunity offered by reading aloud in the classroom is the creation of a shared experience among members of the community of learners—a stimulus of and a focus for reader response (Friedberg & Strong, 1989).

Response to Literature

Research of response to literature involves studying response events as evidence of readers’ (or listeners’) meaning-making with text. Response events include the book-related spoken or written words of readers; their nonverbal behaviors, including gestures and movement; and their artwork (Hickman, 1981). Researchers examine readers’ comprehension of a text, the connections readers perceive between the text and their personal experiences, and the connections readers make to other texts during initial and repeated readings or during subsequent response events. Differences in the ways children of various ages respond to literature were the primary focus of early reader response research. Increasingly throughout the past 30 years, however, reader response studies have been rooted in Rosenblatt’s (1978, 1995) transactional theory of literature, which may also be identified in response studies as reader response theory (Karolides, 1997; Martinez & Roser, 2003).

Briefly stated, transactional refers to the dialogic relationship between the reader or listener and the text; both contribute to the meaning-making activity that takes place during a reading or response event (Rosenblatt, 1978; see also Hickman, 1981). The transactional theory of literature is of great significance to current understandings regarding the role that children’s literature can play in classroom learning. It has contributed to interpretation of data gathered through naturalistic inquiry and to the planning and implementing of instruction that focuses on reading as an active process.
Methodologies in research and classroom instruction have continually influenced one another over time, as “changes in the ways children’s responses have been evoked and inspected reveal an ever richer picture of children’s transactions with literature” (Martinez & Roser, 2003, p.800). The studies in this review illustrate these changes and contribute to an expanding view of reader response and its role in mediating learning among diverse students.

Through a recent comprehensive review of over 100 reader response studies, Martinez and Roser (2003) identified several themes. These themes were (a) the richness and variety of children’s responses to both the text and to their own transactions with the text (b) patterns in response content and style of an individual child—a “response profile” (c) variation of response characteristics across age groups and (d) effects of text familiarity on response. The studies below collectively represent these themes, and each study is relevant to learning in early childhood. In selecting research to include in this review, my primary criteria were a strong connection to reader response theory and an age range of pre-school to third grade. My purpose in keeping the age range of participants somewhat narrow is based upon the developmental nature of response to literature and the range of texts and instructional practices used with various age groups (Hickman, 1981; Martinez & Roser, 2003).

“In the classroom, the author is not the only person behind the book….What children do with books, what they say about them, and what they seem to think of them are all influenced in part by other people” (Hepler & Hickman, 1982, p. 279). The focus of the following discussion of response studies is on the widening lenses of research that “take
increasing depth and breadth of sociocultural meaning—that seek to “hear the voices” of more and more of the people that play a role in the transaction between reader and text (Rosenblatt, 1978).

One investigation in which the researchers considered the influence of a range of such voices was a study of young children’s response to different picture book genres. Shine and Roser (1999) examined the talk of preschool children as the children participated in small-group read-aloud sessions of four different types of picture books: fantasy, information, realistic fiction, and poetic. The researchers conducted this investigation from the perspective that adults and peers influence what children say and do in response to books.

Accordingly, Shine and Roser (1999) examined relevant social contexts as well as the language of the books and of the participating children. These contexts were the socially interactive read-aloud session and the culturally situated context of picture book reading. The other people considered in interpreting the data from the read-aloud sessions included the adults with whom the children had experienced picture books at home, the teacher who provided a poorly stocked and disorganized classroom library, the teacher’s aide and her overly guided story-time reading, the children’s preschool peers, and the adult reader involved in the small-group read-alouds.

Shine and Roser (1999) gathered the contextual information regarding home literacy practices and the classroom book environment through observation and questionnaires. They gathered the primary data of the collective responses of nine selected preschoolers.
during almost daily researcher-led small group read-aloud sessions over the course of four weeks. During these sessions, one of the researchers read aloud a pre-selected picture book to five of the nine children.

The children were allowed to provide their verbal and enacted responses spontaneously; the researcher-reader invited them to do so before, during, and after the reading. The group of children then collaborated in a process of verbally reconstructing the story. A second reading of each picture book involved the same five children and was conducted two weeks after the first reading in order to provide more opportunity for response. These interactive read-aloud sessions made use of a total of eight picture books—two representative texts for each of the four genres. Thus, in this data collection process, Shine and Roser (1999) considered text and reader-listener. This dual focus reflects the authors’ interest in Rosenblatt’s (1978) reader response theory.

Another aspect of this research that reflects this transactional theory is the authors’ identification of various stances associated with the four different types of picture books. Stance refers to the approach that readers take toward selected text and is indicated by their words and actions. Stance suggests what readers seek to experience in relation to the reading of a selected text. An aesthetic stance implies that a reader is seeking to engage with the text in a “lived-through” experience; an efferent stance suggests that the reader seeks to take away from the reading experience some form of knowledge or ability to take action (Rosenblatt, 1978, Shine & Roser, 1999).

In the study, four stance categories emerged as the authors analyzed the type and focus of talk involved in the small-group read-aloud sessions. The four stances associated with the fantasy, realistic fiction, information, and poetic books, respectively, were (a) I
imagine, (b) I recognize, (c) I know, and (d) I appropriate. The identification of these
categories within the children’s response data indicate that, overall, the preschoolers
responded differently to the different picture book genres. However, additional analysis
of the quality of children’s interactions with and about the different genres indicated that
the preschoolers responded from a predominantly aesthetic stance toward even the
informational text until the linguistic and graphic features of the books defined them as
nonfiction. According to the authors, these findings indicate a need to focus not only on
text in interpreting children’s responses to literature but also on the discourse
communities with which children are associated (Shine & Roser, 1999).

Two teacher research projects involving children in the primary grades produced
similar findings. Both studies took place in classrooms in which the teacher planned and
implemented instruction involving a range of children’s literature. Further, both teachers
put into practice a philosophy based upon Rosenblatt’s (1978, 1995) response theory. In
one study, a first-grade teacher and university-based researcher described young students’
responses to nonfiction literature that was part of an ongoing classroom thematic unit
(Dean & Small, 1997). In the other study, a teacher researcher described his elementary
students’ generally aesthetic response to information books (Spink, 1997).

In examining first graders’ response to selected nonfiction, Dean and Small (1997)
focused on a topic (pumpkins) about which the particular classroom population brought a
wealth of real-life experiences from their homes and their rural and small-town
communities. Data were gathered through observation of classroom activities and from
the teacher’s written reflections on his instructional decisions and purposes. Prior to the
activities during which data were collected, Dean, the classroom teacher, had involved
the students in closely examining the familiar objects of pumpkins. He then engaged the children in the interactive reading aloud of an informational story that describes a child’s work with planting and harvesting pumpkins and that narrates information about the life cycle of a pumpkin. The teacher read this work without directly focusing on the information; rather, he invited the children’s response—an interweaving of their own pumpkin-related stories with the information and ongoing narrative illustrations and text of the book.

The classroom talk surrounding this book was interpreted as productive conversation about the book as literature, not necessarily as either fiction or nonfiction. The authors compare these classroom conversations to adult readers’ interactions about books that they have chosen to read and to which they have different responses than others involved in the discussion. Based on their observations of the talk surrounding nonfiction in and out of school, Dean and Small (1997) suggest the importance of opportunities to discuss literature in the classroom—even nonfiction and even among young children.

After such conversation in the study classroom, the teacher invited further response through writing and drawing. However, he was more instructionally directive with these follow-up activities, expecting the children to not only weave their own stories into the text through their written and drawn responses, but also to integrate the information they had gathered through their in-class science experiences and from the text itself. In emphasizing both his students’ ideas through response as well as the informational content of the nonfiction book, this teacher put into practice the response-theory idea that “…the merger of reader and work must be true to the work, just as it must be true to the reader” (Dean & Small, 1997, p. 239).
The blending of reader and literary work was also an aspect of the teacher research project reported by Spink (1997). In his own classes of first and, later, fourth graders, Spink investigated the apparent pleasure with which his students approached both fiction and nonfiction. His prior observations over time had suggested that “genuine understanding of stories or informational texts depends on the links that we are able to make between our experiences and what we are reading” (p. 281). Such links, he asserts, are supported by an at least partially aesthetic approach toward a literature selection.

From this experience- and theory-based perspective, Spink (1997) observed and interpreted his students’ responses to nonfiction works related to science (first grade) and social studies (fourth grade) instruction. He found that, in general, his students seemed to make meaning of and remember the curricular content somewhat easily when it was embedded in an informational text having a narrative structure, such as the story of a the life cycle of a butterfly or a well-constructed biography. When texts were more strictly expository in nature, Spink observed that his students generally made meaning by connecting their own experiences—that is, relating their personal narratives—to the text at hand.

In other words, in his classroom this teacher researcher, observed that “almost everything was seen as either being a story or as informational fuel for [students’] imaginative abilities to construct stories” (p. 285). Particularly relevant to my current study is Spink’s linking of his classroom observations to the theoretical perspective and instructional practice espoused by educator and researcher Karen Gallas in her
classroom-based study of Science Talks. I discussed these rich conversations, which make use of and encourage young children’s wonder, previously in this chapter (Gallas, 1995).

Science Talks and activities that elicit children’s ideas about nonfiction literature, such as reading aloud and talking openly about books, are classroom contexts with diverse social and cultural meanings. The following study made use of this wealth of possible meanings in order to examine young children’s understanding of picture storybooks. As in the classroom studies discussed above, this investigation took place within a classroom context where children were continually engaged in social activity connecting their lives and the literature they shared at school.

In a report of his research within a first-second grade classroom, Sipe (2000) describes the “comprehensive and textured view of young children’s literary understanding in the socially dynamic situation of interactive storybook read-alouds” (p. 260). This view involves Rosenblatt’s (1978) response theory situated in a broader perspective of social constructivism, which includes the work of Vygotsky (1986). This theoretical connection bridges the personal, inner-meaning orientation of Rosenblatt’s theory with the intra- and interpersonal perspective of meaning-making as it is situated “in society”, according to Vygotsky’s psychology. The relevance of Sipe’s research focusing on response to fiction to the current study, which focuses on nonfiction, is based primarily upon these aspects of his theoretical framework.

From the “comprehensive and textured” viewpoint provided by this framework, Sipe (2000) observed and interpreted the verbal and nonverbal open responses of 27 first and second graders in a public elementary school classroom. He constructed five conceptual
categories of response (a) *analytical*, or “dealing with the text as an object for analysis and interpretation” (p. 264); (b) *intertextual*, or relating “the text being read aloud to other cultural texts and products” (p. 266); (c) *personal*, or “connecting the text to [the children’s] own personal lives” (p. 266); (d) *transparent*, or “intensely participating in the narrative world of the story” (p. 267), and (e) *performative*, or “entering the world of the text in order to manipulate or steer it toward [the children’s] own creative purposes” (p. 267).

These categories emerged through the researcher’s theory-grounded analyses of verbal data. He had gathered these data through observational field notes of the language- and literature-rich classroom environment and by way of recorded and transcribed classroom talk during full-class, small-group, and one-on-one read-aloud sessions. These sessions involved fairy and folk tales, contemporary realistic fiction, and contemporary fantasies (Sipe, 2000).

In this use of multiple picture book genres, this research is similar to the work of Shine and Roser (1999) discussed previously. Another similarity is the consideration of a range of voices that influenced children’s spontaneous responses. The voices of influence in Sipe’s (2000) interpretations of verbal data included the diverse, overlapping, intertwined voices of the teachers and students in their classroom read-alouds and the multiple voices of the range of discourses expressed through the five categories of children’s responses. This examination of young children’s literature transactions, thus, situated their book-prompted words and actions within the larger contexts of the various discourse communities associated with the children themselves, the books, the genre, and the shared classroom setting.
The “Poem”

Transacting with literature within these larger contexts is an illustration of what Rosenblatt (1978) calls the poem. The poem is the event of the coming together of reader(s) and text, or the “experience shaped by the reader [or listener] under the guidance of the text” (p. 12). A poem is evoked when the reader lives through the text and the text lives through the reader. According to Rosenblatt (1995), truly experiencing and truly understanding written language requires linking it to the actual living of life—“linking the word with what it points to in the human or natural world.” She states further that, “we must relate it to our own experience so that it may become part of our working equipment” (p. 106).

Studies of the features of nonfiction text and the expression of these features in the pretend readings of books or in the responses of young children during read-alouds by an adult indicate that genre knowledge is reflected in young children’s responses (Duke & Kays, 1998; Pappas, 1993; Shine & Roser, 2003). The focus on responses of teachers and students within the shared and socially interactive read-aloud context indicate the social construction of transactions with literature (Harvey, 1993; Pappas & Barry, 1997; Sipe, 2000). Each of these studies and their various perspectives of reader response and methods for investigating it are rooted in Rosenblatt’s (1978, 1995) transactional theory of literature.
Key Ideas from Theoretical and Empirical Literature

The following assertions regarding the role of nonfiction literature in science teaching and learning are based upon the literature reviewed in this chapter. They reflect connections between reader response theory and a broader sociocultural perspective. These assertions and theoretical connections are consistent with the changing nature and focus of related research (Galda & Beach, 2001; Martinez & Roser, 2003).


2. Nonfiction literature, or informational text, may be considered to be one of many tools of the culture of science (Lemke, 1990; Vygotsky, 1978).

3. During the reading aloud of a science-related nonfiction book, young children’s transactions and their social interaction surrounding their collective responses, may involve them in “talking science”, or in participating in classroom science discourse. Such participation constitutes a particular sociocultural activity (Lemke, 1990; Rogoff, 2003).

4. Learning involves a process of apprenticeship, of participating in culturally significant activity, guided by an adult or by more capable peers (Rogoff, 1990, 2003; Vygotsky, 1978; Wertsch, 1985).

5. Development is humans’ qualitative transformation in thought and action “through their changing participation in the sociocultural activities of their communities, which also change” (Rogoff, 2003, p. 11).
7. Transactions with nonfiction books are one way that young children participate in and construct classroom science, one way that they transform and are transformed by their community of learners (Rogoff, 1990, 2003).

The next chapter describes the procedures I used to examine young children’s responses to nonfiction books as participation in the cultural activity of engaging in scientific discourse.
CHAPTER 3

METHODOLOGY

The purpose of this investigation was to closely examine the responses of young children to science-related nonfiction books in a particular kindergarten classroom. Interactive read-aloud sessions of such books were the primary contexts for examining how my own young students responded to particular nonfiction texts and how together we developed a classroom scientific discourse. The methods I used in order to gather qualitative data representing this discourse included (a) writing my observations and reflections in a teacher-researcher journal; (b) making rough field notes while in the classroom; (c) audio- and video-taping classroom activities; (d) transcribing tapes of classroom science- and literacy-focused events; and (e) developing elaborated sets of field notes based upon my transcriptions, my field observations, and the nonfiction texts. I made use of these methods of data collection because of the sociocultural nature of my research questions and my perspective as a teacher and researcher. I described this theoretical perspective in detail in Chapter 2.

In this chapter, I will first discuss the relationship of this theoretical perspective to the research questions addressed in the study. Next I will describe the sociocultural context in
which I investigated these questions. I will describe the community and institutional setting as well as the participants. Finally, I will explain the research design. I will delineate the particular instruments and procedures of data collection and analysis.

Because of the recursive nature of data collection and analysis in interpretative studies, the discussion of the research design will integrate strategies and purposes for gathering and analyzing data (Erickson, 1986). Further, this discussion of the research design will be structured according to the three sets of questions addressed by this study. Such a structure aligns with the three-plane theoretical perspective detailed in the previous chapter and reflects the organization of the following discussion regarding the general perspective and type of research represented by this project.

General Perspective and Ontological Assumptions

As I have discussed, my research questions relate to interdependent and simultaneous developmental processes of sociocultural activity. In sociocultural activity, such as classroom learning, people interact with one another and take mental and physical action in socially, culturally, and historically meaningful ways. People engage in these actions as they participate in culturally significant activities, such as talking about scientific ideas or responding to a book. The developmental processes of sociocultural activity that framed my research questions are apprenticeship, guided participation, and participatory appropriation. These processes correspond to three planes of analysis, or perspectives on activity, from which each may be observed and described (Rogoff, 1995, 2003).

As a teacher, my focus on the activity of my students and on my own planning and assessment necessarily shifted among the three planes of analysis. With the various academic standards in mind, along with the strengths and needs of individual students and
of my class as a community, I planned learning activities to implement in the classroom. During the activities, I observed and reflected on the words and actions of my students. Afterwards I continued to reflect upon their words and actions and upon my own words and actions as I returned to the standards (represented in state education department documents and in our district courses of study) and to my plans.

Returning to the model of the pyramid introduced in Chapter 2 (Figure 1), I suggest that any cycle of planning, teaching and learning, and assessing is an on-going “walk” around the pyramid. This cycle involves all the developmental processes identified in Rogoff’s (1995, 2003) framework. Because of this cyclical nature of teaching and learning within the setting of formal schooling, the theoretical framework I have described is well-suited to teacher research projects such as the interpretative study I have conducted (Erickson, 1986).

Transactions with Literature as Participation in Cultural Activity

Rogoff’s (1995, 2003) three-plane model for observing and analyzing sociocultural activity, one expression of a broader theoretical perspective of sociohistorical theory (Vygotksy, 1978, 1986), has guided my thinking and the questions I have asked as a teacher for several years. The questions I investigated in this study emerged from this thinking and prior questioning. Because the processes of apprenticeship, guided participation, and participatory appropriation are interdependent, I focused on different questions through particular data collection and analysis activities. Figure 2 indicates the alignment of my questions, features of Rogoff’s three-plane model, and aspects of the review of related literature. The underlined questions represent broad ideas and require
more general description. The sub-questions represent more specific ideas about the data. I will present general and particular description of the data in Chapter 4 (Erickson, 1986).

Later in this chapter, I will build further upon the relationship of my questions to the three planes of analysis as I describe procedures and instruments for observing and analyzing classroom discourse as (a) apprenticeship in the culture of science, (b) guided participation in talking science, and (c) participatory appropriation of the linguistic tools of science through social interaction with/through/about nonfiction literature.
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<tr>
<td>What is the role of science-related nonfiction books in constructing scientific discourse in an early childhood classroom?</td>
<td>Developmental process of apprenticeship</td>
<td>The Role of Talk in Science</td>
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<td>Community-institutional plane of analysis</td>
<td>A Sociohistorical Perspective of School Science: The communicative and constructive role of language.</td>
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<tr>
<td>What graphic and verbal features of such a book affiliate it with science??</td>
<td></td>
<td>Science teaching and learning as apprenticeship.</td>
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<td>Nonfiction Literature in Early Childhood Teaching and Learning</td>
</tr>
<tr>
<td>What is the nature of children’s responses to science-related nonfiction books read aloud in a community of learners?</td>
<td>Developmental process of guided participation</td>
<td>Nonfiction Literature in Early Childhood Teaching and Learning</td>
</tr>
<tr>
<td>What is the content and function of children’s talk during socially interactive read-aloud sessions involving such books?</td>
<td>Interpersonal plane of analysis</td>
<td>The Read-Aloud Context</td>
</tr>
<tr>
<td>In what ways do individual members of the community of learners transform the participation in socially interactive learning activity involving science-related nonfiction books?</td>
<td>Developmental process of participatory appropriation</td>
<td>Response to Literature</td>
</tr>
<tr>
<td>What is the content and function of the talk of focal students in these contexts?</td>
<td>Personal plane of analysis</td>
<td>The Role of Talk in Science</td>
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<td></td>
<td>Nonfiction Literature in Early Childhood Teaching and Learning</td>
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Figure 2: Alignment of research questions, analytical perspective, and literature review.

The idea that processes of cultural and individual human development mutually constitute one another is relevant to the discussion of children’s meaning-making during interactive read-aloud sessions within their classroom communities. Reader and text constitute one another, according to a transactional theory of literature (Rosenblatt, 1978, 1995). The interdependent relationship between cultural beings and cultural tools, such as books, and the multiple voices in action during response events create multiple possibilities.
for making meaning with literature and with one another in a community of learners. These relationships and these multiple voices are what I have intended to observe and interpret in this study.

Cultural Models and Situated Meanings: Response as Discourse

According to Gee (1999), the multiple voices that play a role in a particular sociocultural context are ways of using language that co-construct a shared localized discourse. This localized discourse (with a lowercase \( d \)) reflects connections to other more broadly historically and culturally situated Discourses (with an uppercase \( D \)). Further, this particular co-constructed discourse is situated in the immediate meaning-making activity, such as interaction during nonfiction book read-alouds. This perspective of situated meaning reflects reader response theory regarding the transaction between reader and text. According to Rosenblatt (1978),

there is no such thing as a generic reader…. Each reading involves a particular person at a particular time and place…. [This assertion] underlines the importance of such factors in the transaction as gender, ethnic and socioeconomic background, and cultural environment (p. viii).

These factors are the more historically and culturally situated Discourses which diverse students, texts, teacher, institutional setting, and academic discipline bring to the context of reading aloud nonfiction books in the classroom.

Because of my focus on science as a culture, or as a Discourse, Gee’s (1999) conceptualization of discourse analysis was a key analytical tool. Using this tool, I approached the discourse data collected primarily during the read-aloud sessions. Furthermore, this discourse analysis contributed to a significant shift in my thinking following a short-term study (Protocol Number 2003E0055) I had conducted in my
classroom with a different group of kindergartners. One year before beginning the current study, I recorded and transcribed the verbal responses of my 17 students during interactive read-aloud sessions and their verbal contributions during small-group nonfiction writing sessions.

I began that study with the purpose of exploring the ways in which students made use of the language of the nonfiction books as they participated in the read-aloud sessions and as they engaged in other related activities. Further, I began the study with the assumption that the scientific discourse was “located” in the text of the nonfiction selections and in my own talk as the teacher. As I applied Gee’s (1999) discourse analysis, however, I found that the science was actually in the talk of the children. Science seemed to “come to life” as the stories and questions of the children became part of a verbal kaleidoscope during the read-aloud, bringing to my mind descriptions of young children’s literature response and science in other settings (Gallas, 1995; Sipe, 2000). Figure 3 illustrates these findings.
The key feature of the read-aloud sessions in the particular context of the previous study was the classroom discourse. The information book, teacher talk and, primarily, student talk co-constructed this localized discourse. Three categories of student talk were “visible” in the setting: responding to photographs, organizing the activity, and responding to peer questions/comments. The “leading the text” aspect of responding to photographs was the tendency for students to verbally respond to the photos immediately as the images on the page became visible with the page-turn, even before I had begun to read. The diagram indicates that science Discourse, along with various other Discourses, was constructed through the classroom discourse, or language-in-use. The two-way arrow further indicates that these Discourses, in turn, contributed to the construction of the classroom language-in-use, or the localized discourse.

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1 Action refers to the use of language in social interaction. It is situated language-in-use in a particular time and place (Gee, 1999).
2 Affiliation refers to the sociocultural associations of language-in-use, through various cues and clues, with particular Discourses, or wider cultural systems of meaning (Gee, 1999).
I have introduced this analytical tool here in order to indicate the suitability of Gee’s (1999) discourse analysis in relationship to Rogoff’s (1995, 2003) framework and to literature response (Rosenblatt, 1978, 1995), but I will discuss it further as I describe the research design particularly relevant to my second research question. In the following section, I will describe the study participants and the context in which I investigated the research questions.

Research Context and Participants

Site Selection and Issues of Access

This teacher research project was conducted within the school district in which I had been employed for 13 years at the time of this study. I had been teaching in the particular building for 12 years. Therefore, selection of the research site was based in part on accessibility. However, because my critical questions originated within the context of my own teaching practice, I selected teacher research as the specific strategy for investigating them and my own classroom as the data collection site.

The principal supported this project within our school, and the parents or guardians of all 19 of my students granted consent. Because I had a pre-existing relationship with the parents or guardians, I held personal phone conversations with each of them. I explained the purpose and procedures of the research project, their kindergartner’s role within the data collection process, and the voluntary nature of participation. I then sent a brief written review and a consent form. I invited them to request further information before signing; three parents did request another phone call to review some of the information.
School District

The data collection period took place in a growing suburban area outside a large mid-western city. During 2003-2004 the total student enrollment was 6,635. Total spending per pupil was $8,402; the state average was $8,081. The state department of education designation for the district was “Effective” along a continuum of Excellent, Effective, Continuous Improvement, and Academic Watch or Academic Emergency. To achieve this designation, the district had met 15 out of 18 state indicators. Additionally, the district had continued to make adequate yearly progress.

In order to support effective instruction as evidenced by standardized test scores, curriculum coordinators and teachers collaborated to align the district courses of study with recently adopted state standards across grade levels and subject areas throughout the years surrounding this study. Further, these committees planned and conducted professional development opportunities and selected instructional materials to support teachers in implementing the standards-based curricula. Another district-wide initiative during the years surrounding this study involved character education. Members of the community, including representatives of local businesses, law enforcement, and places of worship, along with school administrators, teachers, parents, and guidance counselors had developed a plan for supporting citizenship traits through a community-wide character education program.
Elementary School Building

The teachers and principal in the school building had identified the community-wide character education program as a primary focus. Additionally, we had committed to a philosophy of honoring students for a range of achievements, including academic, artistic, and behavioral. These commitments are reflected in the school climate. The hallways of the school feature street-corner signs and large banners with character education words and phrases; a growing permanent collection of framed student artwork; walls, display cases, and bulletin boards featuring student work; and, usually, open doorways to classrooms. School-wide assemblies are held on a regular basis to publicly recognize students who have demonstrated strong citizenship traits.

The grade-level organization of the building is traditional, consisting of single-grade classrooms, kindergarten through fifth grade. During the year in which the study was conducted, the school enrollment was 364. Of this total, 18.4% were African American, 5.5% Multiracial, and 74.9% White. The percentage of students who were considered economically disadvantaged was 39.4%, compared to 10.3% for the district. The state department of education designation for the building was “Continuous Improvement.”

The surrounding neighborhood and wider attendance area of the elementary school are established areas; current home construction rates are higher in other areas of the district. A large playground and ball fields, residential streets, and a combination of single-family homes and duplex apartments make up the immediate surroundings of the school. The building itself is a large single-story structure with a central courtyard that serves as an enclosed nature lab.

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The Classroom

The classroom is located in the front of the building, near the office and across from the entrance to the courtyard/nature lab. Figure 4 is an overview of the main physical features of the classroom and their arrangement. My students and I occupied this space in the mornings. Another teacher and her students occupied the classroom in the afternoons. The carpeted class meeting area and the round small-group meeting table were especially significant classroom locations for the activities featured in this study.
Student Work Tables
The round table is the “meeting table” for teacher-guided small groups.

Bookshelves/Book Displays

Figure 4: Classroom layout.
Participants

The co-present participants in this study were the kindergarten students, the read-aloud nonfiction books, and the teacher researcher. Figure 5 illustrates these participants within the primary research context of the interactive read-aloud session. In the three-framed discussion of the research design later in this chapter, I will revisit this illustration of the whole sociocultural context, which includes the research participants as well as the physical space of the classroom and the learning activity. I will use this illustration again in discussing the research design in order to highlight the primary focus of each research question and corresponding strategies for data collection and analysis.

Figure 5: The co-present participants of the study within the primary data collection context.

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The students.

Nineteen kindergarten students, 10 girls and nine boys, participated in the study. The children ranged in age from five to seven years. Of my 19 students, three were African American, three were Multiracial, and 13 were European American. The total percentage of non-White students in this class (31%) varied from the percentage for the building (23.9%) and for the district (19.9%). All 19 students were native English speakers. Seven of the students qualified for free or reduced lunch/breakfast.

Kindergarten in the district is a half-day program. Six of the seven elementary buildings, however, have one or two Extended Day Kindergarten classes for groups of 12 children who have been identified as in the most need among their classmates of early intervention in literacy and mathematics. Our building has two such classes. Three of my students were enrolled in the afternoon Extended Day program all year, and two more enrolled for the second semester. Three had been identified as cognitively delayed; they received additional specialized instruction in the afternoons according to Individualized Education Plans. Eleven were enrolled in the traditional half-day kindergarten program. Six of my students were on individualized behavior plans involving home-school communication charts and one or two goals based on their own needs and related to our school- and community-wide character education program.

The books.

From the perspective of a transactional theory of literature (Rosenblatt, 1978, 1995), the text is a participant in the read-aloud event. Appendix A identifies books that “participated” in the read-aloud events featured in this study. The chart provides brief
descriptions of the most relevant stylistic features of the books as literary works, 
summarizes their roles in teaching and learning within our particular community of 
learners, and indicates their connection to a wider Discourse of science by way of academic 
content standards.

The teacher researcher.

At the time of this study, I had been a teacher for 13 years. Most of my experience had 
been as a classroom teacher in kindergarten through second grade, but I had also served as 
a half-time reading specialist for three years. I was a morning kindergarten teacher and 
afternoon reading teacher during the 2003-2004 school year. Also, at the time of the study, 
I was a doctoral candidate. My graduate studies had focused on children’s literature, 
science in early childhood, and sociocultural perspectives of teaching and learning. For 
eight years prior to this study, I had been both a teacher and graduate student; the 
combining of these roles within this teacher research project emerged somewhat naturally 
from my on-going involvement at the university and elementary school. Throughout the 
following section outlining and explaining the research design, I will continue to discuss 
my involvement in the life of the classroom as the teacher as well as my perspective as a 
researcher.
Research Design

General Research Type

This teacher research project consisted of observation, description, and analysis of kindergarten children’s literature response during interactive read-aloud sessions of scientific nonfiction books. The theoretical orientation of the review of literature regarding science and language, children’s response to literature, and the genre of children’s nonfiction warranted the use of qualitative methods of data collection and an interpretive analytical stance. The research questions were rooted in these existing bodies of empirical literature and in sociocultural perspectives of learning and development. The questions indicate an interpretivist paradigm and require careful observation and analysis of multiple face-to-face interactions over time (Erickson, 1986; Glesne, 1999).

Because my interest was in literature response and scientific discourse within a particular classroom community of learners, this report is a case study. My purpose in presenting the findings of my research in Chapter 4 will be, in part, to provide a descriptive narrative to which readers may compare and contrast their own concerns, questions, and experiences (Stake, 2000). Additionally, as a teacher researcher gathering data, I built upon my unique emic perspective as a member of the classroom community of learners. I will explicitly discuss this perspective as I report and interpret the discourse data (Cochran-Smith & Lytle, 1993; Hobson, 2001).

Through my role as teacher researcher, I closely examined my students’ words and actions while also reflecting upon my own practice and upon relevant theory and research. Seeking to understand their students and searching for ways to most effectively support them in constructing knowledge are key aspects of teachers’ work. Because of the ongoing
cycle of assessment and instructional decision-making, the tasks of developing rich
descriptions of students’ classroom performance, interpreting, and theorizing are research
strategies that are inherent to the work of a teacher (Cochran-Smith & Lytle, 1993). These
tasks were also part of investigating my research questions.

Organization of the Study

The period of data collection and initial data reduction and analysis occurred from mid-
February to the end of May 2004. This 15-week period roughly corresponded to the
second semester of the school year for my students and me. Therefore, the investigation
was conducted after we had developed relationships and established academic and social
routines within the shared space of our physical classroom environment throughout the
previous five months. These established relationships, my daily participation in the
community of learners, and the length of the data collection period constitute prolonged
engagement, one procedure for ensuring trustworthiness in interpretative research
(Erickson, 1986; Glesne, 1999). Figure 6 is an overview of the organization of the study.
<table>
<thead>
<tr>
<th>Week Number</th>
<th>Research Task</th>
<th>Teacher researcher reflection journal</th>
<th>Nonfiction text selection and analysis</th>
<th>Audio- and video-taping of read-aloud sessions</th>
<th>Audio-taping of small-group nonfiction writing sessions</th>
<th>Transcribing audio- and videotapes and developing elaborated field notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
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<td>14</td>
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</table>

Figure 6: Organization of data collection and initial data reduction/analysis.
The research strategies delineated in Figure 6 involved a recursive process of data collection, reduction, and analysis (Erickson, 1986). Furthermore, these strategies integrated my work as a teacher and as a researcher within the instructional/research context. The audio- and videotapes and my reflection journal provided opportunities over several months for me to deliberately consider and re-consider the day-to-day life of the community of learners. These opportunities involved me in persistent observation as a researcher, thus supporting the trustworthiness of this investigation. They also allowed me to “step back” from my embedded position as the teacher in classroom activities, thus enhancing my instructional decision-making and my understanding of my students.

The process of transcribing classroom discourse across various instructional settings and across an extended period of time also involved persistent observation. I employed a constant comparative technique in this transcription process (Schwandt, 1997). I based decisions about how to represent the recorded discourse in writing on (a) my knowledge of my students and of myself as their teacher; (b) existing empirical literature regarding reader response, nonfiction genre knowledge, and classroom science discourse; (c) the Vygotskian perspective of this study; (d) my own understanding and appreciation of the nonfiction books read and crafted in the classroom during the data collection period; and (e) emergent themes in my reflection journal and in tapes of classroom read-aloud sessions of selected nonfiction books. I revised the transcription conventions throughout the first weeks of recording and
transcribing. Appendix B contains the final version of these conventions, which represent my interpretations of our words and actions as my students and I interacted with and about nonfiction.

In Figure 6, the relationship of the task of selecting and analyzing nonfiction text to the task of scheduling the recorded read-aloud sessions indicates the emergent nature of this research project and of my work as a teacher. Within the framework of my long-term instructional goals, various needs and interests arose as the children came into contact with and transformed the official school curriculum. These needs and interests influenced when and how I introduced the various books. Instances of these influences will be described in Chapter 4.

An additional emergent feature of the organization of the study was the selection of focal students. As the following discussion of the research design will show, close examination of the words and actions of particular individuals within the community of learners supported my meaning-making from a teaching and from a research perspective. Further, a focus on individuals within the context of socially and culturally meaningful activity is an aspect of the theoretical framework of this study. Although I began the study with ideas about how and why I would select focal students and what I would do with the information I gathered about them, the time for when I made these selections changed as the actual data collection period started.

As I considered the possible influence of the process of data collection in the classroom and of my dual role as teacher and researcher, I decided not to select the focal students until I had completed all recording and transcribing activities. My initial
purpose for this decision was to avoid treating focal students differently within the daily life of the classroom. An additional benefit of waiting to select focal students was that several distinct “voices” emerged in the ongoing analytical tasks of reducing the data through transcription and developing emergent assertions through analysis of the transcripts and my reflection journal. These were the voices that I chose to feature in describing our classroom community and individuals within it.

In the following subsections, I will describe the particular data collection and analysis activities related to each of the three sets of questions. Further, I will briefly review ideas from existing empirical and theoretical literature.

Investigation of Question 1

Question 1: What is the role of science-related nonfiction books in constructing scientific discourse within an early childhood classroom? What graphic and verbal features of such a book affiliate it with science? What graphic and verbal features of the book elicit response within the community of learners?

Brief synthesis of key ideas from relevant theory and research.

- The language of nonfiction books is a particular way of talking about the world, or a particular discourse. Research has shown that children make use of the features of this genre in their book-related talk (Duke, 2000; Duke & Kays, 1998; Pappas, 1993).
- Science is a particular culturally and historically meaningful way of talking about the world. Talking about science-related nonfiction books is one way that young children can engage in “talking science” in the classroom (Cobern & Aikenhead, 1998; Gallas, 1995; Lemke, 1990, 1993; Pappas & Barry, 1997; Sutton, 1998).
The context of responding to books during interactive read-alouds is a culturally relevant and learning-centered approach to engaging children in talking science and in considering scientific ideas in terms of their own everyday ideas (Ashton, 1996; Dixon-Krauss, 1996; Ladson-Billings, 1994; Rosenblatt, 1978; Vygotsky, 1978).

Data collection strategies and analytical tools.

The set of questions comprising Question 1 is related to the developmental process of apprenticeship. Observations that support description and analysis of sociocultural activity regarding this question involve looking and listening closely to the life of the research setting by way of the community-institutional plane of analysis (Rogoff, 1995, 2003). My focus as a researcher was on what the words and actions of my students meant in terms of (a) science as a particular socio-historically developed worldview, language, and set of skills or ways of taking action, (b) the classroom as a community of learners, with its own history and culture, and (c) the language of nonfiction children’s literature. Figure 7 illustrates this focus within the context of reading aloud nonfiction within a community of learners.
The construction of knowledge through teacher research depends upon the critical position of the teacher at “the intersection between [the interpersonal and the intrapersonal] domains….Teachers are very important factors in classrooms, and much of what they know and think and do in their classrooms is dependent on their knowing of themselves” (Hobson, 2001, p. 10). Similarly, in interpretive research, the researchers themselves are the primary research instruments. Questions, methods, and analyses in both teaching and research entail the social and the personal; that is the activities of teachers and of field-based researchers involve the observable world of classroom action and interaction as well as the socio-historically constructed knowledge, beliefs, and attitudes of the teacher researchers and their students. The procedures and instruments for data collection summarized in Figures 8, 9, and 10, therefore, were based upon this assumption of researcher as key research instrument (Glesne, 1999; Jungek, 2001).

Figure 7: Focus of observation and analysis for Question 1.
Teacher researcher reflection journal.

The following table indicates the parameters for gathering data for the general research question related to the community-institutional plane of analysis: What is the role of science-related nonfiction books in constructing scientific discourse within an early childhood classroom?

<table>
<thead>
<tr>
<th>Purpose for data collection</th>
<th>To describe my work and the work of my students in constructing a social and physical environment that constituted a community of learners, the context in which the read-aloud sessions of nonfiction books were situated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research instrument/strategy</td>
<td>Regular written contributions to my teacher researcher double-entry journal (Burnaford, 2001)—a written account of daily classroom activity and observations, alongside interpretive notes based on theory, research, and classroom experience</td>
</tr>
<tr>
<td>Source of data</td>
<td>110-page double-entry journal recounting critical incidents that occurred throughout the day-to-day life of the community of learners and describing the physical and social environment that had been co-constructed</td>
</tr>
<tr>
<td>Frequency of data collection</td>
<td>Nearly daily, from February 18 to May 28, 2004</td>
</tr>
</tbody>
</table>

Figure 8: Observing and analyzing the classroom as a community of learners.

My written descriptions document my words and actions and those of my students as we co-constructed and enacted classroom “norms” of social interaction, use of the physical environment and materials, and participation in routines and learning activities. The observations and interpretations recorded in my journal detail the
curriculum background and connections of the read-aloud sessions and nonfiction writing projects featured in the data collection procedures. My purpose for engaging in reflective journaling on a regular basis over time was to provide the most direct evidence of the intentions behind my own actions in setting up the physical space of the classroom and in orchestrating socially interactive opportunities. I based my plans for these tasks upon my growing knowledge of my diverse young students and upon the standards-based curriculum of the school district. Additionally, the journal was one way to make explicit my own subjectivity, allowing me to make use of it and to monitor it (Glesne, 1999).

Each time that I added an entry to my journal, I revisited my writing from the previous session. Sometimes I reread all the entries related to a particular unit of study or the entire journal up to the point of my current entry. This rereading involved me in continually reflecting upon teaching and learning within this particular community of learners and in noticing recurrent words and actions—emergent codes—within the journal and between this source of data and the read-aloud transcripts. After the 15-week data collection period, I reread the whole journal and the interpretative notes I had written throughout the period. I continued to compare these data to the emergent categories and themes across the sets of read-aloud and small-group writing transcripts.

Further, I began to note within my journal instances of “intermingling” and “bumpiness” as I compared interactions within my classroom to those discussed in the related literature (Varelas & Pineda, 1999). Intermingling refers to the development of shared understandings within the “ebb and flow” of classroom discourse; bumpiness
refers to instances in which shared understandings of particular science ideas were not achieved. I further appropriated these terms in my ongoing analysis and writing to indicate, in a broader sense than in the prior research, a general way of interacting and making meaning of science ideas and of nonfiction literature within my community of learners, rather than as shared meanings for certain content developed through specific classroom conversations.

**Analysis of read-aloud nonfiction selections.**

The table below summarizes data collection procedures used to address the first sub-question in the first set of research questions: What graphic and verbal features of a science-related nonfiction book affiliate it with science?

<table>
<thead>
<tr>
<th>Purpose for data collection</th>
<th>To identify verbal and visual features of selected nonfiction books that represent science discourse, e.g. technical vocabulary and topics related to science content, and to connect these features to National Science Education Standards and to the ongoing activities within the community of learners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research instrument/strategy</td>
<td>Text analysis, in which text is “data consisting of words and images that have been recorded without the intervention of a researcher” (Silverman, 2000, p. 825)</td>
</tr>
<tr>
<td>Sources of data</td>
<td>8 nonfiction books (See Appendix A.)</td>
</tr>
<tr>
<td>Frequency of data collection</td>
<td>Once per book</td>
</tr>
</tbody>
</table>

Figure 9: Observing and analyzing the language of nonfiction books and science as a particular Discourse.
In order to interpret children’s responses to nonfiction books, knowing what written discourse and images characterize such books is also necessary, since the immediate response event involves both reader(s) and text (Rosenblatt, 1978). My selection of texts to read aloud to my students was an emergent aspect of this study. I selected books according to my teaching purposes. I considered the scientific, literary, and social interests of my students; the quality of the books themselves; and my teaching-learning objectives related to a particular unit of study as well as my ongoing goal of developing a classroom scientific discourse. Appendix A, referenced also in my earlier discussion of the research context and participants, summarizes the findings of my text analysis. This analysis was guided in part by the questions and prompts featured in Appendix D and by the overview of national standards for science learning included in Appendix E.

Interactive read-aloud context.

The following table summarizes procedures for gathering data related to the second sub-question in the first set of research questions: What graphic and verbal features of the read-aloud scientific nonfiction book elicit response within the community of learners?
<table>
<thead>
<tr>
<th>Purpose for data collection</th>
<th>Data related to this aspect of apprenticeship were collected as an aspect of guided participation. (See Figure 12.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research instrument/strategy</td>
<td>Participant observation, audio and video recordings</td>
</tr>
<tr>
<td>Source of data, including number and location</td>
<td>16 sets of elaborated field notes representing participants’ words and actions during 16 socially interactive read-aloud sessions, 11 to 27 minutes in length; in the kindergarten classroom, involving the whole class, sitting in our carpeted area during our “class meeting” or “focus time” periods</td>
</tr>
<tr>
<td>Frequency of data collection</td>
<td>16 sessions from March 3 to May 21, 2004; two readings per book—reading and rereading the whole text or reading part of it one session and reviewing/finishing it the next</td>
</tr>
</tbody>
</table>

Figure 10: Observing and analyzing the language of the nonfiction genre and the context of reading aloud and responding.

Response data gathered during read-aloud sessions of science-related nonfiction books, while gathered in a setting that was more directly aligned with the process of guided participation, may also be considered to be data about apprenticeship because these developmental processes are interdependent and simultaneous. Therefore, I have included the read-aloud context in the tables regarding question one as well as in Question 2.
Summary.

Collectively, the three tables above address aspects of the community-institutional plane of analysis and reflect the assumption that the activity of reading aloud and responding to science-related nonfiction books within the classroom involves learners in a system of apprenticeship. My purpose as a teacher and as a researcher was to support “talking science” within the apprenticeship system of the class involved in this study. This purpose was related to my assumptions that (a) the members of our community of learners would serve as resources for one another and (b) the read-aloud context, books, and children’s responses would provide access to, or support the construction of, a classroom scientific discourse (Rogoff, 1995, 2003). This intention was based upon my developing ideas summarized in Figure 3 and upon the existing empirical and theoretical literature discussed in Chapter 2.

Investigation of Question 2

Question 2: What is the nature of children’s responses to science-related nonfiction books read aloud in a community of learners?

What is the function and content of talk during socially interactive read-aloud sessions of such books?

Brief synthesis of key ideas from relevant theory and research

- Children’s responses to books, particularly their spoken transactions with and about a book, are a way of “bringing” their everyday ideas, or their spontaneous concepts, to the social context to be transformed and to transform the social context
itself. In the social context, these everyday concepts can be mediated by the scientific ideas of the nonfiction book and by the talk of more capable others (Rogoff, 2003; Rosenblatt, 1978; Vygotsky, 1978; see also Ashton, 1996; Dixon-Krauss, 1996; Pappas & Barry, 1997).

- Researchers of response to literature have collected data by recording (audio taping, making field notes) young children’s spontaneous and adult-guided responses during read-alouds in small- and full-group settings (Dean & Small, 1997; Hickman, 1979; Pappas & Barry, 1997; Shine & Roser, 1999; Sipe, 2000; Spink, 1997).

Data collection strategies and analytical tools.

Question 2 pertains to the interpersonal plane of analysis and to the developmental process of guided participation (Rogoff, 1995, 2003). Guided reflects the embedded nature of this developmental process within particular situations of social interaction. In these situations, more capable others, who are physically co-present or are present through text or recalled previous experiences, guide the participation of a learner. Participation indicates the cognitively and socially active role of the learner.

Question 2 is most clearly related to the stated purpose of this study; however, the three question sets are interdependent as the data from each are essential for making meaning of the others (Rogoff, 1995, 2003). While acknowledging the necessity of all three aspects of meaning in thoroughly analyzing responses to scientific nonfiction books during interactive read-alouds sessions, I have fore-grounded the interpersonal plane more in the current study. The other planes of analysis were, in part, for the
purpose of theory triangulation, or a systematic search for meaning from more than one perspective toward the data (Janesick, 2000). Figure 11 illustrates the features of the sociocultural activity and context made most “visible” through the interpersonal plane of analysis.

![Diagram](image)

Figure 11: Focus of observation and analysis for Question 2.

Figures 12 and 13 indicate the parameters for collecting data about guided participation in my kindergarten classroom. Primary data were from the read-aloud sessions, and secondary data were from the small-group writing events. The research strategy of making descriptive and analytic field notes differed from the double-entry journal by which I recorded more general data about the classroom as a community. The field notes that I wrote as a part of data collection for Question 2 related to particular read-aloud sessions or writing group events.
<table>
<thead>
<tr>
<th>Purpose for data collection</th>
<th>To determine the content and function of the children’s and the teacher’s book-related talk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research strategy</td>
<td>Participant observation—audio and video recording and making descriptive and analytic field notes (Glesne, 1999)</td>
</tr>
<tr>
<td>Source of data, included number and location</td>
<td>16 sets (totaling 245 pages) of elaborated field notes representing participants’ words and actions during 16 socially interactive read-aloud sessions, 11 to 27 minutes in length; in the kindergarten classroom, involving the whole class, sitting in our carpeted area during our “class meeting” or “focus time” periods</td>
</tr>
<tr>
<td>Frequency of data collection</td>
<td>16 sessions from March 3 to May 21, 2004; two readings per book—reading and rereading the whole text or reading part of it one session and reviewing/finishing it the next</td>
</tr>
</tbody>
</table>

Figure 12: Children’s responses to science-related nonfiction books read aloud in a community of learners.
| Purpose for data collection | To determine the content and function of children’s talk in crafting nonfiction books related to a classroom unit of study |
| Research strategy | Unstructured group interview—recorded via audiotapes and teacher researcher notes (Fontana & Frey, 2000) |
| Source of data, including number and location | Elaborated field notes consisting of transcripts of group interaction and descriptions of product of teacher-led groups of 3 to 4 students as they engaged in planning, dictating (shared writing), and constructing book pages; one page per small group combined as class books related to two different classroom units of study; in the classroom at our small-group meeting table |
| Frequency of data collection | Two meetings per group for the first book project titled *The Wonders of Spring: A Nonfiction Book about our Nature Lab* and full-class meeting and one small-group meeting of each group for the second project titled *The Great Big Book of Guessing the Animals* |

Figure 13: Small-group crafting of science-related nonfiction books.
Interactive read-aloud sessions.

Recordings and written observations of the words and actions of the participants during the read-aloud events represent spontaneous response to literature. Such response is a form of language-in-use by which people take action through text and through social interaction, co-construct situated meanings, and indicate affiliation with various Discourses (Gee, 1999). The sets of elaborated field notes that I developed through interpreting and transcribing this language-in-use, along with descriptions of the books involved, constituted the primary data sources for this aspect of the study. I compared these data to the secondary data gathered in the small-group work discussed below as well as to the observations and interpretations recorded in my teacher researcher reflection journal discussed in the previous section of this chapter.

Small-group crafting of nonfiction books.

The small-group setting provided an instructional context that was an opportunity for more verbal input by children who participated primarily as listeners in the full-class setting. I had observed throughout the year that several of my students were more likely to talk in the context of a smaller group. Further, the experience of crafting a page for a book related to classroom units of study challenged students to apply their knowledge of both the science content and the language of the genre within a context supported by more capable others, including their teacher and their peers.

In my role as the teacher, I used the small groups to be somewhat directive of the writing process. After each of the first group meetings related to the book projects, I reflected upon my teaching goals for each group and wrote them as brief objectives on
transcripts of the students’ ideas for the text on their page of the class book. These objectives, along with the students’ “in-the-moment” ideas, guided my input during the subsequent meetings. In my role as researcher, I used the information from this small-group writing context to look for instances in which the themes and categories of talk I observed in the read-aloud context converged with patterns in the writing group data. I also searched the data from these two instructional situations to examine similarities and differences in the content and function of the classroom discourse.

The transcription process.

Read-aloud sessions were taped via a microphone suspended above the center of the carpeted class meeting area and attached to an audio-cassette recorder. The sessions were also recorded by an audio-video camera placed at the edge of the carpeted area. During my lunch period or immediately after school on the day that I had recorded a read-aloud session, I bookmarked pages of the text and wrote in my spiral notebook a list of observations as key words or phrases. Later and over the next several days, I expanded these field notes as I (a) viewed the video of the read-aloud session to consider the entire activity and to note the length of time, (b) transcribed the tape-recorded talk and wrote brief descriptions of the written text and illustrations within the sequence of the read-aloud session, and (c) re-viewed the video along with the transcripts to add descriptions of students’ physical expressions and movements and to examine the accuracy of the transcript. I followed these steps in developing elaborated
field notes for each of the 16 read-aloud sessions listed in Figure 6. The transcription conventions I developed in initially analyzing and reducing the recorded words and actions are listed in Appendix B.

During the small-group writing sessions, I wrote brief notes about the actions of the students and made comments to connect these actions to the corresponding talk recorded on the audiotape. The students and I sat at our small round meeting table with the tape player in the middle. When I transcribed the tapes from this data collection context, I used the same transcription conventions that I used for the read-aloud sessions, except that the transcribing was in two stages: (a) a teaching transcript, featuring only the text dictated by the children, in large print, with instructional notes on the back to use when I met with the children and (b) a research transcript, consisting of more description and of the organizational talk and social interactions of the group members in addition to the dictated text for the book pages.

**Function of literature response: Discourse analysis.**

My focus in collecting data from the perspective of the interpersonal plane of analysis was on face-to-face interactions and the language-in-use activity of members of the community of learners (Gee, 1999). I watched and listened as particular people took social action through language. In later re-reading of my field notes, listening to recorded talk, and viewing videotapes, I also sought to recognize how and if participants in the activity demonstrated affiliation with particular culturally and
historically situated ways of talking, thinking, and taking action in the world, especially the Discourse of science. I carefully listened to my students’ and to my localized language-in-use in the particular activity of responding to nonfiction books (Gee, 1999).

Because data collection and data analysis were ongoing and interrelated processes in this interpretative study, discourse analysis was a necessary aspect of this part of the methodology. Gee’s (1999) description of discourse analysis “seeks to balance talk about the mind, talk about interaction and activities, and talk about society and institutions…” (p. 5). Such balance reflects the notion of mutually constituting and simultaneous developmental processes in Rogoff’s (1995, 2003) three-plane model. Further, Gee’s (1999) delineation of six building tasks of language was a useful tool in organizing and reducing data, and two of his tools of inquiry—situated meanings and cultural models—correspond to the Vygotskian ideas of everyday and schooled concepts (Vygotsky, 1978, 1986).

Therefore, discourse analysis as described by Gee (1999) was one meaningful standpoint from which to consider the recorded talk. Throughout the transcription process and during my initial readings of my elaborated field notes, I reflected upon my previous ideas about classroom science discourse illustrated by Figure 3 and upon Gee’s (1999) questions in Appendix C. These questions guided my ongoing, evolving interpretations of the data regarding the function of the children’s book-related talk during the read-aloud sessions. I also noted the function of my talk as the teacher.
Content of literature response: Connections to prior research.

During my initial reading of all the sets of elaborated field notes, I also recognized recurrent categories related to the content of the children’s responses to the nonfiction books. I made note of these in writing throughout the elaborated field notes. My initial categories indicated that the content of the children’s responses focused on (a) true personal stories, (b) fiction and movies, (c) concepts about print/word study, (d) school subjects/science, (e) other nonfiction books, and (f) distinguishing features of nonfiction books.

Because of the similarities between these preliminary categories and the findings reported within the existing literature, on my second reading of the sets of field notes, I used a highlighter to code my data according to the findings of prior research. Specifically, I used the four categories of intertextuality delineated by Pappas, Varelas, Barry, and White (2003). I also had in mind the two modes of talk identified by Kurth, Kidd, Gardner, and Smith (2002), but my coding process focused primarily on the categories of intertextuality. Both studies were discussed in the review of research of classroom science talk in Chapter 2.

The two modes of talk identified by Kurth, et al. (2002) were narrative talk (story mode, related to personal accounts) and paradigmatic talk (argument mode, related to logical claims and universal “truths”). These modes of talk correspond to Categories III and IV in the study conducted by Pappas, et al. (2003). The general categories of intertextuality were (a) Category I: written texts, orally shared texts, other media, and prior classroom discourse; (b) Category II: hands-on explorations; (c) Category III:
specific or generalized personal events; and (d) Category IV: “implicit” generalized events (Pappas, et al., 2003). These categories of intertextuality were useful in coding most of the responses within the elaborated field notes.

Although the category of concepts about print/word study that I had identified earlier could be considered to be part of Category I, within my data, it stood out as a separate category. The category of concepts about print/word study was different because of the apparent function of this type of talk within the read-aloud data. Such responses focused on the nonfiction book as an object. This function was evident in another category from my initial reading/coding—response that focused on distinguishing features of nonfiction books.

As I read and coded the sets of elaborated field notes to indicate links between my data and the existing literature, I began to generate general themes and assertions based upon these early analytical readings. I will identify these themes in Chapter 4. I will also report the findings of subsequent searches of the data for evidentiary warrant regarding these assertions and themes (Erickson, 1986). For these later examinations of the data, I used N6 qualitative data analysis software.

Through these subsequent data searches, I recognized the inseparable character of the function and content of the book-related social interaction during the read-aloud sessions. I, therefore, developed the two broad categories and the ten more finely descriptive response types that I delineate and explain in Chapter 4. These categories integrate the function and content of the talk that I observed and interpreted in this classroom-based investigation.
Investigation of Question 3

Question 3: In what ways do individual members of the community of learners transform their participation in socially interactive learning activity involving science-related nonfiction books?

What is the content and function of the talk of an individual student (focal student) within these contexts?

Brief synthesis of ideas from relevant theory and research.

- The language of nonfiction books is a particular way of talking about the world, a particular discourse. Research has shown that children make use of the features of this genre in their book-related talk (Duke, 2000; Duke & Kays, 1998; Pappas, 1993).
- Science is a particular culturally and historically meaningful way of talking about the world. Talking about science-related nonfiction books is one way that young children can engage in “talking science” in the classroom (Cobern & Aikenhead, 1998; Gallas, 1995; Lemke, 1990, 1993; Pappas & Barry, 1997; Sutton, 1998).

Data collection strategies and analytical tools.

Question 3 reflects my interest in the personal plane and the developmental process of participatory appropriation (Rogoff, 1995, 2003). Participatory refers to the active participation of the learner in sociocultural activity, and appropriation refers to an individual’s process of learning to make use of the ways of thinking and doing associated with a particular culture or Discourse within a community, while also transforming that community and its cultural practices in some way by being a unique participant. Figure 14 illustrates the focus within the personal plane of analysis.
In first developing the pair of questions comprising Question 3, I did not consider the aspect of appropriation in which the community is transformed by the person. I had in mind, as a teacher, the transformation of the individual learner. As a researcher, I had in mind the genre studies outlined in Chapter 2 of this dissertation. However, as I read and reread the set of transcripts from the read-aloud sessions along with my reflection journal, and as I reflected upon the words and actions of the focal students I had selected, what I observed more was the transformation of the community of learners. I will further discuss this assertion in Chapter 4 and Chapter 5. Here, it relates to the shift in my thinking during the period of the collection and initial analysis of data. Through the personal plane of analysis, I actually perceived more than I had anticipated.

My original intent was that, by examining the responses of selected focal children, my research focus would be on the personal use that each child made of language in social situations and how that use changed over time, or transformed, through the
child’s participation in sociocultural activity. The purpose that emerged for this personal plane of analysis was to describe the development of our community of learners, as well as of particular learners, by describing what each focal student’s words and actions meant in terms of his or her own response profile, or patterned way of responding during the read-aloud sessions. I gathered these data on particular children as I continued to revisit my field notes, review initial codes, listen to audiotapes, view videotapes, and reflect upon day-to-day life among my kindergarten students. Further, I compared these response profiles to each focal student’s words and actions during the small-group writing sessions in order to illustrate how the learner and the community transformed through the process of participatory appropriation.

**Focal students within read-aloud and small-group writing sessions.**

Figure 15 indicates the procedures for gathering data about the selected focal students. In case study research, the interest is in the particular. The use of focal students—cases within the case of the particular classroom—helped me to provide thick description of discourse within the contexts of the reading aloud and crafting of scientific nonfiction books and to illustrate the patterns that emerged as my students and I interacted with text, with one another, and with science ideas (Stake, 2000). This description is presented in Chapter 4.
<table>
<thead>
<tr>
<th>Purpose for data collection</th>
<th>To describe change over time in the ways in which individuals participate in classroom learning activities involving scientific nonfiction books and ways in which the community changes through the participation of these individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research strategy</td>
<td>Participant observation/unstructured group interview—using the same recorded and written data gathered during the read-alouds and small groups, but foregrounding the talk of particular individuals</td>
</tr>
<tr>
<td>Source of data, including number and location</td>
<td>3 focal children—with selection based on teacher researcher observation to reflect a range of child variables including diversity of (a) student backgrounds, (b) ways of participating in classroom learning activity, especially their response profiles within the read-aloud data, and (c) academic strengths and needs</td>
</tr>
<tr>
<td>Frequency of data collection</td>
<td>Data were collected for all students within the read-aloud and small-group writing sessions; the analysis of data, rather than the collection, differed for the focal students, whom I identified after the initial data collection period and after several readings of the data corpus.</td>
</tr>
</tbody>
</table>

Figure 15: Individual children’s talk related to science-related nonfiction books read aloud or crafted within a community of learners.

As I gathered and analyzed data about individuals in my class, I continued to note themes across the various instructional contexts that served as settings for data collections—the read-aloud and small-group writing sessions. Later, I further examined ideas that converged by re-searching the sources of data involved in this study, comparing ideas across contexts as well as comparing emerging themes to ideas from existing literature. These linkages are presented in Chapter 4 and discussed further in Chapter 5.
Trustworthiness

The site for this study was the kindergarten classroom in which I was the teacher. The participants were the young children whom I had come to know over the course of five months prior to the beginning of the data collection period. Together these students and I had developed daily routines and ways of interacting within the physical space of the classroom. Within this shared setting, we engaged in the activity of reading aloud and talking about science-related nonfiction books, a familiar and highly social instructional context that also served as the primary context for data collection. My role in co-constructing this community of learners and my long-term relationships with the students contributed to my ability to observe and interpret their words and actions over time and across various instructional/research situations. I explicitly examined my role as an “insider” through my teacher researcher reflection journal.

The triangulation of data collection contexts (classroom community, full-class read-aloud sessions, and small-group writing group events) and of perspectives toward the data (the community-institutional, interpersonal, and personal) allowed me to compare the discourse data I had gathered and to search for convergence of findings across these contexts and perspectives. This triangulation helped me to note patterns within the case of this particular community of learners and to locate and analyze discrepant events, or events that were not typical in the data but which I considered to be key to understanding my students’ collective meaning making with the selected nonfiction (Erickson, 1986; Gee, 1999).
Another way in which I sought and considered various perspectives toward this work was to participate in a writing/peer debriefing group made up of an education professor/researcher and graduate students from different education-related fields and at different points in their graduate programs. Also, I met individually with another teacher researcher, who was also engaged in her dissertation work in the area of children’s literature and with a doctoral student in the field of science education. Both the group and one-on-one forms of peer debriefing began during the proposal phase of this project and continued throughout data collection and report writing.

This chapter has described the methods used in this qualitative study of young children’s responses to science-related nonfiction books according to the three-plane framework introduced in the previous chapter. In the next chapter, I will again utilize this framework as I present the findings obtained through these methods.
The purpose of this research project was to describe and interpret young children’s responses to science-related nonfiction books within an interactive classroom context. In the role of teacher researcher within a kindergarten community of learners, I gathered and analyzed data related to this purpose from a sociocultural perspective. In this chapter, I will present the findings of my investigation.

This chapter is organized according to the three-plane framework introduced in Chapter 2 in the discussion of related theoretical literature (Rogoff, 1995, 2003). Also, this framework served as the structure for the description of data collection and analysis procedures in Chapter 3. In the sections that follow, I will briefly review each question and my purposes in investigating it, present the general findings related to each question, and provide particular description based upon the data I have collected.
Question 1: Observing and Analyzing Apprenticeship

Question 1 reflects the community-institutional plane of Rogoff’s (1995, 2003) framework for observing and analyzing sociocultural activity. From this perspective toward data collection and analysis, I investigated the process of apprenticeship. The set of questions I asked in order to understand apprenticeship within this community of learners was:

What is the role of science-related nonfiction books in constructing scientific discourse within an early childhood classroom?

(a) What graphic and verbal features of such a book affiliate it with science?

(b) What graphic and verbal features of the book elicit response within the community of learners?

My purpose in investigating this set of questions was to understand how the process of apprenticeship transformed the community of learners as my students and I participated in activity affiliated with the historically and culturally developed practice of science. The specific sociocultural activity involved in this investigation was the development of a way of “talking science” in the classroom through reading aloud and responding to a variety of science-related nonfiction books.

The read-aloud sessions of these books involved the shared culture of the early childhood community of learners, which included 19 unique children and one teacher researcher, along with eight books with diverse writing styles, visual features, and science content. Although a multitude of other social and cultural factors were also involved in the process of apprenticeship, I have focused analysis on the meanings of words and actions within the kindergarten classroom in terms of (a) science as a
particular socio-historically developed way of talking or taking action, (b) the classroom as a unique community with a shared culture developed within a particular space and time, and (c) nonfiction books as cultural artifacts of the human work of understanding and representing the natural world through words and pictures. Figure 16 revisits the pyramid introduced in Chapter 2. It summarizes the focus of Question 1 while indicating the relationship of all three planes of analysis.

![Figure 16: A focus on the community-institutional plane in Rogoff’s (1995, 2003) three-plane framework.](image)

In the following subsection, I will present my interpretation of the data related to the primary question about the role of nonfiction books in constructing a classroom scientific discourse. This is a partial description of this role of the eight books used in this study. This description is of the classroom context, part of the community-institutional setting of the study. Understanding the nature of a particular classroom culture is important to understanding the nature of social and cultural activities, such as talking about science-
related nonfiction books, within that unique setting. I will add to my description of the
role of nonfiction in “talking science” in this classroom when I present findings related to
Question 2, which examined response to the books. The data related to Question 1 and
Question 2 converged on the theme of “intermingling”, which I will discuss below. As I
will discuss later in this chapter and in Chapter 5, the nonfiction books and the response
evoked during interactive read-aloud sessions constructed a discourse of science within
this community of learners.

In order to further describe the role of the selected nonfiction literature in this
construction process, I will present findings related to the two sub-questions of Question
1. One sub-section will address the question about how the books are affiliated with
science, and another will focus on the features of the books and the social setting of the
read-aloud sessions that elicited response.

The Role of Science-Related Nonfiction Books: Contributions to “Intermingling”

My teacher researcher reflection journal was the primary source of data for providing
a general description of the community of learners. I analyzed my journal entries over
time in order to understand the development of a shared culture through our day-to-day
activities within the physical space of our classroom, located within a particular
elementary school and suburban community. Through this analytical reading of the
reflection journal, I came to recognize the role of science-related nonfiction books in
constructing a scientific discourse within this setting. That role was to support and
extend an ongoing intermingling of “official” and “unofficial” school Discourses (Gee,
1999).
Later in my presentation of findings related to the nature of response during interactive read-aloud sessions, I will discuss how the context of this intermingling of official and unofficial aspects of classroom life is reflected in the blending of different ways of using language and responding to science-related nonfiction books. In other words, I will describe how the nature of response, like the culture of the community-institutional context, suggests an intermingling of voices and ideas in the interpersonal context of reading aloud and responding to selected books.

To describe the overall way of interacting within this classroom, I have appropriated the terms *intermingling* and *bumpiness* from existing classroom-based research (Varelas & Pineda, 1999). In my work, intermingling is the generally tacit blending of different ideas or actions associated with perspectives that may otherwise be considered to be discrete or to have opposing purposes within the classroom. The categories of intermingling evident in the classroom interactions that I recorded and reflected upon in my journal were (a) purpose intermingling, or the blending of play- and instruction-oriented goals of a particular activity within or related to the establishment of the social and physical environment; (b) language mode intermingling, or the blending of narrative and paradigmatic modes of classroom talk; and (c) curricular intermingling, or the blending of ideas from different areas of the official school curriculum or of tasks and ideas associated with the institution of formal schooling.

Bumpiness refers to a lack of such blending. Within my teacher researcher reflection journal, the instances of bumpiness that I recognized and documented were related to behavioral issues, verbal interruptions, or social conflicts within the community of learners. Figure 17 summarizes the data related to instances of intermingling and
bumpiness from my reflection journal. The total percentage of the reflection journal included in this table is 86; the additional 14 percent of my journal writing addressed procedural issues rather than classroom interaction.

<table>
<thead>
<tr>
<th>Description of Classroom Interaction</th>
<th>Percentage of Coded Text Units in Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermingling</td>
<td>81</td>
</tr>
<tr>
<td>• Purpose Intermingling</td>
<td>14</td>
</tr>
<tr>
<td>• Language Mode Intermingling</td>
<td>24</td>
</tr>
<tr>
<td>• Curricular Intermingling</td>
<td>43</td>
</tr>
<tr>
<td>Bumpiness</td>
<td>5</td>
</tr>
</tbody>
</table>

Figure 17: Intermingling and bumpiness in classroom interaction.

The numerical data in Figure 17 represent what I chose to record in my journal as a subjective member of the community of learners and as a fully participating observer of the day-to-day life of the classroom. The detailed descriptions recorded in my journal indicate what events and routine aspects of the social and physical environment I considered to be most relevant to the process of apprenticeship. Further, my interest in apprenticeship arose from my involvement in numerous such routine events throughout thirteen years as a teacher of young children. My experience as a teacher, along with a sociocultural perspective of teaching and learning, thus, were integrated through the research strategy of reflective journaling over time.
The categories that emerged as I analyzed data and compared recurrent ideas to concepts in the existing related literature are also represented in Figure 17. I will further illustrate these categories of classroom interaction through excerpts from my reflection journal. As a review, Figure 18 lists the categories and their definitions.

<table>
<thead>
<tr>
<th>Description of Classroom Interaction</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermingling</td>
<td>The generally tacit blending of different ideas or actions associated with perspectives that may otherwise be considered to be discrete or to have opposing purposes within the classroom.</td>
</tr>
<tr>
<td>• Purpose Intermingling</td>
<td>The blending of “play-oriented” and “instruction-oriented” classroom goals.</td>
</tr>
<tr>
<td>• Language Mode Intermingling</td>
<td>The blending of narrative and paradigmatic modes of classroom talk.</td>
</tr>
<tr>
<td>• Curricular Intermingling</td>
<td>The blending of ideas from different disciplines/Discourses or areas of the official school curriculum.</td>
</tr>
<tr>
<td>Bumpiness</td>
<td>A lack of blending of purposes, language modes, or curricular areas due to behavioral issues, verbal interruptions, or social conflicts.</td>
</tr>
</tbody>
</table>

Figure 18: Definitions of categories of classroom interactions.

**Purpose Intermingling.**

I identified 217 of the 1,538 lines of text, or 14 percent of the journal text units, as representing the concept of purpose intermingling. The blending of playful and instructional intentions behind classroom routines, materials, and learning activities were both intra- and interpersonal interactions. In other words, purpose intermingling was at times a feature of my own planning and reflecting as a teacher; at other times, purpose intermingling involved my students’ and my own varied
purposes. The journal entries in which I noted purpose intermingling began on the first
day of data collection on February 18, 2004 and continued through the middle of May.

The vignettes that follow are journal entries from early March, when much of my
writing described the culture that my students and I had co-constructed since the
beginning of the school year. The first illustrates a daily routine that had become a
special tradition throughout the months prior to the research period. The second vignette
illustrates the significant role of the children in the way I planned and implemented
instruction in the classroom. A final story features an instance of purpose intermingling
that differs from the others. In these vignettes and all of the findings I present throughout
this report, I have replaced student names with pseudonyms.

Purpose intermingling is evident in this excerpt from my reflection journal from
March 3, 2004:

The “gift of learning” today was our busy bee finger puppet and Farfallina the
butterfly (Beanie Baby). [The purpose was] to remind the children about our
“Furry Friend Friday”…. Several weeks ago a number of children were
bringing stuffed animals to school, wanting to share them. Our instructional
time is so limited [that] most of our “show and tell” time is spent sharing our
writing books (journals), talking about our weekends, etc. I wanted the class
to have time to share their favorite stuffed animals…so I told them we’d have
a special day to do that….

Both the “gift of learning” and its contents on that day represent the concept of
purpose intermingling. This “gift” was a large box wrapped in bright green paper and
orange ribbon and topped with a large white bow. Opening it had become a fun tradition
in our classroom. Children took turns coming to the front of the group in the carpeted
area to lift the lid of the colorful box, have a peek inside, and remove the “gift” from the
box. Additionally, this tradition was an instructional practice that I had initiated in order
to focus our limited time in the classroom. The “gift of learning” was a way to introduce
the focal point of much of our reading, writing, and talking throughout the morning as
well as to connect our classroom language to our on-going work in math, science, social
studies, and health. The “gift of learning” was a tool for helping me to organize and
integrate our classroom activities and for providing the children with a way to organize
their thinking and summarize their school experiences at home.

The contents of the box in the above journal excerpt also illustrate the concept of
purpose intermingling. Puppets and stuffed animals generally engage the interest and
imaginations of young children and are associated with playfulness and fun. The finger
puppet and the stuffed animal were “characters” in the day-to-day life of our classroom.
They were also visual mediators to help my young students think about their noise level
and attention in different school situations. After much discussion and role-play using
the toys as models, the bee had become for the children a symbol of productivity and
cooperation in the classroom, and the butterfly had come to represent the quiet line of
students expected in the hall.

In their role as the “gifts” in the above journal excerpt, the toys were reminders about
an important upcoming event in the classroom. The planning of “Furry Friend Friday”
was related to my desire to allow the children to bring objects to school that were
important to their play at home. However, these objects also would become classroom
materials to engage my students in writing, asking and answering questions, sorting by
various attributes, and participating in a class literacy-based project. This special
classroom event and the related learning activity are the focus of the next vignette
illustrating purpose intermingling.
On March 5, I wrote, “…What a wonderful collection of stuffed animals! The children introduced them at morning meeting, where they also shared their journal writing….“ Later in the same entry, I described a related class writing project.

Throughout much of February 2004, my students and I had been investigating shadows. One of the activities with the children’s stuffed animals was to place each toy on our overhead projector, which we had used previously in our shadow studies. I photographed the shadow cast by each child’s stuffed animal as well as the actual object. These photographs were for the class writing project that I had planned based on my students’ strong interest in a guessing book featuring shadows. An excerpt from March 9, 2004 further describes this project:

We started a nonfiction interactive writing project about the photos of shadows and of the “real things”….It’s a chart with lift and look doors—shadow on the outside and other photo on the inside. Today we wrote the statement suggested by Rachel and not modified by anyone else, “Try to guess whose shadow.” We’ll write step-by-step directions for how to interact with the chart over the next few days, then hang it in the hallway….

As illustrated by the classroom stories about the tradition of “gift of learning” and the newly introduced monthly activity of “Furry Friend Friday,” purpose intermingling is the blending of play- and instruction-oriented goals. The activities of play and learning constructed one another within the classroom. Further, it appears from the vignettes that purpose intermingling was a type of interaction that I used, as the teacher, primarily to build learning activity upon the children’s interest in play. However, one event that I recorded late in the spring illustrates that purpose intermingling is a more complex interaction between the purposes of unique individuals within the community of learners.
On April 23, 2004, our second “Furry Friend Friday,” I wrote:

When he arrived this morning, Michael introduced his stuffed animal (a panda) to me and mentioned that he would have liked to bring one of his stuffed dinosaurs but it is Furry Friend Friday…. I told him that next month, we’d just call it “Stuffed Animal Day.” He also told me that three of his dinosaurs make shadows, but he’s not sure about his two small ones.

This exchange demonstrates the blending of purposes for our monthly day with “Furry Friends” in the classroom. Apparently, Michael had made more use of the instruction-oriented purpose of bringing a toy to school as he carefully selected a stuffed toy that represented a furry animal. The more scientific and instructional purpose in this instance was Michael’s, not mine. My intention in naming the day was a playful use of alliteration rather than a definition of what kind of stuffed animal to bring. In addition, Michael’s comment about his uncertainty of the shadow-making capabilities of his two small dinosaurs signaled to me his interest in using the overhead projector to investigate. This comment also prompted me to rethink Michael’s and others’ understandings about shadows.

Next I will discuss a second category of intermingling—language mode intermingling. The tacit blending of language modes occurred in a larger percentage of text units than purpose intermingling, and, like purpose intermingling, this category is evident from the beginning of my recorded descriptions and reflections in the journal.

Language mode intermingling

Language mode intermingling occurred in 364 of the 1,538 lines of text in the journal; that is, I identified 24% of the text units as representing language mode intermingling. I documented instances of this category throughout the journal, beginning with the first entry on February 18, 2004 and continuing through the final entry on May 28. A
narrative mode of interaction reflects personal accounts or a story-telling style of talking. A paradigmatic mode reflects an argument or statement of some “universal truth” or an interest in evidence (Kurth, et al., 2002). The first excerpt below represents a somewhat literal illustration of the intermingling of these modes of talk. The second demonstrates the close relationship between this type of intermingling and the play- and instruction-oriented purpose intermingling discussed in the previous section.

The excerpt below is from a two-and-a-half page entry in which I was reflecting on my plans for an upcoming series of science experiences. At the time, I was considering how to revisit some ideas that my students had expressed regarding shadows in the days following Groundhog Day. On February 18, 2004, I wrote:

We used a paper groundhog to observe whether it would “see” its shadow or not. [This activity was] part of an on-line project with kindergarten classes from different parts of the country. Ours “saw” its shadow at the designated time—9:00 A.M. on Groundhog Day…six more weeks of winter, as the story goes. We’re keeping track [of weather conditions] on a chart… for six weeks. Our evidence includes what we had to wear…to be comfortable outdoors….

The use of the cardboard groundhog literally involved our kindergarten community in a storytelling experience. On the morning of February 2, 2004 my students and I had gone outdoors with our groundhog, which we had named in honor of our school, and watched as its shadow fell across a small area of smooth snow on our playground. Later, this experience, through personal accounts, intermingled with more scientific ways of talking and acting as my students and I gathered observation and measurement data over time to “test” our groundhog’s prediction about the arrival of spring.
This shared narrative experience also became an aspect of activities I later planned and implemented in order to further support a more paradigmatic style of conversation about the relationship between shadows and weather. These activities included (a) viewing weather descriptions of other areas and photographs of other “groundhogs” posted on the internet, (b) investigating the shadows of students, playground equipment, and trees on the playground on a cold and sunny morning, (c) reading and responding to nonfiction books featuring realistic illustrations or photographs, and (d) explicitly discussing students’ concepts, such as the ideas that shadows cause wintry weather or that being able to see shadows outdoors is related to wintry weather conditions.

Another instance of language mode intermingling occurred during and after a mid-spring field trip to a local park. The planning of this experience had a general purpose associated with a paradigmatic mode. This purpose was to observe and describe plants and animals in the spring and to identify changes in them since our last visit to the park. We had taken an autumn trip to the same location and had recently reviewed our observations by looking at and talking about a collection of photographs from our previous visit. The naturalist who led us on our spring walk provided much information about a large variety and number of features of the woods and gardens in the park. He seamlessly wove this information into an ongoing narrative through a series of personal accounts which seemed to engage my students as listeners, questioners, and observers. I noticed that they shared experiences with one another and with the story-telling scientist leading them through a fascinating setting rich in signs of spring.

On April 23, in one of two entries recounting our field trip experience, I wrote:
Early on in our walk, the naturalist spontaneously told a story about a morning recently when he and a deer had stood “staring at each other for what seemed like a long time.” He pointed out the wooded area/ravine that the deer ran toward when he finally moved. Then the naturalist asked the class if the park [gardeners] wanted the deer in their gardens. A chorus of voices said “no.” The naturalist then talked about how the deer eat plants, dig up bulbs, etc. This prompted Rachel to mention that squirrels do that, too, and, to me, that that’s why we had planted our bulbs at school [in our nature lab garden] six inches deep.

Thus, Rachel wove into the naturalist’s story, which itself featured information about the deer and gardens, her own information from the experience that the community of learners had shared at school. Rachel’s language mode in this instance was paradigmatic and indicated her construction of a sort of “universal truth” about the human work of gardening and the behavior of wild animals. Her language blended with the narrative that was underway as we walked, stopped, and observed throughout the park.

In the same journal entry, I recorded another instance in which a student’s language demonstrated a paradigmatic mode. This instance involved Sean’s use of his observations elsewhere as evidence for an informational statement he made at the park. I wrote:

As we crossed a little bridge in the wetland area, Sean told me that that’s where the raccoons were….He KNEW it because that’s where he had seen them before at home….Raccoons had been on our minds since the very beginning of our walk, when the naturalist had pointed out duck eggs that had been opened and eaten by some animals, most likely raccoons.

Sean’s comment about the raccoons revisited the shared experience of the earlier part of our walk and contributed additional information. This illustration of language mode intermingling and the example involving Rachel’s comment show how two students within the community of learners used a paradigmatic mode of talk to connect the current learning experience to prior shared or personal experiences.
An event later in our naturalist-led walk provides another illustration of language mode intermingling. This example of intermingling differs from the previous two in that it describes an instance in which the playful language of the naturalist was woven into a student’s language. In the other two vignettes, Rachel and Sean had woven information into the current shared experience of the community of learners. In my reflective journal entry on April 23, 2004, I recorded these thoughts about David:

…Shortly after the naturalist had said to “keep our fingers crossed” that the weather would stay nice for the afternoon group, David looked up and said, “LOOK! It’s not gonna rain!” The sun was shining brightly through the clouds. Then he held up his hands to show me that his fingers were crossed.

On April 27, a few days after the field trip, I recorded this event in my journal:

This morning at class meeting, where we briefly discuss an overview of the day, “recess” was in our pocket chart as the last event of the morning…. It was mostly sunny during class meeting, and at one point, spontaneously…David said to me, while crossing both sets of fingers, that he was crossing his fingers “to keep the weather nice!” He grinned. I grinned back and nodded and thanked him. I knew just what he was thinking: Crossing his fingers on the field trip last week, at the suggestion of the naturalist, did [seem to] keep the rain away for the rest of our trip and all afternoon for the afternoon classes.

As these excerpts from my journal indicate, language intermingling involves the blending of different ways with words which represent different purposes within a teaching-learning situation. These excerpts also create a picture of language intermingling as a complex aspect of the socially interactive context of the kindergarten community of learners. The instances of intermingling documented in my teacher researcher journal suggest that the “movement” between ways of talking was not a unidirectional developmental process; that is, narrative and paradigmatic modes of talk, as contributed by various individuals within the community of learners, co-constructed a shared localized discourse (Gee, 1999).
In the following section, I will present instances of curricular intermingling, the most frequently coded of the three types of intermingling identified in the journal.

**Curricular intermingling.**

This category of intermingling occurred in 43% of the journal text units, or 655 out of 1,538 lines of text. Earlier I defined intermingling as a *generally tacit* blending of ideas or actions. Part of my purpose in including the term *tacit* in the definition was to differentiate curricular intermingling from the overt practice of integrating teaching and learning goals across the curriculum. However, due to the nature of my teacher researcher journal as a source of description *and* reflection, these concepts of intermingling and integration actually blended together throughout the journal. In other words, the idea of a tacit blending of different aspects of the institution of school itself intermingled with my work in making explicit my subjectivities as a teacher researcher.

As I had recorded them in my journal, I noticed that instances of curricular intermingling were rooted in my explicit planning as a teacher, and they “came to life” as shared aspects of the social and physical environment of the classroom. These shared and blended meanings for various activities within the community of learners are what I refer to as *curricular intermingling*—a concept that became “visible” to me as I examined the life of the classroom through the lens of the community-institutional plane of analysis (Rogoff, 1995, 2003).

One aspect of classroom life in which I observed curricular intermingling was in different daily routines. As I discussed earlier, one such routine, the “gift of learning,” had become a classroom tradition. Another routine, which over time came to be a tacit
blending of math, science, and language arts, was observing and recording the weather conditions as part of our daily opening activities. I reflected upon this routine as we began a new month on March 1, 2004:

One data collection activity that is part of our daily morning class meetings is observing the weather out the window…. I choose names from a little bus-shaped tin, usually giving letter-sound or rhyming clues or number of syllables to have the children guess whose name I’ve picked. We sing a song as the weather observer looks out the window. Then he/she inserts the word (sunny, cloudy, rainy, snowy) into the song and puts a cube [with plastic links] into one of four labeled baggies hanging on our calendar bulletin board…. At the end of the month, we stack the cubes to construct a vertical bar graph. This demonstrates in a more concrete way how such a graph is made. Collecting our data in the baggies also allows for predicting and estimating as the children can see through the plastic baggies throughout the month. After a few days of having the [concrete] bar graph in the room…and after discussing what it means, we use graphing software to represent the same information….I print out and copy a letter-sized version for the children to take home to share with their families and post a big-book version of the graph…on our large classroom timeline. We can refer back to them to compare our current month’s data with the previous month(s). This was something I especially noticed as we awaited our first snowy observation….That “none” [on our graphs] really captured the children’s attention.

The tasks of observing the weather, constructing and interpreting graphs, using phonemic awareness skills, engaging in the shared reading of a familiar song, and predicting and estimating quantities of objects are skills and strategies representing different areas of the official school curriculum. They were discrete skills even in my planning. However, through daily practice within the social life of the community of learners, these skills intermingled to create a shared cultural practice—the activity of our “weather observations” routine.

Another routine in which I noticed curricular intermingling as I analyzed my reflection journal was the use of reading, writing, and illustrating to represent our own ideas related to our various topics of study or to investigate ideas of other people, such as
authors and illustrators. In my planning and on-the-spot instructional decision-making, this integration of literacy across other curricular areas was a more explicit feature of my work as a teacher. In the practice of interacting with and about print and illustrations as readers and writers, however, my students and I constructed a more tacit blending of language and visual arts with the academic disciplines of science, social studies, and health. The repetitive use of literacy as a tool to represent and to investigate ideas as well as our involvement in particular literacy- and art-related projects over time seemed to contribute to the development of these practices as “routines” within the community of learners.

The following journal excerpt from April 7, 2004 illustrates curricular intermingling within one such “routine” project:

Today, based on recent observations of the Sweet Gum tree in our nature lab… we talked as a class then worked in small groups to prepare (with paint) the first of a series of spring murals—a continuation of the three science murals we had done in the fall in October, November, and December to represent how the Sweet Gum tree and the surrounding ground and sky looked different on three different days…. The murals together are a sort of time-line and have been hanging along one of our classroom walls…. When we worked on the murals in the fall and when we worked today, I reminded the class that this is science work—that our murals are “nonfiction”—to show people what we really observed, as closely as possible, in the nature lab…. Two weeks later, on April 21, I recorded this description of our science/art/literacy work, along with some of my teaching purposes:
We visited the nature lab today, circling the Sweet Gum tree…focusing on the tree, its buds, the ground beneath and the sky above it. After art class, we worked on our second science mural (our fifth overall) depicting our observations…. We had done this in the fall…to document how the tree had lots of colorful leaves on it, then just two, then no leaves [on it]…and snow on the ground. Judy and Lawrence had been mentioning the captions lately during our read-alouds, and I see a need to label the buds and other features of these murals, so I will discuss this with the children: “What else could we do to help people learn about the changes in the Sweet Gum tree? What could we put on our murals to give people more information…?”

According to this excerpt, using literacy and art as tools to represent the ideas of our class as a group was an explicit part of my teaching goals. The products of our work and the process of creating “nonfiction” representations of our shared experiences contributed to the tacit blending of ideas across our official school curriculum. In addition, the blending of playful and instructional purposes and of narrative and paradigmatic forms of talk were aspects of the social and physical classroom environment that my students and I had co-constructed over time through our day-to-day learning activities and routines.

The intermingling of objectives, language modes, and cross-curricular ideas were features of this classroom culture that I have identified as particularly important to the development of a classroom scientific discourse. Earlier in this chapter, I stated that the role of science-related nonfiction books in the development of a shared localized discourse of science was in supporting and extending this ongoing “intermingling” aspect of the classroom culture. This is a partial answer to the question of the role of nonfiction in constructing such a discourse. Later in this chapter, I will further describe this role
when I address the nature of response to the books in within this “culture of intermingling.” Providing a description of this culture was the primary purpose for the presentation of the data summarized in Figure 17 and of the narrative vignettes related to each of the three categories of intermingling.

Through these illustrations of intermingling, I have sought to create a picture of the community-institutional context of this research project and to begin to bring into focus the developmental process of apprenticeship within this community of learners (Rogoff, 1995, 2003). Next I will present data related to the two sub-questions of Question 1. I will add to the picture of apprenticeship as it developed within a particular kindergarten community. I will indicate the affiliation of selected nonfiction books with the culture of science by describing the graphic and verbal features of the eight books used in the read-aloud sessions. Then I will discuss features of the books and of the read-aloud sessions that elicited literature response within the community of learners.

**Affiliation of Selected Nonfiction Books with Science**

The purpose of this section is to present findings related to the first sub-question: What graphic and verbal features of a selected science-related nonfiction book affiliate it with science? Affiliation refers to the ways in which certain uses of language in particular social situations indicate that the language, the situation, and/or the language-user is associated in some way with a wider cultural system of meaning. In other words, the language-in-action, or discourse, within a particular instance of social interaction, may link that instance to a broader way of thinking, talking, and taking action, or a Discourse (Gee, 1999).
The concept of affiliation relates to my question regarding how the nonfiction books I read aloud within my kindergarten classroom contributed to a localized scientific discourse. I applied the concept as I examined eight books in terms of the authors’ and illustrators’ use of written language and pictures to represent scientific ideas. As a teacher, I also considered how the books were affiliated with the Discourse of science through links to the National Standards, as summarized in Appendix E (National Research Council, 1996).

Although multiple factors are important to consider in selecting nonfiction books for classroom use, my analysis for this project focused on the features of (a) type of nonfiction book, (b) writing style, and (c) illustrations and format. I focused on these in order to investigate links to the language aspects of teaching and learning science (Huck, et al., 2004; see also Appendix D). Figure 19 summarizes my analysis of the eight selected books. The table also indicates links to the Standards (National Research Council, 1996).
<table>
<thead>
<tr>
<th>Title</th>
<th>Author/Illustrator</th>
<th>Type</th>
<th>Overview: Writing Style and Illustrations and Format</th>
<th>Links to Science Standards</th>
</tr>
</thead>
</table>
-Colorfully drawn illustrations that “narrate” the text                                                             | -Physical Science content  
-Model of science as a human endeavor                                        |
| What’s the Weather Today?     | Allan Fowler                               | Survey Book   | -Mix of conversational and neutral tone  
-Photographs that illustrate key ideas                                                                                   | -Earth & Space Science content  
-Model of science as a human endeavor                                        |
| Winter                        | Ron Hirschi/Thomas D. Mangelsen            | Photographic Essay  | -Visually and verbally “poetic” representation of wildlife and habitats in particular season and location; part of a series of four season books  
-Afterword with additional information                                         | -Life Science, Earth & Space Science content  
-Model of science as a human endeavor                                        |
| Changing Seasons              | Henry Pluckrose                            | Survey Book   | -Photographs and brief text that survey generalized human, plant, and animal life throughout the four seasons  
-Neutral tone                                                                                                           | -Earth & Space Science, Life Science content  
-“Big Idea” of Constancy, Change, & Measurement                                |
| Be A Friend to Trees          | Patricia Lauber/Holly Keller               | Concept Book  | -Conversational tone  
-Enumeration of key ideas about trees and their importance  
-Detailed, colorfully drawn pictures that “narrate” or “illustrate” text on different pages; some labeled illustrations | -Life Science content  
-Science in Personal & Social Perspectives                                       |
| Animal Tracks                 | Arthur Dorros, author and illustrator      | Survey Book   | -Clue/guessing format  
-Conversational tone  
-Detailed illustrations that “narrate” an ongoing search for clues                                                        | -Science as Inquiry content  
-Life Science content  
-Model of science as a human endeavor                                            |
| What Do You Do When Something Wants to Eat You? | Steve Jenkins, author and illustrator | Survey Book   | -Detailed cut-paper illustrations  
-Richly descriptive, accurate vocabulary within highly interactive text and supportive illustrations                | -Life Science content  
-“Big Idea” of Form & Function                                                    |

Figure 19: General affiliation of selected nonfiction books with science.
Figure 19 includes different types of nonfiction books for children, including two concept books, four survey books, and two photographic essays. Concept books focus on a class of objects or set of general ideas. Typically for school-age children, they “begin with what is already familiar and move toward the unfamiliar…” (Huck, et al., 2004, p. 541). The purpose is to help readers deepen their understanding of a particular concept. Survey books, however, provide a broad overview of a topic, such as weather, seasons, wildlife tracking, or animal defenses, along with some specific examples of the topic of discussion.

The third type of nonfiction book used in this study was the photographic essay. Photographic essays use words and pictures to present ideas not only to inform the reader, but also “to particularize general information, to document emotion, to assure the reader of truth in an essentially journalistic fashion” (Huck, et al., 2004, p. 542). The purposes of developing deeper understandings of concepts, of gathering a range of ideas about topics, and of being inspired as well as informed are associated with the different types of nonfiction books featured in this study. These purposes, which are also aspects of the Discourse of science, are one way that the selected books are affiliated with science.

Another way in which these books are affiliated with science as a particular way of using language is the style of writing, illustration, and format. In Figure 19, these features are included in a single column as a general overview for each book in order to represent the verbal and graphic features as parts of a complete work—that is, as words
and pictures that together present the science-related content of the book. In order to demonstrate how this range of styles affiliates the books with science, I will describe some of the unique features of examples of each type included in Figure 19.

As a concept book, *What Makes a Shadow?* presents familiar everyday experiences with shadows through text and illustrations. The book then explains the observations in more scientific terms and suggests further science investigations. The text features a conversational tone, often directly addressing “you”, the reader, and asking “you” questions. The illustrations feature young children exploring shadows in a variety of familiar outdoor and indoor settings. Relationships among illustrations on successive pages, such as the repetition of child and pet “characters” and the gradually changing position of the sun, provide an underlying narrative structure to the book.

Such a structure is also evident in the survey book *Animal Tracks*. The text and illustrations represent an observation walk through a wooded area on the way to a beaver pond. Illustrated clues and the conversational tone of the written questions and descriptions of the observed signs of animal life invite readers on the walk, to search for evidence and identify various wild animals. Later, the book invites readers to look for animal signs in their own familiar surroundings, including city parks. The author/illustrator provides how-to information for collecting animal tracks at the end of the book and an identification key on the endpapers. Further, he is pictured at the end of the book investigating a real animal track in a streambed with his young son.

*Winter* and *Spring*, the two photographic essays listed in Figure 19, feature poetic language that accurately and vividly describes seasonal changes in particular wildlife behavior and physical appearance. The books also include artistically placed
photographs of the scenes that seem to have inspired the written words. These books are part of a set of four, each of which presents some of the same animals throughout the different seasons and ends with a gentle lead into the next season.

The range of writing style and illustration and format of the books involved in this study affiliates them with science as a particular way of representing ideas, questions, and information through words and pictures while maintaining a focus on accuracy and a connection to human experiences. Illustrations of children engaged in science work, photographs of familiar and unfamiliar sights, text that clearly articulates information and asks questions, and a tone that involves readers in an ongoing scientific conversation are features of the set of books that indicate an affiliation with science as a Discourse.

The final column of Figure 19 indicates links between the books and academic content standards for science (National Research Council, 1996). The various concepts and topics addressed by the books relate to a range of science content areas, including Life, Physical, and Earth and Space Science. Additionally, the standard of Science in Personal and Social Perspectives is addressed by a focus on recognizing, recycling, and decreasing use of a particular resource in the book Be a Friend to Trees.

Another standard associated with the set of books involves the nature of science. As indicated in the summary table, several of the books serve as models of science as a human endeavor. For example, the previously discussed What Makes a Shadow? serves as such a model through its illustrations of young children investigating shadows together in a variety of everyday (e.g., noticing their own shadows outdoors on a sunny day) and more overtly scientific situations (e.g., experimenting with light sources, objects, and surfaces both in- and outdoors). The illustrations in Animal Tracks visually lead readers
on a walk as the text points out evidence of wildlife activity, asks questions, and tells the story behind each clue. Further, the author/illustrator himself models the human work and pleasure of scientific endeavors in the photograph and biographical information at the end of the book. The photographic essays listed in Figure 19 also model this perspective of science, when these artistic works are considered alongside the background information about the men who created them. The complete set of photographic essays is the product of the work of a wildlife biologist/author and a wildlife advocate/photographer.

The books featured in the summary table above are connected to science education standards not only through content but also through the processes and concepts that link the standards themselves. Two of these unifying concepts and processes, or “big ideas,” are (a) form and function and (b) constancy, change, and measurement. *What Do You Do When Something Wants to Eat You?* surveys the topic of animal defenses and explicitly embeds the specific examples of form and function in the “bigger picture” of survival. The book indicates this link through a brief introduction stating that it “shows a few” ways that animals escape being eaten by predators. Further, the book closes with the question, “What would you do if something wanted to eat you?” (unpaged).

The process of seasonal change is the “big idea” focus of *Changing Seasons*. This survey book provides a generalized view of the four seasons through photographs and brief text that present specific examples of animal and plant life, weather conditions, and human activities. Because the book does not specify the location of the presented
seasonal observations, the overall purpose of the book within the classroom in this study was more to illustrate the pattern of change known as our four seasons and to connect to specific examples from the shared experiences of the community of learners.

Such connections were an important theme regarding book selection and use throughout my teacher researcher reflection journal and in my elaborated field notes of the read-aloud sessions. Appendix A is a table that summarizes the teaching purposes and classroom connections for each of the books used in the read-aloud sessions. I also referred to this table in Chapter 3 while introducing the books as “participants” in this study. This information is relevant here, in a discussion of how these books are affiliated with science, because the purposes and methods for their use in the classroom are related to their affiliation with the Discourse of science and their role in constructing a classroom scientific discourse.

Elicitation of Response within the Community of Learners

The purpose of this sub-section is to address the question: What graphic and verbal features of a science-related nonfiction book elicit response within the community of learners? The primary source of data regarding this sub-question was the set of elaborated field notes from the 16 interactive read-aloud sessions. These elaborated field notes consisted of (a) transcribed student and teacher talk during the sessions, (b) description of the specific setting of the read-aloud, (c) page-by-page descriptions of the text and illustrations, and (d) written observations of student and teacher actions.

From the perspective of the community-institutional plane of analysis, I examined the elaborated field notes to identify the objects of children’s response. Specifically, I began my analysis with two possible categories in mind: words and pictures in the book.
However, ongoing analytical reading of the field notes revealed (a) a larger number of categories than I had anticipated and (b) an expanded definition of the “graphic and verbal features” that evoked response during the read-aloud sessions. Figure 20 summarizes these findings.

<table>
<thead>
<tr>
<th>Category (Response elicited by…)</th>
<th>Description</th>
<th>Numbers of Text Units Coded Across 16 Read-Aloud Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture</td>
<td>Photograph or illustration on the cover or endpapers or within the book</td>
<td>1247</td>
</tr>
<tr>
<td>Student Contribution</td>
<td>Book-related actions or spoken words of a student or of more than one student</td>
<td>1121</td>
</tr>
<tr>
<td>Teacher Contribution</td>
<td>Book-related actions or spoken words of the teacher</td>
<td>624</td>
</tr>
<tr>
<td>Read-aloud Text</td>
<td>Text from the cover, title pages, or pages of the book that the teacher is reading or has read aloud</td>
<td>515</td>
</tr>
<tr>
<td>Print</td>
<td>Actual printed words or letters on the cover, in captions, or on any page of the book</td>
<td>82</td>
</tr>
</tbody>
</table>

Figure 20: Features of the books and read-aloud context that elicited response.

As Figure 20 indicates, five categories organize the data regarding the second sub-question about the role of nonfiction books in constructing a classroom scientific discourse. These categories include features of the read-aloud social context itself (student contributions and teacher contributions) as well as features of the books (pictures, orally read text, and print). Together these categories indicate the multimodal experience created during the interactive read-aloud sessions. For example, the
categories of print and pictures represent visual features that evoked responses, and the categories of read-aloud text, student contributions, and teacher contributions generally represent verbal features that evoked response. With the exception of the category of print, I identified the categories across the set of data for all 16 read-aloud sessions; I recognized print as evoking response in data for 12 of the 16 sessions.

In analyzing the data according to these five categories, I assigned a code to a selected response based upon what I interpreted to be the feature of a book or of the read-aloud context that had evoked that response. The categories, therefore, indicate more about what prompted response than about the nature of the response itself. Such information is an aspect of my investigation of Question 2 and will be presented later in this chapter. Because of this more generalized perspective on the nature of the responses themselves, the response data in the far right column include my responses as well as those of the students. Further, these data include verbal and nonverbal responses.

**Summary.**

When I examined the day-to-day life of the classroom, including the use my students and I made of the social and physical environment, I found that purposes for activities, language modes, and curricular areas blended to create the unique culture of this community of learners. This “culture of intermingling” was the context for the interactive read-aloud sessions of nonfiction books. As indicated by the findings I will present in the following section, the eight selected books and the response elicited by the features of the books themselves and by the contributions of others supported the ongoing intermingling of ideas. Figure 21 illustrates these community-institutional aspects of the read-aloud sessions.
In the next section, I will describe what I observed when I looked at this community of learners from the perspective of the interpersonal plane of analysis (Rogoff, 1995, 2003). The intermingling nature of the community-institutional setting was still visible, but for Question 2 I focused on particular face-to-face interactions rather than on the ongoing day-to-day culture of the classroom.
Question 2: Observing and Analyzing Guided Participation

The questions that I asked in order to understand guided participation within this kindergarten community of learners were:

What is the nature of children’s responses to science-related nonfiction books read-aloud within a community of learners?

What is the function and content of talk during socially interactive read-aloud sessions of such books?

These questions reflect the interpersonal plane of Rogoff’s (1995, 2003) three-plane framework for observing and analyzing sociocultural activity. My interest in gathering and interpreting data according to this particular aspect of the framework was in understanding the process of guided participation. As I stated in Chapter 3, this developmental process involves (a) particular situations or instances of social interaction and (b) cognitively and socially active people. These people are guided by others who have greater expertise or experience as they participate in these particular socially interactive events.

In this research project, these socially interactive events were the 16 read-aloud sessions. My 19 kindergarten students and I were the co-present participants, along with the eight previously described science-related nonfiction books. The purpose of this section is to describe our interactions during the read-aloud sessions, primarily through the language of the children. Figure 22 illustrates the theoretical focus of this section.
The second question above is a more specific restatement of the first; the two questions are not separate. Therefore, in this chapter section, I will present findings regarding the content and function of book-related talk recorded during the read-aloud sessions. I will provide particular description of various categories of such talk through a series of descriptive vignettes. These specific instances of children’s use of language embody the nature of their responses to science-related nonfiction books within this community of learners.

The response categories illustrate the nature of the children’s work with nonfiction and link response to the books in this study back to the earlier question about their role in constructing a classroom scientific discourse. I stated in my findings regarding Question 1 that the role of the nonfiction books was in part to support the ongoing blending of ideas, or the intermingling of official and unofficial aspects of classroom life. The other part of the role of the books involves the response to them during the interactive read-aloud sessions.
The Nature of the Children’s Responses: Two Building Tasks of Language

Elaborated field notes (transcripts and descriptions) of the 16 interactive read-aloud sessions were the primary sources of data that I used in examining the nature of the children’s literature responses. As I discussed in the previous section regarding the first set of research questions, I considered the eight nonfiction books to be affiliated with the Discourse of science. My purpose in investigating my second research question, therefore, was to observe how my students interacted with and about the books and to determine how this interaction was or was not related to the development of a classroom scientific discourse.

One of my assumptions, based upon existing theoretical and empirical writings, is that literature response is a way of bringing children’s ideas to the social setting to be transformed as well as to transform the social setting itself and influence the ideas of others. In other words, I believe that observing and analyzing language and nonverbal behavior during the read-aloud sessions was an opportunity to investigate the process of guided participation. This is the perspective with which I approached the read-aloud data.

As I discussed in Chapter 3, a key analytical tool with which I approached the read-aloud data was the discourse analysis developed by Gee (1999). In repeated analytical readings of the response data, I asked the questions listed in the table in Appendix C. Eventually I identified two building tasks of language within the read-aloud data: activity building and connection building. These two broad categories integrate both the function and content of talk during the read-aloud sessions.
Activity building refers to the use of language clues or cues in a specific time and place to make meaning of the activity at hand. To “make meaning” of an activity is to socially construct the particular situation, or carry out the activity, in a manner that is important and understandable to the people involved. Additionally, activity building entails making meaning of the specific verbal and nonverbal actions of the participants that make up the activity (Gee, 1999). In this chapter, I will discuss activity building in terms of how this community of learners constructed the activity of reading aloud nonfiction books. In the next chapter, I will relate the concept of activity building to the broader context of engaging in scientific discourse.

The second major category of response indicated by the read-aloud data is connection building. This building task involves the use of language cues or clues to link past, present, and future related ideas. Connection building involves understanding how specific words or actions used in a current time and place reflect past interactions, influence future interactions, and connect the present words and actions to their past and future. In this chapter, I will describe how the task of connection building linked the nonfiction book, the literature responses, and the context of the read-aloud to past, present, and future texts and experiences associated with the particular community of learners.

The Nature of the Children’s Responses: Response Types

Within the two broad response categories of activity building and connection building, I identified more specific response types to use in organizing talk and in portraying the nature of the children’s response to the nonfiction books. Figures 23 and 24 include the six activity building and four connection building response types, along with samples and
descriptions of the content and function of each category. The samples represent typical instances of each response type across the 16 interactive read-aloud sessions. The reference in the parentheses after each language sample indicates the read-aloud session during which the talk occurred; Appendix F provides further information about the sessions. In the subsections that follow Figures 23 and 24, I will describe the categories in more detail.
<table>
<thead>
<tr>
<th>Activity Building Responses</th>
<th>Description of Response Type: Content and Function</th>
<th>Response Type Samples From Students’ Talk</th>
</tr>
</thead>
</table>
| Informing                  | Content: a statement that retells information represented in words or pictures in the book, tells additional related information, or answers a question posed during the read-aloud session  
Function: stating “facts” or “known truths” | -Judy: And sometimes it could be cloudy, but you KNOW the sun’s behind the clouds. (R-A 8)  
-Kurt: Um, crocodiles don’t like stand there then protect their eggs. They go underwater and HIDE. THAT’S how they protect their eggs. (R-A 9)  
-Carla: No, they’re not ducks. They’re OWLS. (R-A 7) |
| Questioning                | Content: an explicit or implied question or argument  
Function: asking about information represented verbally or visually during the session or questioning/arguing against such information | -David: What’s that little bucket thing? (R-A 11)  
-Lawrence: What’s a ‘possum? (R-A 13)  
-Rachel: Then why does alligators go in the zoo? (R-A 3) |
| Playing                    | Content: singing, rhythmic, silly or repetitive words and/or nonverbal behaviors  
Function: playing with or manipulating spoken words and sounds or ideas presented visually or verbally by the book or stated by others during the read-aloud session | -Lawrence: Today, shooky! (R-A 4)  
-Carla: Jumpin’ all the way down. (R-A 15)  
-Rachel: Your butt is made out of wood! (R-A 11) |
| Attention-focusing         | Content: a direct comment, exclamation, or gesture about a specific feature of the print or pictures in the book  
Function: pointing out to the teacher or student(s) that feature and eliciting their attention and/or response to it | -Reba: Look. (R-A 2)  
-Rachel: Did you notice, on the cover, there’s a question mark? (R-A 16)  
-Peter: A worm! (R-A 13) |
| Evidence-providing         | Content: statement reflecting one or more of a variety of sources of information (e.g. personal and shared experiences, fictional stories, information from the book itself, and spontaneous demonstrations or investigations)  
Function: supporting one’s own idea or an idea shared by the book or another participant during the session | -Sean: It can’t shine on me. See? I don’t have no shadow. See? (R-A 1)  
-John: ‘Cause herons have those kind of tracks. …I’ve seen a heron track before. (R-A 13)  
-Kurt: My sister SCREAMED when she was stung! (R-A 15) |
| Critiquing                 | Content: Verbal or nonverbal expressions of feelings about the book itself  
Function: Expressing own opinion | -Olivia: Can we read it again? (R-A 16)  
-Carla: I like the snow book. (R-A 5) |

Figure 23: Activity building responses.
<table>
<thead>
<tr>
<th>Connection Building Responses</th>
<th>Description of Response Type: Content and Function</th>
<th>Response Type Samples From Students’ Talk</th>
</tr>
</thead>
</table>
| **Linking to personal experience** | Content: personal narratives of prior or ongoing experiences outside of the read-aloud session and usually outside of the school setting  
Function: making or extending meaning of the current text or context by linking to what is known | -Peter: One time when I got my teddy bear…and there was a light for my bed…and I started to wrestle him and I saw his shadow! (R-A 1)  
-Frances: At my house, I have a tree, and it has flow...white flowers on it, and every day I see petals on the driveway. (R-A 9)  
-David: I’m gonna play in the snow when I get home. (R-A 5) |
| **Linking to shared experience** | Content: experience(s) shared at school by all or most members of this community of learners (e.g. hands-on activities, units of study, field trips, and classroom routines)  
Function: making or extending meaning of the current text or context by linking to what is known | -Sean: I was raisin’ my hand on THAT page ’cause we sawed that red bird before on that bi...at the park….It said, “BIR-dy, BIR-dy.” (R-A 12)  
-John: Like we just got done with winter, but we’re having a little bit more. (R-A 4)  
-Judy: I’m going to try it [moving an object in relation to a light source] on the screen. (R-A 2) |
| **Linking to fiction** | Content: a “made-up” book, story, song, or movie experienced in or out of school  
Function: drawing a comparison between the words or pictures represented by the read-aloud nonfiction book and the fictional material | -Sean: Finding Nemo! (R-A 15)  
-Carla: Wow! What a wonderful world! (R-A 3)  
-Peter: …Like in The Duck and the Chick. When the eggs hatch, then, then the chick is gonna swim in the water. (R-A 9) |
| **Linking to nonfiction** | Content: a published nonfiction book, a class-produced nonfiction writing project, or an instructional video experienced in or out of school  
Function: drawing a comparison between the words or pictures represented by the read-aloud nonfiction book and the other nonfiction material | -Reba: Didn’t we...see this before?...On that one book, we seen this page. (R-A 1)  
-Lawrence: Look at the coyote. Now look at it. |

Figure 24: Connection building responses.
Informing responses.

Figure 23 lists three samples of talk that students used to provide information during the read-aloud sessions. Responses in this category contributed to building the activity of our interactive read-aloud sessions by restating information in students’ own language or by adding other relevant ideas to the reading experience. In my analysis of the students’ talk, I coded language that fits the description of this response type, as listed in the table above, whether or not the information provided was completely accurate; my concern in this discourse analysis was with the function of the language from the perspective of the speaker.

The first language sample for the informing response occurred during our second reading of *Spring*, one of a set of four season photographic essays by Ron Hirschi and Thomas D. Mangelsen. This reading of *Spring* took place toward the end of our morning kindergarten class on an early spring day. The weather was sunny at the time of our read-aloud session, after starting out very cloudy. Part of our plan for the day included spending the last few minutes before dismissal outdoors on the playground in the sunshine.

The discussion preceding Judy’s informing response had focused on the bright yellow color of the endpapers. During the first reading of *Spring*, Judy had connected the color of the endpapers to springtime sunny weather. During this second read-aloud, we reviewed this connection and the idea that, in reality, we experience sunny as well as other weather conditions in the spring. Judy’s statement, an informative assurance that “the sun’s behind the clouds”, suggests an awareness of the change in weather we were fortunately experiencing on that morning. This informing response also evokes an image
featured in a previously shared nonfiction book. One of the illustrations in *What Makes a Shadow?* is of a cloudy sky over a neighborhood with the sun above the clouds. The text and the students had identified the illustration as a “cloudy day”. During the reading of *Spring*, Judy’s response to the endpapers provided additional information relevant to appreciating the nonfiction book at hand and to recognizing the current weather conditions.

The language sample that features Kurt’s comment about how crocodiles protect their eggs also brought additional “outside” information to a read-aloud session. The session involved the first reading of *Changing Seasons* by Henry Pluckrose. A photograph of nesting trumpeter swans near the water, along with a student’s comment about a fictional big book titled *The Chick and the Duckling*, led to a brief discussion of animals and their eggs. During this discussion, I addressed a student’s question about alligators and how they protect their eggs. This discussion was the context for Kurt’s informing response, when he emphatically spoke and gestured to indicate that “crocodiles don’t like just stand there….” Moments after first sharing his knowledge about crocodiles, Kurt extended this informing response by telling us in a very animated tone that “…if something comes to eat their eggs…if the crocodile catches it, it’s its dinner or lunch!”

The third language sample representing the informing response category is from the read-aloud session during which I first introduced the book *Spring*. For approximately 13 minutes before this read-aloud, I had reread *Winter* to the students, and much of the discussion during the reading of *Spring* focused on what the children noticed about the now slightly more familiar Montana animal life. As I turned to the page featuring a photograph of the owls that Carla mentioned in this informing response, several students
continued to talk about geese and swans from the previous page. During this talk, a classmate sitting behind Carla whispered, “I see them ducks.” This statement prompted Carla to lean back, turn her head toward him, and speak directly to him. She used her informing response to reinterpret the photograph for this classmate and to retell information from our previous reading and discussion of Winter, which also featured an owl.

Carla’s response represents a function that differs from the way in which the first two language samples contributed to the building of our classroom read-aloud activity. Carla’s informing response contributed to the read-aloud activity by correcting information put forth privately by another student. Judy and Kurt used language in a manner more typical of this type of response within this community of learners; they presented their ideas as “information to the public”, knowledge for all to use in making meaning of the science-related nonfiction book and the ideas it presented or inspired within the community.

Questioning responses.

The questioning response category represents talk that was used to seek more information or to question information that had already been provided. The three language samples listed in Figure 23 suggest that typical questioning responses within this community of learners focused on (a) specific details in illustrations or print and (b) words or phrases that the students had isolated from what they heard in the discussion or heard as read-aloud words of the book.

The first questioning response sample is from the first reading of Be a Friend to Trees. David asked his direct question in order to identify an object in the illustration. The
“little bucket thing” is a sap container hanging on a sugar maple in the foreground of the double-page illustration. The colorful picture shows people engaged in familiar activities among various small animals and trees common to our area. The bucket is a less common feature that captured David’s attention after I had read aloud the text, which makes no mention of the bucket. I responded by identifying the sugar maple tree. Several students and I then collaborated to identify the object and its purpose. Also, another student reminded us of a story he had told earlier in the session about seeing a sugar maple tree at his sitter’s house. Therefore, what seemed to be a “simple question” was, in this case, a catalyst for the socially interactive construction of an answer as well as a connection to a student’s real-life experience.

Whereas a visual feature of the book prompted David’s question, a particular spoken word elicited the second questioning response sample. Lawrence asked his question during the first read-aloud session with the book Animal Tracks by Arthur Dorros. This session lasted almost 30 minutes because of the amount of talk invited by the guessing format of the book and the appealing topic. The discussion began with the cover and continued with the endpapers, which show actual-size illustrations of tracks drawn and colored with shades of brown on a tan background. I began pointing to each set of tracks and reading the labels. As I read, Lawrence isolated one of the words he heard me say—opossum—and sought more information about it. Lawrence’s question, like David’s “what is...” question in the previous example, indicates that a typical function of the questioning response in this community of learners was to help students identify unfamiliar objects and to understand unfamiliar words.
Another typical function of the questioning response was to seek clarification of or to express disagreement with a statement from our discussion or the read-aloud text. Figure 23 includes a sample of such a questioning response. During the first reading of What’s the Weather Today?, several students and I had a brief conversation about warm climates and alligators. This conversation began when Sean asked if there were alligators in a pool of murky water in a photograph of a tropical location. As other students contributed comments about warm weather and Florida, Sean restated his question as an affirmative exclamation. I responded that alligators could be in the water in such a climate, where, as the text said, it snows “hardly ever” (p. 17).

As the discussion continued, Rachel asked her question: “Then why does alligators go in the zoo?” Her use of “Then why…” suggests that she noticed a contrast between the current discussion and her experience of visiting the zoo; she had seen alligators locally where it does snow more than “hardly ever.” The discussion then focused briefly on the work of zookeepers and caring for animals outside their natural habitats before we continued our reading of the book.

**Playing responses.**

The three language samples for the playing response category listed in Figure 23 further illustrate the varied ways in which students used language to construct the activity of the read-aloud. The generally playful purpose of this response type was a factor in the development of our nonfiction read-aloud sessions, which became periods of social interaction with and about books during which different ways of thinking and doing were generally “welcomed into the mix.”
The first language sample for the playing response is from our second read-aloud session with the book *What’s the Weather Today?* by Allan Fowler. The reading took place during our daily class meeting and opening activities in mid-March. When Lawrence made his humorous rhyme, another student had commented that the cold but sunny weather featured on one page of the book was “Just like today!” As I briefly agreed with that student by restating his comment, Lawrence quickly shook his head, rocked back slightly, and quietly exclaimed, “Today, shookay!” Then Lawrence was quiet, and the discussion of the connection between the day’s weather and the information in the book continued. Lawrence’s playing response was a brief manipulation of a single word and a play-oriented verbal insertion within an ongoing instruction-oriented conversation.

The second sample of the playing response also demonstrates how children played with the words spoken by others. Carla contributed this playing response during our first reading of *What Do You Do When Something Wants to Eat You?* by Steve Jenkins. On the right-hand pages throughout this book, Jenkins uses brief text ending in an ellipsis and detailed illustrations to introduce an animal and one of its predators. With each page turn, the defensive mechanism or maneuver is revealed. Throughout the reading of this book, I had been inviting predictions about what the prey would do, and with the page turn, children had immediately been confirming or altering these predictions using the vivid illustration.

When Carla made her playful comment in a rhythmic, singing style, I had just invited children to predict the actions of the gliding frog, pictured hanging onto the tip of a small tree branch with a large snake positioned to attack. One of the students answered,
“Hopping.” Another predicted that the frog was “Goin’ up a tree. Jumpin’ ALL the way up!” Carla playfully manipulated this informing response to create the short descending-line tune “Jumpin’ all the way down.” I then turned the page to reveal the frog’s escape, and the interactive read-aloud continued.

The third language sample of the playing response category on Figure 23 is an excerpt from an ongoing informative list of student ideas presented as I read aloud *Be a Friend to Trees*. During the first reading of this book, Rachel initiated a brief exploration of classroom objects surrounding our carpeted meeting area to identify what was and was not made out of wood. This spontaneous exploration had been prompted by a page in the book that discusses paper and other wood products. Rachel’s “made of wood” litany at first included a clipboard, the easel, and a stool.

As several other students continued to identify additional wooden items, Rachel stated matter-of-factly that “…your skin is made of wood.” Rachel, the aide, and I laughed, and another student and I playfully disagreed with Rachel. Next, Rachel stated that people’s pants and heads are made of wood. I mentioned Pinocchio in response to Rachel’s wooden head comment, and several children laughed and said, “Noooooo” to her idea. A few students continued the “serious” search for wooden objects, and Kurt raised his hand to share an idea about the importance of trees to our classroom. Among these more information-oriented actions, Rachel quietly contributed her next playing response, “Your butt is made out of wood!” This captured the attention of most of the students as well as my quiet response that it was time to move on. At the same time, a student found another object that was really made of wood, and, after a brief pause, we did refocus and continue our reading.
The brief social impact of Rachel’s playing response was perhaps mostly due to her public use of the word *butt*. However, another factor could also be that she was playing with *ideas*, rather than quickly manipulating the sound of a word or phrase. Rachel began mixing real and playful information by adding obviously nonsense items to her ongoing list of wood products, which had originated with the information in the words and illustrations of our nonfiction book.

**Attention-focusing responses.**

Attention-focusing responses were used throughout the read-aloud sessions to explicitly point out certain visual features of the book. These specific features at times became the focus of further verbal response, which was usually brief. The positioning of the camera and the quality of the videotapes during data collection did not allow me to re-examine if students looked at the object of the attention-focusing response. In the day-to-day activity of classroom interactions, however, students do usually at least look at something another is pointing out to them. The three language samples that I will discuss below represent typical instances of the attention-focusing category described in Figure 23.

The first language sample in this category involves Reba’s discovery of one of our high-frequency words (familiar and frequently used words) within the print on a page. She pointed out this discovery toward the end of our second reading of *What Makes a Shadow?* in early March. After I had read aloud the text, another student made several comments about the picture as Reba raised her hand and waited. Then she pointed and read, “Look.” She also pointed to and read aloud the word *you*. Reba’s response
prompted another student to then stand up and say that she also noticed “over and over words.” After this brief focus on these specific print features, we discussed the final page of the book.

The second sample for the attention-focusing response category also represents an instance in which a student used her talk to draw attention to a specific print feature. This sample is from our second read-aloud session with the book *What Do You Do When Something Wants to Eat You?* in late May. This revisiting of the book was more of a guided discussion during which I reread or paraphrased parts of the text as the children and I looked at the illustrations. At one point, I turned the open pages of the book back toward myself as I waited for several children to refocus their attention. During this brief pause, Rachel approached the book, pointed to the cover as it faced the class, and asked me, “Did you notice…there’s a question mark?” This attention-focusing response evoked an idea that had become part of our ongoing classroom reading and writing work: the role of question marks in prompting careful thought. In fact, Sean once referred to the one on the cover of *What Makes a Shadow?* as a “thinking mark” which indicated that the book is “a thinkin’ mark book, so it’s gonna be tricky…” (R-A 1). After Rachel pointed out the question mark on the cover of the current read-aloud, I answered her then continued revisiting the book with the class.

The first two samples of this response category represent student talk that was used to focus attention on print. Pictures also typically elicited such response. Peter’s exclamation, “A worm! That’s a worm!” was part of the same conversation during
which Lawrence had asked his brief question about the opossum. As I previously described the first read-aloud session with *Animal Tracks*, I had begun to point to the illustrations of animal tracks and read the labels on the endpapers.

After identifying several, I began to ask the students what type of animal they thought would make each track. Peter’s attention-focusing response occurred during this teacher-guided questioning. Out of its context, the content of this language sample resembles an informing response. However, I recognized Peter’s exclamation as attention-focusing because Peter contributed this response after the discussion of the animal tracks on the endpapers had moved beyond the one to which he was referring. Moments earlier, other students had individually and chorally suggested that a snake, snail, or a worm would produce the curvy single-line track drawn on the page, but I had not confirmed any of the ideas by reading the label. The function of Peter’s response was to redirect our attention to the picture of the long narrow track. In fact, Peter’s attention-focusing response did prompt me to provide more information. Immediately after I identified the type of track we were currently discussing, I pointed back to the other track and said, “And this was a worm track.”

Evidence-providing responses.

The three language samples representing the category of evidence-providing illustrate the range of speaking styles and sources of information that students used to support an idea. One of the purposes of these responses in the task of activity building was to establish tacit guidelines for interacting with and about the science-related nonfiction books. Whereas the playing response category suggests a lighthearted attitude toward the
activity of the read-aloud, the students’ use of evidence-providing responses indicates that there were certain standards of behavior involved with our reading and discussions of nonfiction.

The first language sample for this category is from the first read-aloud session with *What Makes a Shadow?* in early March. Earlier in the morning, the children and I had used the overhead projector and a variety of classroom objects to determine “what makes a shadow”. On the previous day, the students had explored with their own flashlights, small objects, and various surfaces. Additionally, I had previously read aloud two other nonfiction books about shadows.

Sean’s statement listed in Figure 23 accompanied his spontaneous demonstration that at the moment he was not casting a shadow on our floor. The context of this response indicates that its function was to provide evidence about the relationship of the sun to the shadows illustrated on a double-page spread at the beginning of the book. When I had first turned to these pages, Sean had pointed out the sun in the upper right corner and stated that it “makes the shadow.” Immediately after I read the brief text, Sean held out his hands and arms, and while looking down toward them, stated, “It can’t shine on me. See? I don’t have no shadow. See?” Here Sean was supporting the idea that the sun “makes the shadow”, as indicated by the illustration to which he had responded moments earlier.

In the second sample of language used to provide evidence during a read-aloud session, John supported his own idea during the first reading of the book *Animal Tracks*. The format of this book invites readers to predict the identities of various animals by using clues provided by the text and illustrations. Toward the end of the book, I pointed
to an illustration of some tall grass along the edge of a pond and asked about an animal the children would expect to see there. I also showed the students some animal tracks in the mud surrounding the grass. Several students shared ideas: mouse, duck, robin, chipmunk, snake. After I turned the page, pointed to a Great Blue Heron in the illustration, and stated its name, John, who had not shared his guess aloud, exclaimed “I KNEW it was a bird!” He then continued to explain how he knew: “‘Cause herons have those kind of tracks….I’ve seen a heron track before.” With this pair of statements, John provided evidence in two steps. First he supported the idea that the tracks illustrated on the page belonged to a bird; then John supported his statement about the tracks by using a personal prior experience.

The third language sample for this response category also makes use of such an experience. Because of their content, these two responses—John’s “I’ve seen a heron track before” and Kurt’s “My sister SCREAMED when she was stung”—are similar to personal experience connection-building responses. However, I have identified them as evidence-providing responses because of the way that John and Kurt used these words to support information within the context of a read-aloud.

Kurt’s language sample for the evidence-providing category is from our first reading of *What Do You Do When Something Wants to Eat You?* in late May. This book features a format similar to that of *Animal Tracks*, and the children and I interacted with and about the book in the same way—using verbal and visual cues to make a prediction and confirming or altering ideas about the book when we had more information. Kurt contributed the response about his sister’s scream after the class had discussed information about the hover fly and its defense of “mimicking the appearance of a wasp”
While the enlarged illustration of the hover fly was still visible on the left page of the open book, several students had turned their attention to the snake and frog on the right page, and the talk of the group began to focus on the snake. However, one student asked what a wasp is and drew some attention back to the wasp-like hover fly. Kurt and another student joined me in answering him. According to Kurt, “A wasp stings badder than a HORnet!” He went on to support this assertion with the evidence of his sister’s scream.

**Critiquing responses.**

The critiquing response occurred rarely during the 16 interactive read-aloud sessions. When students did offer critiques, the statements were typically brief and prompted little or no additional conversation. Sometimes such statements referred to a single page or part of the book, but critiquing responses generally referred to “the book”. For example, Olivia’s positive appraisal of *What Do You When Something Wants to Eat You?* was a request to reread the whole book after I had invited students to recall some of the information from our first reading. Carla’s critique of another book was a brief comment that she made as I introduced the collection of the four photographic essays before we began our read-aloud session with *Winter*, the “snow book” to which Carla had referred.

In the previous six subsections, I described typical instances of the different types of activity building responses featured in Figure 23. The following four subsections refer to Figure 24 and are descriptions of typical events involving the different types of connection building responses.
Linking to personal experience.

Three language samples listed in Figure 24 represent typical instances of the connection building response of linking to personal experience. In this community of learners, students used this response type during the read-aloud sessions to make meaning of the book and to extend the meaning of the words and pictures to the “real world” beyond the book. Personal experience responses were generally longer than other response types, often consisting of two or more sentences that were expressed in a single speaking turn or that were stated in a stop-and-start manner among others’ responses or interruptions. The narrative structure of these responses was typically a complete story. At times, however, a child’s personal narrative was incomplete due to the brevity of the comment (e.g. a one-sentence connection to the child’s personal experience) or the nature of the social setting (e.g. multiple voices speaking together or verbal interruptions).

The first language sample for this response type is a story that Peter told during our first reading of *What Makes a Shadow?* As I have discussed, this session took place during an ongoing classroom focus on shadows which had already included hands-on explorations with light sources, surfaces, and objects. Peter’s sharing of this story occurred as I held up the book so that the cover was visible to the children seated on the carpet. After I had introduced the book and while the children and I discussed ideas about shadows, Peter approached the book from the back of the group and sat in the front before telling his story: “One time when I got my teddy bear, and, and there was a light for my bed - - - there was a light for my bed, and, and I started to wrestle, and I saw his shadow!” The three short lines between *bed* and *there* indicate that Peter was interrupted but continued telling his story.
In the immediate setting of the read-aloud session, Peter’s story was apparently inspired by the cover illustration in which one of the children is holding a teddy bear. Moments earlier, another student had pointed out the shadow of the teddy bear on the wall behind the children in the picture. Further, Peter’s inclusion of the detail of the necessary light suggests that his story also served the purpose of connecting our read-aloud to the prior hands-on experiences and discussions of light and shadows. This instance of linking to personal experience, thus, contributed to the read-aloud event a child’s at-home observation of a real shadow and his knowledge of the role of light in forming that shadow.

The second sample for this category involves another personal narrative that linked a read-aloud session to a child’s observations at home. This event occurred during our first reading of *Changing Seasons* during our daily class meeting in the early spring. My purpose in choosing this book, which features vivid photographs and brief text about seasonal changes, involved its relevance to our work in the school nature lab throughout the year. One of our ongoing activities involved monthly observations of a Sweet Gum tree and group-created artistic/scientific representations of the tree as it changed throughout the seasons. Frances’ story suggests her use of careful observation and description skills at home, too.

Frances’ descriptive statement indicates a link between a real-world object and a visual feature of the book, and it expresses an understanding of the idea of spring changes. When I turned to a full-page photo of colorful flower gardens on the left side and a close-up full-page photo of a tree branch with pink and white blossoms on the right side, several students commented on the gardens and flowers. At that time, Frances also
quietly raised her hand. I read the text then turned to the next pages, which pictured animals. These photographs prompted much discussion, during which Frances sat with her hand still raised.

When I invited Frances to speak, she was interrupted by another student at first, but she then contributed her connecting response in a single speaking turn: “…I have a tree, and it has flow..white flowers on it…” As she spoke, Frances interrupted herself once to make her description more precise and perhaps to more directly indicate a link to the white blossoms in the photograph. Her mention of seeing petals “every day…on the driveway” indicates her awareness of the changes in the tree during this season—another idea that links this personal experience to our classroom through the read-aloud session.

The third language sample representing the personal experience response category, like the two I have discussed, indicates a link between the read-aloud and a child’s life outside of school. In its subject matter, this final sample is similar to Peter’s bear shadow comment; both relate to playing. David’s response, however, suggests a linking forward to an activity that he planned to do.

David contributed his statement about playing in the snow during our first reading of the photographic essay Winter a few days before the beginning of spring and one day after school had been closed for a snow day. The title page of Winter is a double-page photograph of snow-covered rolling hills. Tall evergreens with deep pockets of snow on their branches, bare grayish deciduous trees, and a small herd of mule deer are spread across the hillside picture. As I presented the title page to the class, David sat up on his knees in the back of the group, where he could see the large classroom window as well as the book. Upon seeing the title page, he immediately connected the two snowy scenes by
stating excitedly, “I see snow on the tree, like that!” Shortly afterwards, he quietly said
“I’m gonna play in the snow when I get home.” David, thus, created a link between the
current nonfiction book and the actual weather conditions in our particular time and place
and then to his personal plans for later in the day.

Linking to shared experience.

Students used language that linked the read-aloud to shared experiences for the same
purposes that they used the linking to personal experiences—to connect the words and
pictures of a nonfiction book to what students knew or had experienced already. The
primary difference between the personal and shared experience categories is that the
shared experience occurred at school and involved all or most of the members of the
community of learners. It seems that because of this “shared” aspect of the latter
category, fewer of these responses were narrative in nature than the personal experience
responses. Perhaps the task of building connections to events that were from their
family- or home-related experiences outside of school required more contextual
information, leading children to construct personal narratives to express these
connections. Indeed, many of the responses in the shared experience category imply
awareness that the listeners were already familiar with the context of the reference
experience. The three language samples listed for this category in Figure 24 demonstrate
this characteristic.

The first sample is from our second reading of Be a Friend to Trees on the day after a
field trip to a local park. Sean contributed this lively response late in the session just after
I had turned to a page on which two small generically-illustrated birds are pictured below
the text on the left side of the book. One of the birds is red and one is yellow. When he
saw this page, Sean said, “…we sawed that red bird before…at the park….It said ‘BIRD-die, BIR-die’.” Sean’s comment about the red bird recalled an event from our field trip the day before when the naturalist had pointed out a male Northern Cardinal and demonstrated one of its songs. I was the only one to respond verbally to Sean’s comment. The conversation then began to focus on other students’ responses to a few details in the illustrations.

Whereas Sean’s shared experience response did include minimal contextualizing information for the listeners (“at the park”), John’s response indicates more reliance on the idea that the listeners already shared much of the necessary information. John, his classmates, and I were all in the same place at the same time of year—“having a little bit more” winter weather. Therefore, John’s meaning about a connection between the current season and the text he had just heard read aloud was evident. This text was a page in the book *What’s the Weather Today?* John provided his link to shared experience during our second reading of this nonfiction book. The text on the page which elicited John’s response in this event mentions the relationship between types of weather during different seasons. John expanded this idea to the real-life shared experience of our current cold winter weather.

Sean’s shared experience response linked the read-aloud to a past event, and John’s linked to an ongoing event. Judy’s language sample listed in Figure 24 connected the reading aloud of *What Makes a Shadow?* to a past as well as a future event. During the discussion preceding our second reading of this book, I showed the children two small green squares and invited them to predict what would happen if we placed the two tiles on our overhead projector; one of the math materials was opaque and one transparent.
We had used the projector to investigate shadows with various other objects on the day before this session. After a brief discussion, I mentioned the science work time that would follow the read-aloud and told the children that they could try the two tiles then. (Several did use the tiles in their investigations.) Later, as we read and discussed a double-page spread that shows children investigating shadows with a light source, a surface, and objects (their hands), Judy contributed her linking response amid other students’ comments about investigating hand shadows: “I’m going to try it on the screen.”

**Linking to fiction.**

The language samples that represent the category of linking to fiction demonstrate the various types of other materials that provided the content for such responses to nonfiction. One sample links to a popular children’s movie, which most of the students had seen on video or at the theater; another indicates a connection to a favorite classroom book and song; and a third sample is a link to a published storybook that a child recalled from another setting.

Sean’s exclamation, the first fiction connection listed in Figure 24, occurred during our first reading of *What Do You Do When Something Wants to Eat You?* Within this community of learners, linking to fiction was often based on the visual similarities between book illustrations and the fictional materials. Sean’s response to a picture in the book provides an example of such linking. Sean contributed his comment about the movie “Finding Nemo” immediately after I had turned the page to reveal the “answer” about the defensive maneuver of the animal from the previous page. A few students, including Sean, commented briefly on this “playing dead” illustration of the hog-nosed
snake. I was summarizing their comments when Sean said quietly, in an animated whisper, “Finding Nemo!” The page facing the hog-nosed snake illustration shows a clown fish swimming from a predator. Sean’s comment prompted multiple others to talk further about “Nemo” and to identify the clown fish in the picture.

The second language sample of linking to fiction was also prompted by a picture in a nonfiction book. Carla contributed her “wonderful world” comment during the first read-aloud session with *What’s the Weather Today?* She did so immediately after I had turned the page to reveal print on the left side and a photograph and print on the right side. The photograph shows weather forecaster Willard Scott smiling brightly and standing in front of a large map of the United States. The map is speckled with white fluffy “clouds” and is surrounded by a bright blue background. The face of a smiling sunshine is “peeking” out from behind the large colorful umbrella that Scott is holding. This weather map differs from the images that the young students would typically have seen on television.

Carla’s response to this picture evoked Ashley Bryan’s fanciful illustrations of white clouds, a bright blue sky, a sun with bright orange and yellow rays, big smiles on people’s faces, and colorful backgrounds in the book *What a Wonderful World*. One of our classroom traditions was to sing along with a recording of Louis Armstrong during our morning opening activities as I held up the illustrated book. After Carla’s linking to fiction response, I smiled at her and said “What a wonderful world!”; Ronnie exclaimed, “Just like our song!”; and Rachel asked, “Is this a made up story?” These students’ comments indicate that they, too, had understood Carla’s response to be a reference to a familiar “fictional” text.
The third sample for this category listed in Figure 24 is similar to the previous two samples in its apparent visual prompting. In this case, the visual features of the nonfiction book prompted Peter to build a connection to a storybook that I had previously read to the class. Peter contributed his connecting response shortly after I had turned to two pages featuring birds and their offspring in the book *Changing Seasons*. The left-side photograph shows a pair of swans at the edge of water near their nest of eggs surrounded by reeds. The photograph on the right-hand side is of a parent bird standing on the edge of its nest among branches of a thorny bush. The bird is holding a worm or grub above the open beaks of two of its nest full of chicks. After reading the accompanying text on these pages, I held the book open to them as another student continued to ask some questions about the frog eggs on the previous page.

During this time, Sean made a brief comment about birds eating worms, and he later approached the book and pointed to the swans. Shortly afterwards, Peter approached the book, still opened to the bird photographs, and provided his verbal link to the “Duck and the Chick” story. In *The Chick and the Duckling*, after they hatch, both young birds eventually do go swimming. Peter’s link to the story seems to compare the subjects of the photographs (soon-to-be-hatched birds) in the nonfiction book to the bird characters in the story. Furthermore, his linking response connects the activities of the fictional characters to the action Peter was predicting for the offspring of the real swans featured in the photograph: “…the chick is gonna swim in the water.”

This predicting quality of Peter’s response suggests a use of fiction that was less characteristic of the read-aloud sessions than the other picture-prompted responses.
represented by the first two language samples in this category. Following Peter’s
collection building response, Sean linked Peter’s idea back to his own earlier comments,
and I linked Peter’s idea back to the nonfiction book at hand by referring to the swans
and that they actually do swim. The session then continued with the egg-protection and
reptile conversation that I described previously.

**Linking to nonfiction.**

The three samples for the response category of linking to nonfiction in Figure 24
represent typical ways that students used language to draw comparisons between the
read-aloud book and other nonfiction materials. Although the description of this category
allows for reference to nonfiction from other settings, all such responses in the recorded
data were related to nonfiction that we had shared in the classroom. In this way, the
category of linking to nonfiction is similar to the function of linking to shared experience.
The content of linking to nonfiction responses was rooted in experiences with the words
and pictures of specific works; thus this category also is similar to the linking to fiction
category. In this subsection, I will describe the contexts for the language samples of links
to nonfiction.

The first language sample representing this category is from the first read-aloud
session with *What Makes a Shadow?* As I mentioned previously, this session took place
amid various ongoing activities focusing on shadows, including the earlier reading aloud
of two other nonfiction books. Reba contributed her linking response after I had turned
to a double-page illustration of children conducting an indoor investigation with the wall,
the hand of one of the children, and a lamp. Reba began to speak as I read the
accompanying words, but waited until I finished the text to begin her response to the
Illustration: “Didn’t we see this before?” Comments from others interrupted her response. When I invited her to finish, Reba approached the book and pointed to the illustration of a boy holding his hand in front of the lamp. She said, “On that one book, we seen this page.” Reba was referring to a book that we had read on the previous day. It was titled *Shadows Here, There, and Everywhere*, and one of the black and white photographs used to illustrate information about shadows and how they are made closely resembles the depiction of the children’s investigation in *What Makes a Shadow?*

Lawrence’s statement for this category in Figure 24 also was a response to a visual feature of the nonfiction book being read-aloud. Lawrence contributed this response during our first session with the book *Spring*. We began this session immediately after revisiting the related book *Winter*. When I turned to the page with a large photograph of a coyote in *Spring*, Lawrence gradually crawled closer to the book and started to verbally seek my attention by saying my name. I continued to present the page to the class by pointing out the coyote and reading the text, which briefly describes the coyote’s shedding. As I read, I stressed the words *Now* and *shed* in order to emphasize the change in the coat of the coyote; I did not directly point out the comparison to the previous season, however. Amid other students’ comments, Lawrence stood and walked to the easel at the front of the carpeted area. As he said “Look at the coyote,” he held up *Winter*, the cover of which features a large photo of a coyote with its thick winter fur. Then Lawrence pointed to the photo in the *Spring* book in my hand and said, “Now look at it.” Lawrence used this response to make explicit the connection between the two books that I had implied during this read-aloud and during the preceding conversations about visual similarities and differences across the set of season books.
Summary.

The preceding descriptive vignettes illustrate typical events during the 16 read-aloud sessions from early March to late May 2004. The purpose of organizing the book-related talk into the six activity building and four connection building categories was to create a picture of the overall social and intermingling nature of the children’s responses to the selected nonfiction books. My intention was to create this picture through the language the children used during particular times and in the particular space of our classroom.

The specific setting of the classroom nonfiction read-aloud sessions was situated within the broader context of the unique community of learners that my students and I had developed over time, as illustrated in my presentation of findings related to Question 1 earlier in this chapter.

Figure 25 is another representation of the 10 response categories. This table lists the response types in order by the number of text units coded to each category across the body of read-aloud data.
<table>
<thead>
<tr>
<th>Response Type</th>
<th>Number of Read-aloud Sessions</th>
<th>Number of Text Units Coded Across Transcripts of the 16 Read-aloud Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informing</td>
<td>16</td>
<td>710</td>
</tr>
<tr>
<td>Linking to personal experience</td>
<td>15</td>
<td>250</td>
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<tr>
<td>Questioning</td>
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<td>196</td>
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<td>Playing</td>
<td>16</td>
<td>161</td>
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<tr>
<td>Attention-focusing</td>
<td>16</td>
<td>142</td>
</tr>
<tr>
<td>Evidence-providing</td>
<td>14</td>
<td>134</td>
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<tr>
<td>Linking to shared experience</td>
<td>11</td>
<td>85</td>
</tr>
<tr>
<td>Linking to fiction</td>
<td>14</td>
<td>84</td>
</tr>
<tr>
<td>Linking to nonfiction</td>
<td>6</td>
<td>47</td>
</tr>
<tr>
<td>Critiquing</td>
<td>8</td>
<td>17</td>
</tr>
</tbody>
</table>

Figure 25: Nature of children’s response to the selected nonfiction books within the kindergarten community of learners: A summary of numerical information from the read-aloud data.

The purpose of the numerical information listed in Figure 25 is to indicate the overall nature of the children’s response to the selected nonfiction during the three-month read-aloud data collection period. The number of text units coded to each response type represents the number of lines of transcribed book-related talk that correspond to each category across the complete set of elaborated field notes. The typical events described for each response type in the preceding subsections of this chapter illustrated general characteristics of that particular category of response.
Figure 25 provides a more global picture of these response types and indicates which types were more and less typical uses of language within the body of read-aloud data. The table suggests that language was used for a variety of purposes as my students and I interacted with and about science-related nonfiction books. This variety is somewhat reflected in findings from a related data collection context—the small-group nonfiction writing sessions that I described in Chapter 3. Because the purpose of the writing groups was to investigate the content and function of the students’ talk, I analyzed this talk using the broad response categories of activity building and connection building from the read-aloud data. However, because of the difference in the role of students between the read-aloud and the writing context, I did not use the 10 more specific response types. In the context of crafting the nonfiction group books, the children were in a role that required them to be more directly concerned with the words and pictures—the genre features—of the nonfiction works.

A summary of the data based on the students’ and my interactions during the writing sessions is included in Appendix G. As the language samples suggest, students did use language for similar purposes as during the read-aloud sessions, such as playing, asking questions, informing, and linking to prior experiences. In Chapter 5, I will discuss further findings and how they relate to the read-aloud data. The different ways that language was used during the read-aloud sessions—that is, the nature of response in this kindergarten setting—correspond to the ongoing “intermingling” characteristic of the wider community of learners. I will discuss this theme further also in Chapter 5.
As a review, Figure 26 illustrates the focus of analysis involved in Question 2. In the next section, I will further examine the nature of response in this setting by focusing on the unique contributions of three focal students.

Figure 26: Interpersonal aspects of the nonfiction read-aloud sessions (Rogoff, 2003).
Question 3: Observing and Analyzing Participatory Appropriation

The questions that I asked in investigating participatory appropriation within this community of learners were:

In what ways do individual members of the community of learners transform their participation in socially interactive learning activity involving science-related nonfiction books?

What is the content and function of the talk of an individual student (focal student) within these contexts?

These questions reflect the personal plane of analysis in Rogoff’s (1995, 2003) three-plane framework. Figure 27 indicates this focus of observation and analysis.

Figure 27: A focus on the personal plane in Rogoff’s (1995, 2003) three-plane framework.

The suitability of this sociocultural framework for classroom research is related to the three planes and how they allow for the foregrounding of one while maintaining the significance of the other planes. Furthermore, this framework reflects the multi-purpose interests and work of a teacher. These include the various areas of the official school
curriculum and the disciplines they represent; the social-cultural backgrounds of the children as well as of the teacher; the general institution of formal education; the particular school setting; and the shared classroom culture created through day-to-day interactions with one another, with materials, and with the curriculum.

The particular teaching interest reflected in the personal plane of analysis is individual student learning. The developmental process upon which observation and analysis are focused from this perspective is participatory appropriation (Rogoff, 1995, 2003). This process involves changes in the ways an individual participates in the culturally significant social activity of the particular community (in this study, the kindergarten community of learners) and how this participation reflects his or her appropriation of associated Discourses (Gee, 1999). Not only does the individual change in this process, but the community also develops in a particular way due to the participation of the unique individuals involved; that is, learners are transformed by their community and they transform it.

My thoughts about participatory appropriation changed throughout the course of repeated readings of the data represented especially in the read-aloud transcripts. I shifted from (a) examining the change in an individual’s words and actions between the beginning and end of the data collection period to (b) describing the individual’s response profile within the classroom activity of reading aloud and responding to the selected nonfiction books (Martinez & Roser, 2003). Perhaps this shift resulted from my primary interest in the interpersonal plane and the process of guided participation. As I stated in Chapter 3, the interpersonal perspective is the one most closely related to the purpose of this study.
The three focal students that I selected to further address this purpose contributed to the development of the read-aloud sessions as a culturally significant and socially interactive classroom activity. Also, they contributed to the linking of this activity to other relevant texts and experiences outside the immediate setting. Kurt’s, Carla’s, and Frances’ voices represent three distinct ways of interacting with and about science-related nonfiction. These individuals participated in varying amounts and through the use of different combinations of the 10 activity building and connection building response categories discussed earlier in this chapter. Their individual response profiles are represented by sets of tables (Figures 28 through 36) that summarize their uses of the 10 response types and that indicate the features that elicited these responses during the read-aloud sessions. (Because some text units required more than one code, the total number of “elicited by…” data and the data across the 10 categories are not equal for all read-aloud sessions.)

Samples of Kurt’s, Carla’s, and Frances’ words and actions were included in the class data in Figures 23 and 24. In the following sections, I will provide additional language samples that represent the class-wide response categories and that illustrate the particular response profiles of the individual focal students. These profiles are based upon my interpretation of the content and function of the children’s talk, according to the 10 response types, as well as upon my knowledge of the children as their teacher. Appendixes F and G contain more information about the read-aloud and small-group writing sessions that I reference.
Kurt

In my description of the research context and participants in Chapter 3, I stated that the elementary school in which this study was conducted had an Extended Day Kindergarten (EDK) Program. This program provided additional need-based instruction for students who had been identified through one-on-one testing and classroom observation. Kurt was one of the students enrolled in this program. He entered the program at the beginning of the year. At the mid-year evaluation, the EDK teacher and I decided to have him stay in the program for the second semester as well. Kurt’s primary academic need involved working with print as a reader and writer; for instance, he needed to further develop his letter identification and sound recognition skills. Kurt’s knowledge of the structure of books and of book language was an area of strength, according to the early literacy assessments. Also, his parents indicated that they read aloud daily with Kurt.

Kurt’s response profile for this research project is based upon my interpretation of the data listed in Figures 28, 29, and 30. These tables list information about Kurt’s response across the read-aloud data collection period. Kurt was present for all 16 sessions.
<table>
<thead>
<tr>
<th>Book Titles</th>
<th>Picture</th>
<th>Student Contribution</th>
<th>Teacher Contribution</th>
<th>Read-aloud Text</th>
<th>Print</th>
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Figure 28: Number of text units contributed by Kurt as elicited by text/context features across the 16 interactive nonfiction read-aloud sessions.
As Figure 28 indicates, Kurt contributed observable responses during 12 of the sessions. The category of teacher contribution was the most common feature of the read-aloud context to elicit Kurt’s response across the set of data. This differs from the class data presented earlier, in which pictures elicited more responses than each of the other categories. The category of print elicited no overt responses from Kurt. Print-elicited responses also occurred rarely in the class data.

During most of the read-aloud events, at least two of the graphic-verbal features of the read-aloud context elicited response from Kurt. Late in the data collection period, during the first readings of *Animal Tracks* and *What Do You Do When Something Wants To Eat You?*, four out of the five categories elicited Kurt’s response. Kurt’s contribution of 10 and 31 total text units during these sessions, respectively, was likely related to the guessing or predicting-confirming format of these books. These were also sessions during which Kurt used language for a variety of purposes within each session, as indicated by the data in Figure 29 and 30.
<table>
<thead>
<tr>
<th>Book Titles</th>
<th>Activity Building Response Type →</th>
<th>Informing</th>
<th>Questioning</th>
<th>Playing</th>
<th>Attention Focusing</th>
<th>Evidence Providing</th>
<th>Critiquing</th>
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<tr>
<td>What Makes a Shadow?</td>
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<td>What’s the Weather Today?</td>
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Figure 29: Number of text units representing Kurt’s use of the activity building responses across the 16 read-aloud sessions.
<table>
<thead>
<tr>
<th>Connection Building Response Type</th>
<th>Linking to Personal Experience</th>
<th>Linking to Shared Experience</th>
<th>Linking to Fiction</th>
<th>Linking to Nonfiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>What Makes a Shadow?</td>
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<tr>
<td>What’s the Weather Today?</td>
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<td>Winter</td>
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<td>Winter</td>
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<td>Spring</td>
<td>3</td>
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<td>Changing Seasons</td>
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<td>Be A Friend to Trees</td>
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<td>Be A Friend to Trees</td>
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<tr>
<td>Animal Tracks</td>
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<td>Animal Tracks</td>
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<tr>
<td>What Do You Do When Something Wants to Eat You?</td>
<td>3</td>
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<tr>
<td>TOTALS</td>
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<td><strong>1</strong></td>
<td><strong>1</strong></td>
<td><strong>1</strong></td>
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</tbody>
</table>

Figure 30: Number of text units representing Kurt’s use of the connection building responses across the 16 read-aloud sessions.
Figures 29 and 30 summarize Kurt’s use of the 10 different response types across the set of read-aloud data. He used the informing response much more frequently than the other response types. This was also the most commonly used response type in the class data. Kurt used language to provide information in 11 of the read-aloud sessions, from early in the data collection period.

After the informing response category, the linking to personal experience category was second most common in Kurt’s read-aloud data, although he only contributed such responses in five of the read-aloud sessions. Kurt did not provide any critiquing responses, and he rarely used his language to connect fiction, shared experience, and nonfiction to the current read-aloud text or context. In fact, according to the data in Figure 30, Kurt contributed links to shared experience or nonfiction late in the data collection period, with the first reading of *Animal Tracks* and the first reading of *What Do You Do When Something Wants to Eat You?*, respectively.

Kurt’s response style was generally paradigmatic in nature. His talk functioned primarily to provide information, as indicated by his use of the informing response. Further, his informing responses were typically rather substantive, providing information that may not have otherwise been available or apparent in the read-aloud session. The following list of language samples illustrate this characteristic of Kurt’s way of responding to the nonfiction books in this study:

1. And sometimes they can warn us about things like that HUGE fire they had to put out (R-A 3). [adding his thoughts to a brief discussion about the work of meteorologists, mentioned in the text and shown in a photo]
2. That’s why it’s in the DOG family (R-A 6). [providing additional information and further explaining a statement in which I had described a coyote by comparing it to a dog, as we discussed a photo in the book]

3. Um, they’re gonna make a nest in it (R-A 8). [with a tone of certainty, answering my question about a hole in a tree shown in a photo]

4. And if there weren’t trees there’d be no word wall (R-A 11). [continuing the serious investigation of wood products in our classroom and discussion of trees, amid laughter surrounding another student’s playing response]

5. It’s called a FLYING squirrel (R-A 15). [correcting another student’s terminology as she described an animal—a “gliding squirrel”—that was similar to the gliding frog featured in the book]

The fifth sample in this list suggests Kurt’s role in the co-construction of precision, an emergent concept that I will discuss in Chapter 5. Typically, when Kurt provided responses that were elicited by student contributions, he was correcting his classmates or extending their comments with more precise terminology. He also extended my contributions in this way on occasion.

Further evidence of Kurt’s generally paradigmatic language during the read-alouds is that the few playing responses that are included in his data could also be interpreted as somewhat informative or precision-oriented. For example, Kurt’s first observable use of this response type occurred during the first reading of Be a Friend to Trees. Kurt’s comment followed my reading of the last part of the text on the page: “Chocolate also comes from a tree. It is made from the seeds of cacao trees” (p. 13). The mention of
chocolate prompted raised eyebrows, smiles, and lip-licking as well as Peter’s playful exclamation, “OOOOOOHHHH! Chocolate!” This was immediately followed by Kurt’s quickly and playfully presented label, “Cocoa beans!”

I affirmed Kurt’s input while the session continued with more chocolate-focused comments—Cocoa Puffs, “The Chocolate Factory,” chocolate bar, etc. I interpreted Kurt’s response in this situation as part of the ongoing “chocolate fun”, but his comment also added to the read-aloud session different terminology for the words of the text. Kurt’s playing responses during the first and second readings of *What Do You Do When Something Wants to Eat You?* were of a similar playfully paradigmatic nature. In the following section, I will discuss a profile that differs from Kurt’s in the range of response types used as well as the overall frequency of the child’s observable participation.

Carla

Carla had joined the classroom in January, shortly before the data collection period began. She was enrolled in our half-day morning kindergarten class after attending a full-day kindergarten program in a neighboring large urban school district. She spent most early mornings and afternoons at a nearby daycare center, where she had gone since her pre-school years. Another student in the class also attended that daycare, so Carla already had a familiar classmate when she joined our class. This was especially helpful to Carla, who tends to be somewhat fearful in new situations.

Carla’s beginning literacy and math skills were well-aligned with the average of her new half-day class, but as the semester continued I observed a need for additional
support. I addressed these needs in the classroom and recommended her for the EDK program waiting list; a position did not open before the end of the year, however. Also, Carla had difficulty following through on verbal directions. Conversations with her mother indicated that this had been a pattern of behavior. We implemented a daily take-home chart to support Carla’s progress in this area through home-school communication as well as to gather documentation of the behaviors we were observing in both settings.

Carla’s response profile is based upon the data summarized in Figures 31, 32, and 33. The first table indicates the features of the read-aloud sessions that prompted Carla’s response. The overall appearance of this table suggests that Carla was verbally active across the 16 read-aloud sessions. Information about the most and least common features of the setting that elicited her response corresponds to the data for the class; that is, print-prompted responses were rare and picture-prompted responses were most common. In fact, the data representing Carla’s observable participation indicate that she responded to the pictures on the cover, endpapers, or pages of the books in all 16 of the read-aloud sessions.
<table>
<thead>
<tr>
<th>Book Titles</th>
<th>Picture</th>
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<th>Teacher Contribution</th>
<th>Read-aloud Text</th>
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Figure 31: Numbers of text units contributed by Carla as elicited by text/context features across the 16 interactive nonfiction read-aloud sessions.
An interesting set of data in Figure 31 is the number of picture-prompted responses that Carla contributed during the sessions involving the book *What Makes a Shadow?* To help illustrate Carla’s response profile as a member of this kindergarten community of learners, I will further describe this situation in which she was so active in making meaning with the visual features of a book. I will describe the content and function of her responses as she interacted with and about a particular nonfiction selection. Figures 32 and 33 indicate Carla’s use of the 10 response types in this situation and across the 16 read-aloud sessions.
<table>
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<th>Book Titles</th>
<th>Informing</th>
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<th>Playing</th>
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Figure 33: Number of text units representing Carla’s use of the connection building responses across the 16 read-aloud sessions.
What Makes a Shadow? focuses on a concept that was an important part of our ongoing hands-on classroom work at the time of the read-aloud sessions. Additionally, through conversationally structured text and colorfully detailed illustrations, the book provides information about the concept of how shadows are made. In these illustrations, the same children and pets are depicted investigating shadows outdoors during the day time and inside in the evening. These recurring “characters” and the gradually changing position of the sun seem to visually narrate the “story” of a day in the life of curious children.

Carla’s responses to What Makes a Shadow? suggest her awareness of this visual storyline. A third of her picture-prompted responses during the first read-aloud session represented the attention-focusing response category. The features that Carla pointed out with these responses involved the children and the pets in the illustrations, as indicated by the following list of one-line responses from Carla’s read-aloud data:

1. Look at the dog. He’s hoppin’ like a bunny.
2. Look. And all the people walking can see their shadows.
3. They [the children] got the cat (R-A 1).

During the second read-aloud session with this book, most of Carla’s picture-prompted responses were similar to these samples from the first session. Also, during the second reading, Carla provided two critiquing responses, one of which further suggested storybook-oriented talk: “I don’t like this part” (R-A 2). Carla was referring to the “part” where evening has come and the children are indoors investigating shadows with their globe and lamp.
In addition to demonstrating an awareness of the somewhat narrative nature of the illustrations in the book, the samples of Carla’s responses to *What Makes a Shadow?* suggest another pattern in her response profile. This pattern was a focus on specific features of the text, such as a certain word that she heard read-aloud, a particular print feature that she saw in or on the book, or specific features in an illustration. The picture-oriented aspect of this pattern is what the samples above indicate.

I will use three language samples from the first read-aloud session of *Spring* to illustrate Carla’s focus on discrete words. I chose this session because it took place later than the samples I presented previously, and it was an event during which the full range of categories listed in Figure 31 elicited response from Carla. Language samples that demonstrate Carla’s focus on isolated verbal features of the book are:

1. Baby du..ck. Baby duCK. (R-A 7) [a playing response focusing on the /k/ sound heard in the read-aloud text]
2. I-N-G! (R-A 7) [an attention-focusing response pointing out three letters, which together form a familiar word part]
3. What is a cub? (R-A 7) [a questioning response seeking the meaning of a word from the read-aloud text]

A fourth language sample from the read-aloud data for the book *Spring* suggests a related and more subtle pattern that occurred in the content and function of Carla’s responses throughout the read-aloud sessions. After approaching the book and pointing to a particular visual feature—one of several hummingbirds in a photograph—Carla said, “I’ve seen one of these on ‘Pocahontas II’” (R-A 8). Carla had isolated a feature in the book and used it to build a connection to an experience outside the immediate read-aloud
setting. While representing her typical focus on specific visual or verbal features, linking responses such as this one perhaps helped Carla make meaning of what she saw and heard during the read-aloud sessions by connecting particular elements to familiar words and pictures.

Frances

Frances entered kindergarten academically strong, according to early literacy and math individualized assessments. Her performance on various assessments throughout the year exceeded grade-level district expectations. Although Frances was a strong student academically, conversations with her mother indicated that the new situation of entering school was somewhat stressful for Frances.

In the classroom, Frances was generally very quiet and attentive. However, she gradually became more overtly active, even in activities involving the whole class such as the read-aloud sessions involved in this study. In these situations, I noticed that Frances tended to observe the activity for a while as she perhaps participated as a careful listener and thinker. Then she would quietly carry out an action or make a verbal statement that effectively applied an idea from previous or current lessons or from her own life. In other words, Frances’ observable participation was rare but meaningful.

The smaller number of total responses in Frances’ data tables (Figures 34-36), compared to those of the other two focal students, reflects this quality of her overall way of participating in classroom life; she had developed this participation style throughout the months leading up to the study. However, the lower number of responses is also related to the fact that Frances was absent for four of the 16 read-aloud sessions during
which I collected verbal data. Despite these absences, I chose to highlight Frances’ verbal data because of the unique voice she represented during the read-aloud and small-group writing sessions and because of the subtle transformation in her quiet, thoughtful participation style throughout the data collection period.

The characteristic of Frances’ participation style of being quietly meaningful and influential in the classroom is illustrated by an event that took place during one of the small-group writing sessions. During the first meeting of the group composed of Kurt, Frances, Sean, and Ashley for the spring nature lab book project, Sean and I did most of the talking. Early in the session, I asked Frances what she thought the page could say based on the photographs the group was using. She shrugged her shoulders, and I told her to use more time to think about her ideas. Then I invited Kurt and Ashley to share their ideas. They both indicated that they were “still thinkin’ about it” (II/Spring; see Appendix G).

A few moments later, Kurt provided a series of one-sentence captions related to the whole set of photos. He then reminded me to invite Frances to share her ideas again. After Sean made a few additional comments about the photos, Frances said, “Even though it was a snowy day, the bulbs were still growing.” This sentence seemingly integrated the information portrayed by one of the photographs and an indoor science experience from earlier in the school year.

The picture shows the children’s garden covered in a light layer of snow through which tulip plants had begun to emerge. The indoor experience involved observing the above- and below-ground changes in four Paperwhite Narcissus bulbs in the classroom. The children and I had planted them indoors in a clear container around the time that we
had planted tulip bulbs in the nature lab. Frances’ contribution during the group writing session suggests her careful consideration of what the group had already said about the photos and of what related work we had done as a class. Further, she made this contribution toward the end of the session after being a quiet member of the group throughout most of the meeting.

Frances’s generally quiet and careful demeanor is also reflected in her response profile, which is based on the data summarized in Figures 34, 35, and 36. The overall appearance of these tables indicates that Frances was less overtly active during the read-aloud sessions than Kurt or Carla. During the 12 sessions for which she was present, I observed that Frances typically raised her hand and waited to speak. If another student interrupted her speaking turn, she stopped and waited for a break in the flow of conversation or for a prompt from me to finish her statements. When she did contribute observable responses, Frances generally responded to pictures or teacher contributions, according to Figure 34. This table also indicates, however, that across the sessions for which she was present, Frances did respond to all five features of the read-aloud context at some point.
<table>
<thead>
<tr>
<th>Book Titles</th>
<th>Picture</th>
<th>Student Contribution</th>
<th>Teacher Contribution</th>
<th>Read-aloud Text</th>
<th>Print</th>
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<td>What Makes a Shadow?</td>
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<td>What Do You Do When Something Wants To Eat You?</td>
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Figure 34: Number of text units contributed by Frances as elicited by text/context features across the 16 interactive nonfiction read-aloud sessions.
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<th>Playing</th>
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<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Animal Tracks</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What Do You Do When Something Wants to Eat You?</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>TOTALS</td>
<td>8</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Figure 35: Number of text units representing Frances’s use of the activity building responses across the 16 read-aloud sessions.
<table>
<thead>
<tr>
<th>Book Titles</th>
<th>Linking to Personal Experience</th>
<th>Linking to Shared Experience</th>
<th>Linking to Fiction</th>
<th>Linking to Nonfiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>What Makes a Shadow?</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What’s the Weather Today?</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changing Seasons</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Be A Friend to Trees</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>Animal Tracks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What Do You Do When Something Wants to Eat You?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>18</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>

Figure 36: Number of text units representing Frances’s use of the connection building response across the 16 read-aloud sessions.
In addition to being a quieter participant than the other two focal students, Frances also made use of a more limited range of response types. According to the data in Figures 35 and 36, Frances made use of only four out of the 10 different response types across the 12 sessions in which she participated. Two of these four categories—questioning and evidence providing—represent rare events in Frances’ data. The other two response types which Frances used—the informing and the linking to personal experience categories—indicate more typical features of Frances’ response profile.

This more typical occurrence of the informing and the linking to personal experience response in Frances’ data suggests that her overall profile consists of both a paradigmatic and narrative language mode. Frances’ informing responses were brief and generally identified or restated information readily available in the book or read-aloud discussion. However, Frances’ personal narratives served the purpose of extending the meaning of the words or pictures of the book.

These narratives informed without being overtly paradigmatic. Through her stories, Frances illustrated ideas from the books and discussion and provided additional information. However, the narrative structure of her responses limited the scope of her information to her own experience. Because of her use of language that clearly situated her comments in specific times and places, it appears that Frances was not offering her stories as “universal truths”. In other words, her connecting responses were less paradigmatic than Kurt’s generally were, for example. The following list of language samples illustrates this quality of Frances’ response profile in this study:
1. One time when there was a tornado, we went over to my grandma’s because she has a basement, and we didn’t (R-A 4).

2. One time in my backyard, I heard a woodpecker (R-A 8).

3. When I was at the zoo, and I went to see the otters, wherever we go the otters beat us, and we keep followin’ them, but they keep going under (R-A 9).

The third sample above is from a read-aloud session during which Frances was particularly verbally active, according to the data in Figure 36. This session was the first reading of *Changing Seasons*. Earlier in this chapter, I described another one of Frances’ personal experience responses in the discussion of Figure 36. This language sample also was an excerpt from the elaborated field notes for our first reading of *Changing Seasons*. The reading of this book, with its large colorful photos and minimal text, afforded many opportunities for students to respond. Also, the broad context of the read-aloud session involved our ongoing study of seasonal changes. Perhaps these conditions of this read-aloud setting played a role in Frances’ contribution of one of her two largest numbers of text units in a single read-aloud session. It seems that her own stories supported Frances in transforming her own participation and, in turn, transforming our read-aloud sessions by connecting them to specific relevant real-life experiences.

**Summary**

In this section, I have described the response profiles of three individual children. In doing so, I have focused on the personal aspects of the nonfiction read-aloud sessions. The meaning-making activity of each focal student was situated in the socially interactive and culturally meaningful setting of responding to science-related nonfiction books within this community of learners. In Figure 37, the bold outline of the single child
among the more faintly sketched outlines of the other co-present participants indicates the focus of this personal plane of analysis. My goal in focusing on individual learners in this way was to observe the process of participatory appropriation—the process of a child appropriating aspects of scientific discourse through participation in the nonfiction read-aloud sessions. As I will discuss in Chapter 5, this process became “visible” to me as I considered the collective meaning-making activity of this kindergarten community.

Figure 37: Personal aspects of the nonfiction read-aloud sessions (Rogoff, 2003).
CHAPTER 5

DISCUSSION

The purpose of this chapter is to summarize and discuss the findings of my classroom-based investigation of scientific discourse. As a review, the chapter begins with a restatement of the questions addressed and an overview of the methodology used. The major portion of the chapter revisits the findings presented in Chapter 4 and discusses the relationship of these findings to existing theoretical and empirical literature from Chapter 2. The final section of this chapter discusses the implications of this study for classroom practice and further research.

Purpose of the Study and Research Questions

The purpose of this case study was to describe and interpret children’s responses to science-related nonfiction books within a kindergarten community of learners. Data collection and analysis were based upon the following questions:

1. What is the role of science-related nonfiction books in constructing scientific discourse in an early childhood classroom? What graphic and verbal features of such a book affiliate it with science? What graphic and verbal features of the book elicit response within the community of learners?
2. What is the nature of children’s responses to science-related nonfiction books read aloud in a community of learners? What is the function and content of children’s talk during socially interactive read-aloud sessions involving such books?

3. In what ways do individual members of the community of learners transform their participation in socially interactive learning activity involving science-related nonfiction books? What is the content and function of the talk of an individual student (focal student) within these contexts?

As I have discussed throughout this report, these questions relate to interdependent and simultaneous developmental processes of sociocultural activity and are based upon a model that links Vygotskian psychology and a transactional theory of literature (Rogoff, 1995, 2003; Rosenblatt, 1978, 1995; Vygotsky, 1978, 1986). The methodology used to investigate the three sets of questions was based upon the integration of these theoretical perspectives.

Review of the Methodology

This study was a teacher research project based upon a sociocultural perspective of teaching and learning. I was deeply immersed in the day-to-day life of the classroom as the teacher, and I was systematically reflective as the researcher. The theoretical orientation of the research questions of this case study required the use of qualitative data collection methods and an interpretative analytical stance. This interpretivist perspective required careful observation and analysis of multiple face-to-face interactions over time (Erickson, 1986; Glesne, 1999).
The case in this study was my own class of kindergarten students, a particular community of learners (Cazden, 2001; Rogoff, et al., 1996). This community included co-present participants (19 children, one teacher, selected nonfiction books) and others who were present through cultural artifacts and memories (authors, illustrators, scientists, people directly involved in the participants’ past experiences). I observed and analyzed face-to-face interactions among these participants from the three perspectives of Rogoff’s (1995, 2003) framework for investigating sociocultural activity; that is, I studied this case from a community-institutional, an interpersonal, and a personal view of the data.

The primary context for data collection was a series of 16 interactive read-aloud sessions involving the whole community of learners. These sessions involved spontaneous response to the nonfiction text and context. Small-group writing sessions focusing on two different topics were secondary data collection contexts. I gathered data in these naturalistic classroom contexts by way of audio- and videotaping and note taking. I developed sets of elaborated field notes using the recordings and my rough field notes. Additionally, I maintained a teacher researcher reflection journal throughout the data collection period to describe the classroom culture, and I engaged in text selection and analysis of the eight nonfiction books to describe their instructional purposes and affiliation with the Discourse of science (Gee, 1999).

These research strategies involved a process of data collection, reduction, and analysis (Erickson, 1986). Data collection and initial analysis took place during a 15-week period in the late winter and spring of 2004. Following this period, I continued to use a constant comparative method to find patterns within my data and relationships between my emergent findings and existing theory and research (Schwandt, 1997). Additionally, I
made use of one type of discourse analysis (Gee, 1999) and continued to examine my reflection journal and elaborated field notes according to the three-part perspective of this study (Rogoff, 1995, 2003).

Summary of Findings and Relationship to Existing Theory and Research

I presented the findings of this study in Chapter 4 according to Rogoff’s (1995, 2003) framework. I had introduced the framework in Chapter 2 to describe the theoretical perspective and applied it in Chapter 3 to explain the methodology. I will structure this discussion in the same way. In the following subsections, I will summarize my findings, describe the relationship of these findings to prior research, and examine what my findings mean according to the broader sociocultural perspective of this study.

As a review, Figure 39 illustrates the framework and the questions I investigated from each of the three perspectives of Rogoff’s (1995, 2003) model. In this study, this sociocultural activity was the development of a classroom scientific discourse through reading aloud and responding to nonfiction. The figure also highlights the findings associated with each analytical perspective.
Community-Institutional Plane/Developmental Process of Apprenticeship

Investigation of the role of the eight nonfiction books in the community’s construction of a classroom scientific discourse

Findings of a culture of “intermingling” within the kindergarten classroom

Personal Plane/Developmental Process of Participatory Appropriation

Investigation of how learners transformed their participation in the nonfiction-related contexts

Findings of a collective appropriation of ways of “talking science” through participation in nonfiction read-aloud sessions

Interpersonal Plane/Developmental Process of Guided Participation

Investigation of the nature of the children’s response to eight selected nonfiction books

Findings of 10 categories of response and the nature of response as a blending of ideas

Figure 39: Overview of research focus and findings.
Apprenticeship in Scientific Discourse within a Culture of Intermingling

Through the interpretative lens of the community-institutional plane, I observed (a) the community of the kindergarten classroom through everyday interactions and activities, (b) the institution of school science through the written and illustrated or photographed ideas in eight nonfiction books, and (c) the response to those books within the community of learners. My analyses of these contexts revealed that the role of the nonfiction books in constructing a scientific discourse was to support and extend *intermingling*. In this study, intermingling was the ongoing blending of official and unofficial ways of making meaning of ideas encountered in school, or *schooled concepts*, and it was a theme that I noticed “weaving” its way through the classroom overview data as well as the more particular response data (Varelas & Pineda, 1999; Gallimore & Tharpe, 1990).

The primary question that I addressed from the community-institutional perspective toward the classroom was “What is the role of science-related nonfiction books in constructing scientific discourse within an early childhood classroom?” Two sub-questions were (a) “What graphic and verbal features of such a book affiliate it with science?” and (b) “What graphic and verbal features of the book elicit response within the community of learners?” In the following two subsections, I will discuss the findings of my investigation of this set of questions. First, I will focus on the primary question. Then I will address the two sub-questions together because I have found that the features of the book, along with the elicitation of response during the read-alouds, were what affiliated the eight selected nonfiction books with the Discourse of science (Gee, 1999).
**Purpose, language mode, and curricular intermingling.**

According to my written accounts of daily classroom life, throughout the school year and during the study period, my students and I co-constructed a culture of intermingling through day-to-day routines, classroom traditions, daily conversations, and science experiences and projects in and outside the classroom. Within our community of learners, this intermingling was the generally tacit blending of different ways of thinking, speaking, or taking action. The blending of diverse purposes for learning activities, modes of talk, and curricular areas was a significant feature of the culture of the kindergarten class involved in this study and was the broader context for the interactive reading aloud of nonfiction books.

As it was used in the report of a research project summarized in Chapter 2, *intermingling* referred to instances of classroom social interaction during which the teacher and students co-constructed an “ebb and flow” between experience-based, everyday concepts and more widely accepted scientific concepts (Varelas & Pineda, 1999). The instructional purpose in that upper-elementary classroom, as in my kindergarten classroom, was to provide discourse opportunities for children’s ideas to mediate scientific concepts—to make the scientific ideas more concrete and comprehensible through connections to the children’s own real-life experiences (Dixon-Krauss, 1996). This intermingling of ideas was a feature of the classroom scientific discourse in the prior study. Based upon the findings I presented in Chapter 4, I assert that intermingling was also a feature of the overall classroom culture that my young students and I had created.
According to a Vygotskian perspective, such a culture is a fruitful context for learning and development because of the key role that language plays in the construction of knowledge within and among people (Vygotsky, 1978, 1986). The orchestration of rich conversations among learners with a range of prior experiences and ideas, along with the teacher’s guidance based upon the disciplinary knowledge of the official school curriculum, is one aspect of effective classroom science instruction (Crawford, et al., 1999; Gallas, 1995; Varelas & Pineda, 1999).

One way of bringing widely accepted scientific ideas to these conversations is through quality information books (Pappas, et al., 2003). Such books may be considered to be cultural artifacts of science, or tools useful to young apprentices becoming literate in the Discourse of science (Gee, 1999; Lemke, 1990; Vygotsky, 1978). My students and I engaged in interactively reading aloud eight of these cultural tools of thought as part of the current study.

Affiliation of nonfiction books with science.

The affiliation of the eight selected nonfiction books with the Discourse of science contributed to the development of a classroom scientific discourse through the children’s response to these books. The authors’ and illustrators’ representation of scientific ideas through words and pictures, connections to National Science Education Standards, and my students’ and my use of these published ideas within our interactive read-aloud sessions linked the books to the Discourse of science (Gee, 1999; National Research Council, 1996).

The words and images themselves, “located” in the selected concept books, survey books, and photographic essays, along with the various responses they evoked, were
instances of language-in-action. My students and I also took action through language by responding during the read-aloud sessions to one another’s comments and questions. These instances of language-in-action (the response categories) were situated in the particular context of reading aloud within the particular kindergarten class. Thus, the books and responses to them together constituted the shared localized discourse of science within this community of learners (Gee, 1999). The construction of this discourse became evident as I observed and analyzed classroom talk according to Rogoff’s interpersonal plane (Rogoff, 1995, 2003).

**Guided Participation in Scientific Discourse through Response to Nonfiction**

From the perspective of the interpersonal plane, I observed and analyzed the nature of my students’ response to the eight selected nonfiction books during 16 interactive read-aloud sessions. The interactive read-alouds were the primary data collection contexts. Small-group writing sessions focusing on two nonfiction projects were secondary contexts. Although I also examined my own participation, my primary focus was on how the words and actions of my kindergarten students guided their own and one another’s participation in these nonfiction experiences.

The nonfiction books also guided the participation of the readers-listeners through the graphic and verbal features that evoked response. The interactions between the children, as readers-listeners, and the books, as cultural artifacts of science, were transactions. Literature transactions are dialogic relationships among the multiple perspectives that intermingle when reader(s) interact with, about, or through text (Rosenblatt, 1978, 1995).
These transactions could also be described as instances of mediation, a process in which ideas influence one another on an intra-psychological (within a person) and an inter-psychological (between people) level. According to Vygotskian psychology, this process becomes evident as a person or a group of people participates in overt activity. These words and actions reflect the participants’ own ideas as well as the ideas of others who are actually present in the situation or present through memories or cultural artifacts, such as the books in this case (Vygotsky, 1978, 1986; see also Dixon-Krauss, 1996).

The data that I presented in Chapter 4 suggest that the children asserted their own ideas through their use of both narrative and paradigmatic modes of language (Kurth, et al., 2002). They stated information, expressed “universal truths”, and asked questions based upon features of the books or read-aloud context. The children also told stories and directly connected the books we shared to various personal and community experiences. The language that I observed and analyzed during the read-aloud sessions—the transactions between readers and texts—reflected both the children’s own ideas and the ideas of more knowledgeable others (authors, illustrators, scientists, science education consultants) who were “present” by way of the selected nonfiction books. Additionally, the data regarding the elicitation of response in Question 1 indicate the importance of the pictures in “making present” the ideas of the people behind the books; picture-prompted responses were the most common in the response data. The voices of peers were also important “more knowledgeable others” to the students in this study; the category of student contribution was the second most common in the response data.

The primary question that guided my data collection and analysis regarding Question 2 was “What is the nature of children’s responses to science-related nonfiction books
read aloud within a community of learners?” A more specific expression of this question was “What is the function and content of talk during socially interactive read-aloud sessions of such books?” My findings regarding the content and function of the children’s talk suggest that the overall nature of their responses represented the construction of a classroom scientific discourse.

As I discussed in Chapter 2, scientific discourse refers to particular culturally significant and historically developed ways of using words to represent ideas and to build understandings among members of a community. It is a specialized way of talking or writing to express a specialized, systematically and socially constructed way of knowing (Halliday & Martin, 1993; Lemke, 1990, 1995, 2000; Sutton, 1998). Together, the 10 categories of response to nonfiction identified in this study reflect this way of using language. I will discuss these response types as the sub-categories of two building tasks of language that I introduced in Chapter 4: activity building and connection building (Gee, 1999).

**Building the activity of the interactive read-aloud.**

During the interactive read-aloud sessions, students used language for informing, playing, questioning, focusing attention, providing evidence, and critiquing the book. These six response types represent instances in which children used language for *activity building* (Gee, 1999). Through their language, the kindergartners constructed the activity of the interactive read-aloud sessions by working to make meaning of the words and pictures in the books and of the words and actions of one another. Thus, the children constructed the reading aloud of the science-related nonfiction books as an active, collaborative meaning-making activity in which they:
1. restated information in their own language or added other relevant ideas to the read-aloud experience (the informing response).

2. played with, or manipulated, spoken words and sounds or ideas represented by the words and pictures of the book (the playing response).

3. asked questions seeking additional information or presenting an implied argument (questioning response).

4. directed the attention of others to a certain visual feature of the book (attention-focusing response).

5. supported their own ideas or the ideas of each other by verbally referring to various sources of additional information (evidence-providing response).

6. expressed their opinions about the book (critiquing response).

The combination of these ways of responding suggests the collaborative grappling with ideas that Gallas (1995) describes as “Science Talks”. As I discussed in Chapter 2, Gallas’ science instruction and her research focused on the development of scientific concepts, in part, through the construction of a classroom scientific discourse. Such discourse consisted of respectful, imaginative, science-focused conversations about student-generated questions.

The purpose of these conversations was to elicit and make use of the children’s own ideas as a tool for scientific concept development. The children expressed these ideas verbally during the Science Talks. In other words, the Science Talks in Gallas’ (1995) classrooms were contexts in which the children’s everyday ideas mediated the schooled
concepts discussed during the talks and encountered in various hands-on science experiences. The Science Talks were contexts of transformation, in which the children over time appropriated, or took on, oral language that represented scientific discourse.

Transformation through discourse was also the focus of Segal’s (1997) sociocultural investigation in an early childhood classroom. In that study, transformational interactions took place as the children and their teacher talked and reflected upon classroom science experiences. Specifically, they focused on connections between their shared inquiry experiences with light and shadows and their own diverse prior knowledge about these concepts. The teacher guided the children in making their relevant prior experiences explicit by reading aloud and inviting response to an exciting story, which was illustrated with pictures featuring many lights and shadows due to the nighttime setting.

This elicitation of students’ ideas through literature response and the theory behind Segal’s (1997) study are relevant to the instructional setting and theoretical perspective of the current study. The instructional model, which she developed with the classroom teacher, includes the use of literature as a mediator of classroom science talk. Further, Segal’s discussion of the value of the children’s and teacher’s reflection upon their own and others’ ideas, within the ongoing activity of science discussions and inquiry experiences, are similar to my description of activity building responses.

These activity building responses were elicited by the pictures, read-aloud text, teacher contributions, student contributions, and print during the interactive read-aloud sessions. Thus, in my study, as in Segal’s, young children engaged with the visual and verbal features of books and of the read-aloud context. This spoken and enacted
engagement brought to the social setting students’ own everyday ideas, or spontaneous concepts (Vygotsky, 1978). In prior studies as well as in the current study, grappling with these everyday ideas in the social setting of the classroom was one way of helping children to participate in their own transformations as learners and in the transformation of the learning community (Gallas, 1995; Pappas & Barry, 1997; Segal, 1997; Shepardson, 1997).

The six response categories in this section represent the particular types of talk that my students and I used to construct the activity of reading aloud and talking about science-related nonfiction books. This language task described as “activity building” in the current study reflects a collective transformation of the ideas presented in the books and of the ideas that the children and I contributed to the read-aloud context. The literature and the response to literature mediated the classroom talk during the read-aloud sessions.

In the next subsection, I will continue to discuss my findings regarding guided participation. I will focus on the second subset of the nature of response in this case—the connection building response categories. These four categories further contributed to the creation of a way of grappling with and making sense of schooled concepts within our kindergarten community of learners.

**Building connections between literature and life.**

During the interactive read-aloud sessions, children used language to contribute information; play with words, sounds, and ideas; ask direct questions or present implied arguments; direct others’ attention toward specific visual features of the book; support their own and others’ ideas with various forms of evidence; and express their opinions
about the books. These uses of language constituted the activity building functions of language in this setting. *Connection building* was the other primary use of language that emerged from the interactive read-aloud sessions (Gee, 1999). Within this broad category of language use, I identified four response types: linking to personal experience, linking to fiction, linking to shared experience, and linking to nonfiction. These connection building responses served the purpose of linking a read-aloud book or context to past, present, or future related texts and experiences associated with certain learners or to the classroom community as a whole.

In the specific times and place of the interactive read-aloud sessions in this study, the children connected the literature to their individual and shared life experiences as they:

1. told brief personal narratives about prior or ongoing experiences outside the read-aloud session and, usually, outside of school (the linking to personal experience response).

2. mentioned a fiction-oriented text, such as a story, movie, or song, experienced in or out of school (the linking to fiction response).

3. referred to activities, classroom routines, field trips, or other instructional experiences shared previously or on a continuing basis by all or most of the class (the linking to shared experience response).

4. mentioned a published or class-produced nonfiction text, such as a book, video, or chart experienced in or out of school (the linking to nonfiction response).

The children used these connections to make or extend the meaning of the words and pictures of one of the eight nonfiction books or of a student or teacher contribution during the read-aloud sessions. With these connection building responses, the children
constructed verbal links to other experiences and made comparisons between other texts and one of the particular nonfiction books. These links and comparisons suggest a dialogic process involving everyday and schooled concepts. Certain ideas did not seem to overtake others in the children’s talk; rather, ideas interacted with one another through the connections the children had provided through their responses (Vygotsky, 1986).

A similar dialogic process was a finding in another sociocultural study involving the reading aloud of information books in two early childhood classrooms (Pappas, et al., 2003). I summarized the study in Chapter 2. Here I will further examine the relationship between the previous findings and the connection building responses I observed in my own classroom.

The prior investigation of the talk of first- and second-grade students and their teachers was based on a perspective of information books (cultural tools) and of science (a culture with an associated discourse genre) that is similar to the current study (Pappas, et al., 2003, p. 437). Furthermore, the researchers recognized that the science-related information books mediated the children’s ideas as represented by their talk and the ideas of science as represented in the literature. Pappas and her colleagues found that this mediation of ideas took place during the read-aloud sessions as the children and teachers made verbal contributions representing intertextual connections. These were statements that linked the text being read to other relevant texts, such as other books, songs, charts, and oral stories about personal experiences.

According to the authors, these intertextual connections were one means by which the children and teachers brought to their shared classroom science experiences their diverse everyday concepts. The result was the blending of ideas associated with the official
curriculum of the school and the unofficial curriculum of life outside the classroom. This blending was a dialogic process in which learners used their everyday concepts to make meaning of schooled concepts (Pappas, et al., 2003).

According to Vygotsky (1978, 1986; see also Ashton, 1996), learners’ participation in such processes in the social setting, or on an inter-psychological plane, supports the development of such processes within an individual, on an intra-psychological plane. Therefore, the making of intertextual connections with scientific information books, as observed in the prior research, is an important means of appropriating a discourse of science in the classroom (Pappas, et al., 2003). In the current study, I observed such appropriation within the collective activity building and connection building responses of our kindergarten community of learners.

**Constructing the “poem” of scientific discourse.**

The children involved in the current study used their responses to the nonfiction books to build the activity of the read-aloud as a collaborative meaning-making experience and to build connections to other texts and contexts. As they transacted with the selected nonfiction books, the children created a unique blend, or intermingling, of their own ideas and the ideas represented in spoken and written words and in pictures and actions during the read-aloud sessions (Rosenblatt, 1978; see also Harvey, 1993; Pappas & Barry, 1997; Sipe, 2000).

As I examined my students’ transactions with the science-related nonfiction books, I considered Rosenblatt’s (1978) description of the *poem*. The *poem* in this transactional theory is the experience of the text “coming to life” through the reader and the reader coming to live in a new way through the text. Linking the written word with actual life
experiences and engaging with books aesthetically, as my students did through the 10 response categories, is key to a true understanding of that written word (Rosenblatt, 1978; see also Dean & Small, 1997; Sipe, 2000; Spink, 1997).

The connection building that I observed through the interpersonal plane of analysis suggests a blending of ideas, a meaning-making collaboration. It seems that students called to mind—and to the social setting of the read-aloud sessions—past, present, and future relevant experiences (Gee, 1999). This linking of life and literature served a vital purpose in the collective meaning-making of the read-aloud sessions—building a shared understanding, transforming our classroom into a community of learners, and constructing a classroom scientific discourse (Cazden, 2001; Gallas, 1995; Rogoff, et al., 1996; Sutton, 1998). In the next section, I will further discuss this transformation, which developed as my students participated in the interactive read-aloud sessions.

Participatory Appropriation of a Classroom Discourse of Science

From the perspective of the personal plane of analysis, I examined the words and actions of individual students within the contexts of the read-aloud and small-group writing sessions. The questions that I addressed were: “In what ways do individual members of the community of learners transform their participation in socially interactive learning activity involving science-related nonfiction books?” and, more specifically, “What is the content and function of the talk of a focal student within these contexts?”

In asking these questions, my initial purpose as a researcher reflected one of my primary interests as a teacher—individual student learning. I expected to observe change over time in focal students’ ways of responding. While anticipating evidence of such
transformation within an individual’s response data, I actually identified two unanticipated findings: (a) somewhat stable response profiles for the three focal students and (b) a collective form of participatory appropriation.

*Participatory appropriation* is the developmental process associated with the personal plane of analysis. It is the taking on of new ways of interacting with others, and new approaches toward the social and physical world by actually participating in activities in that social and physical world. The theoretical focus is the individual person in relation to the social activity, in relation to the cultural setting (Rogoff, 1995, 2003). In Chapters 3 and 4, I stated that my intent was to investigate this process by analyzing the changes in individuals’ responses over time, but as I examined the content and function of three students’ talk, their distinct response profiles emerged. I did observe subtle transformation in the profiles of two individuals (Carla and Frances). However, the individuals’ transformation of the community of learners was more apparent in the data, as the three response profiles contributed to the intermingling of voices during the interactive read-aloud sessions.

In this section, I will discuss my findings regarding participatory appropriation, the third of the three developmental processes that I sought to observe and analyze in this study (Rogoff, 1995, 2003). I will review my findings from the three focal students’ response profiles. Then I will discuss a theme that suggests a collective form of participatory appropriation.
Response profiles: Individual voices within a culture of intermingling.

In Chapter 4, I presented the response profiles of three members of the community of learners. Numerical data representing their participation in the read-aloud sessions indicated that Kurt, Carla, and Frances contributed different numbers and types of activity and connection building responses throughout the data collection period (Figures 28-36). Further, their responses were elicited by different combinations of the text and context features.

Kurt’s response profile represented a generally paradigmatic approach to the nonfiction books and read-aloud context (Kurth, et al., 2002). The informing and linking to personal experience responses were the two most represented in his verbal data. He used these responses to keep our interactive read-aloud sessions focused on the accurate information and precise terminology that are characteristic of much informational literature and scientific discussion. Kurt’s contributions were often emphatic and spoken with a tone of certainty. What Kurt said and how he said it reflected a “teaching” purpose to his responses; that is, his profile reflected an overt sharing of his knowledge.

Carla’s way of responding, however, was more reflective of her effort to support herself in making meaning of what she saw and heard during the read-alouds. Carla responded more frequently and with a greater variety of responses than Kurt did, but her responses were generally less substantive. She used language to play with, ask questions about, and direct attention to discrete graphic and verbal features of the books. Carla’s response profile also suggests a narrative approach toward the books. Over time Carla seemed to link the nonfiction literature to her own life experiences, particularly involving
prior experiences with fiction. Also, at times, Carla contributed information and critiquing comments that were reflective of response to stories. Apparently, linking new ideas from the nonfiction books to familiar words and images from fictional texts or stories was a strategy for making meaning of nonfiction.

Frances’ response profile also reflects a linking of the nonfiction read-alouds to stories, but in her case, the stories were generally personal experiences. Frances made use of these connection building responses in a “gently paradigmatic” way. She did not use them to directly assert information and provide “universal truths” as Kurt did. Rather, Frances situated information within brief personal narratives and seemed to leave the connection building up to those who listened to her responses. Like Carla’s profile throughout the study, Frances’ way of responding midway through the data collection period included hints of individual transformation, as by telling her stories Frances’ responses contributed more information to the read-aloud sessions.

The different general ways of responding represented by Kurt, Carla, and Frances’ response profiles suggest different stances toward the books as well as the idea of both an individual and a collective “movement” along a theoretical stance continuum (Rosenblatt, 1978: see also, Karolides, 1997; Shine & Roser, 1999). Stance refers to how and for what purpose a reader approaches a text. It is the general frame of mind that the reader employs based on his or her life experiences as well as upon features of the text itself. Rosenblatt (1978) identifies two predominant stances: efferent and aesthetic. An efferent stance is associated with a focus on the information to be carried away from the
reading experience, or the instructional purposes for reading the text. An aesthetic stance is associated with a focus on text as literature, for the purpose of experiencing something of life as portrayed in the book.

My descriptions of Kurt, Carla, and Frances in Chapter 4 indicate that they entered school with a range of life experiences. Their response profiles represent a few of the unique personalities that built our classroom culture through day-to-day interactions involving routines, traditions, and more formal instructional activities. The focal students, thus, personify the intermingling of diverse perspectives, or the range of efferent-aesthetic approaches to the nonfiction works, that built our classroom scientific discourse.

Furthermore, my description of the “poem” of our classroom scientific discourse in the previous section is related to a collective intermingling of efferent-aesthetic stances toward the eight nonfiction books. As I have discussed, the range of graphic and verbal features of the text and read-aloud context that elicited response, along with the 10 response categories, illustrate this intermingling. These categories together suggest a blending of paradigmatic and narrative language modes, as illustrated by the response profiles of the three focal students (Kurth, et al., 2002; Rosenblatt, 1978).

In the following section, I will discuss this language mode intermingling. This theme emerged from the verbal data collected during the nonfiction read-aloud and writing sessions. The data from these nonfiction contexts suggest a collective form of participatory appropriation, the developmental process that I sought to investigate from the perspective of Rogoff’s (1995, 2003) personal plane.
The nature of response to nonfiction as language mode intermingling.

Language mode intermingling is the generally tacit blending of narrative and paradigmatic modes of classroom talk. As I appropriated the terms from Kurth, et al. (2002), narrative refers to classroom talk that reflects a story-telling style to convey personal accounts; paradigmatic refers to an argument or a factual statement and reflects an interest in evidence. Together the 10 response categories (Figures 23 and 24) suggest a blending of language modes during the read-aloud sessions. Students both played with language and used it to provide information. They told stories from their own lives and related information from books to our classroom science experiences. As individual students “lived through” the text, the community came to live in new ways. The classroom discourse began to take on, or appropriate, new uses of language through the children’s participation in activities involving science-related nonfiction books.

Throughout this report, I have described the development of this discourse through (a) the classroom culture of intermingling, (b) the affiliation of selected nonfiction books with science as a particular Discourse, (c) the mediation of everyday and schooled concepts by way of transactions with the nonfiction books, and (d) the nature of the collective response to the nonfiction as an intermingling of stances and language uses. These findings indicate apprenticeship relationships involving children and books and the construction of a classroom discourse of science within the kindergarten community of learners (Gee, 1999; Rogoff, 1995, 2003; Rosenblatt, 1978; Vygotsky, 1978). I have also cited prior studies in which other researchers interpreted classroom scientific discourse as
children’s appropriation of scientific ideas or as contexts for appropriation (Gallas, 1995; Pappas, et al., 2003). In the current study, the range of response categories suggests such an appropriation in a collective sense.

In addition to the 10 response categories, two emergent concepts suggest a collective form of participatory appropriation: story-based evidence and co-constructed precision. These concepts contribute to the theme of language-mode intermingling evident in the whole set of response categories. I discovered the concepts through my analysis of key events during the read-aloud and small-group writing sessions. In the following paragraphs, I will describe these key events, which suggest a collective awareness of the paradigmatic nature of the linguistic and visual aspects of nonfiction along with the occasional expression of more narrative- and play-oriented perspectives toward these nonfiction characteristics.

In my previous discussion of evidence-providing responses, I stated that students referred to a variety of sources of information to support an idea. I also indicated that an apparent purpose of such response was to uphold an implied belief in the importance of evidence in discussions involving what is “real”. Evidence-providing responses typically involved clearly paradigmatic talk, with a tone of certainty, such as John’s statement listed in Figure 23 (in Chapter 4). After a more excited “I-knew-it” declaration, John stated matter-of-factly that he knew because “…herons have those kind of tracks…I’ve seen a heron track before.” His evidence was based on an actual observation. Kurt’s evidence for the “badder-than-hornet” sting of a wasp was also based on his logical interpretation of a real-life event—his sister’s scream after experiencing a wasp sting.
Kurt contributed his evidence-providing response emphatically, although with the same tone of certainty expressed by John and other students in typical evidence-providing responses.

Such a paradigmatic style of speaking was used in another instance of evidence-providing. The evidence in this case, however, was based on fictional stories. This less typical instance of the evidence-providing response is significant because of the way that it seemed to be delivered and received within the flow of activity during the nonfiction read-aloud session: as an acceptable way to support an idea. I will use excerpts of transcribed talk to present this response and the surrounding conversation. Appendix B contains the transcription conventions, and information about read-aloud dates, authors and illustrators is listed in Appendix F. The excerpt is from the transcript of the second read-aloud session with the book *Spring* (R-A 8):

**Lawrence**: Um, do birds go to sleep?
**T**: Do birds go to sleep?
**David**: SOME birds!
**T**: SOME birds do?
**Rachel**: ~And the owls!
**Lawrence**: ~(turned toward David, sitting next to him in front of group) I wasn’t talkin’ to you.
**T**: What do you think about owls, Rachel?
**Rachel**: They go to sleep.

...  
**Rachel**: I have, I have this book, it’s like *Sam and the Firefly*, and the owl go to sleep in the morning and then he goed..and then he played in the night.
**T**: Mmmm.
**Carla**: (looked over and back to Rachel) Oh, I know that book!

This brief conversation took place during a slightly longer discussion based on two facing pages in the book; the transcript for this one double-page spread is over a page long. The photo of a marmot prompted several personal narratives about other small
mammals as well as a question about burrowing. As one student was telling about her puppy, Lawrence began to attempt his question about birds, apparently prompted by the photograph of the robin on the facing page. When he succeeded in having his question recognized by the group, I repeated it, and David immediately answered that “SOME birds” do.

After my brief question, which was intended to repeat David’s response rather than to question it, Rachel and Lawrence spoke at the same time. Rachel suggested owls as examples of birds that sleep. Her apparent support for this comment came from a storybook she recalled reading at home. I responded to this connection with a brief acknowledgment of her speaking turn, and Carla responded with an exclamation about the book, which she also recognized. Within the book-related talk of the read-aloud session, Rachel’s use of the story as a source of evidence seemed to “fit” in with the ongoing flow of the conversation. Perhaps part of the reasons for this “fit” was that Rachel was supporting a comment that reflected a commonly held view of owls.

This event is one of several key events that illustrate the intermingling of language modes during the interactive reading aloud of nonfiction books within this community of learners. It suggests a tacit commitment to providing support for one’s ideas within nonfiction-oriented contexts. The other emergent concept related to the theme of language mode intermingling involved an apparent commitment to being precise in such contexts.

Throughout the read-aloud data, I noticed instances of individuals using precise language to describe something they had seen, especially when contributing a link to
personal experience. As indicated in Figure 24 (in Chapter 4), Peter, for example, included the detail of the light in his teddy bear shadow story, and Frances explicitly stated the color of the flowers she had observed at her house.

A pair of interactions from the second read-aloud of *What Do You Do When Something Wants to Eat You?* (R-A 16) illustrates this process. All 19 students had been present for the first reading of this book on the previous day and were, therefore, at least generally familiar with the information in the book. In the following brief excerpt, Kurt apparently used this information to more precisely restate Rachel’s response to the illustration of an octopus and its approaching predator.

**Rachel**: It’s gonna spray the black stuff.
**Kurt**: It’s gonna spray INK!

Together Rachel’s and Kurt’s comments provide a description of what an octopus squirts to protect itself and the particular term used in the book to identify the “black stuff”. Such an instance occurred again later in the read-aloud session shortly after I turned the page to reveal a clown fish swimming from its predator. In the following excerpt, I briefly inserted a paraphrase of the written text between Rachel’s response to the illustration and Kurt’s comment. Kurt’s comment then functioned to complete my sentence and to provide the correct terminology for the idea that Rachel had provided:

**Rachel**: It’s gonna go in a poison sea urchin or something.
**T**: The clown fish protects itself by ….
**Kurt**: Going in a sea anemone!

These brief events illustrate the intermingling of the voices of individuals during interactive read-aloud sessions involving the whole class. The involvement of Rachel and Kurt in both excerpts is an example of how, through their response profiles,
individuals transformed the read-aloud events and contributed to our ongoing
development of a classroom scientific discourse. Below, I will continue the current
discussion of language mode intermingling with a focus on information from the small-
group writing sessions.

As I described them previously, the purpose of these small-group sessions was to
determine the content and function of the students’ talk as they crafted nonfiction books
related to our classroom units of study. The change in the students’ role in these small-
group writing settings prompted talk that more explicitly focused on the precise use of
language in nonfiction writing. The students were listeners/readers/responders during the
interactive read-aloud sessions but became the actual “builders” of nonfiction text and
organizers of the visual features of our collaborative book projects as they participated in
the writing groups. Co-constructed precision was, therefore, a typical feature of the
interactions during the nonfiction writing sessions.

The following excerpt is from the first meeting of a group made up of Carla, Reba,
Peter, and John on April 1, 2004. I was presenting to them the set of photographs from
our nature lab that would be the topic of their page in the class big book. Other groups
had different topics. The overall focus of the book was the season of spring, and
eventually the book was titled *The Wonders of Spring: A Nonfiction Book about our
Nature Lab*, reflecting the overt focus on nonfiction throughout the project.

After we had looked at all the photographs for the group’s page, I suggested that we
begin to think of what to write about them. John initiated a focus on a photograph of the
emerging foliage of a day lily. This photo was one of a series of pictures taken of the same plant at different times. Carla suggested a caption for the photo and identified the plant as grass. Then Reba had a suggestion:

T: Reba, what did you wanna say?
Reba: (held picture) I-see-grass-growing.
Carla: I see grass growing?
John: No, we, we.
T: We? Since it’s a team writing it? Does that sound good to you, Reba? WE see grass growing?
Reba: Not just grass growing.
T: We-see-grass-growing….
Reba: Growing and changing!
T: What do you mean by that?
Reba: It’s growing AND it’s changin’!
T: Yeah, and if you put these two pictures together, you can really see that the grass is growing and changing.

The above conversation illustrates how this group of children and I worked together to construct a one-sentence caption about the photos of a real feature of our nature lab.

John’s suggestion of the word we in place of I contributed a more realistic, or precise, portrayal of the number of people involved. Reba’s suggestion of “growing AND changin’” contributed to a more precise description of what the picture actually depicts. Also, this phrase had been used repeatedly within this community of learners since the beginning of the year, when it had been somewhat of a title for our thematic work about the children themselves as they entered a new phase of their lives.

The following excerpt is from the transcript of the second meeting of Carla, Reba, Peter, and John several days later. During this session, I prompted a discussion to focus on the use of accurate information in the sentence about the “grass growing and changing.” I had typed out the sentences from the previous meeting. After a discussion about what color of construction paper to use as the background for this page in the class
book, we reviewed the pictures and sentences. As we looked at the day lily foliage photos, I mentioned to the students that I did not think the photos were actually of grass. This became a major point of our work as we began to connect the sentences with the photos. After some more brief discussion, we began the following conversation:

T: Okay, let’s look at this sentence that Reba thought up. “We see grass growing and changing.” Where should that go?  
Peter: Both of these. (waved finger over two daylily foliage photos)  
Reba: Both of these. (pointed to two daylily foliage photos)  
John: Um.  
T: Two. So maybe we could put it here, kind of like in the middle?  
Reba: No, wait, let’s dig it. Here I’ll show you. (spread photos, put text in between) Then, like that, …  
T: Okay.  
John: OR, or, it could be under this, and, since it’s “growing and changing”.  
T: Growing and changing. Yes. Can I ask you something, science writers? This says grass (pointed to text), but I DON’T think this is grass (pointed to photo of daylily foliage). So can we just change it to..plants?  
Carla: Yeah!  
Reba: Sure!  
Peter: Noooo.  
T: Because, we KNOW they’re plants, but I don’t think it’s grass.  
Carla: YEEEES!  
T: I think they’re gonna have a type of flower.  
Peter: They ARE graaaaasssss.  
T: It looks like grass to you?  
Reba: It looks like grass to me!  
T: It DOES look like grass.

Peter openly disagreed with my suggested change in wording. Reba initially agreed to the revision. However, her statement “It looks like grass to me!” suggests that she was not completely convinced that the information I had shared was more accurate than what the photo appeared to represent. Indeed the narrow green blades in the photo do look like grass. The following excerpt continues the discussion:
John: It looks like flowers to me.
Reba: ‘Cause if it was flowers it wouldn’t be..it wouldn’t be down, it would be up.
Carla: Because I can show you something.
T: Well, the flowers haven’t come out yet. When we go out to the nature lab, we’ll look at that in person. …
Carla: I just thought, something in the bear one looks like that.
T: What looks like that?
Carla: (found and held *Bear Wants More* which was near the table) THIS is about spring, right, the yellow flowers. …
T: …It’s in spring, too, isn’t it?

Reba: (while looking through pages of *Bear*) Sanchez, you gotta, gotta, LOOK. Look, Sanchez! Look! (showed illustration of flowering plant, similar to the foliage in our photo)
T: Oohhh.
Reba: That’ what it is!
T: And the flowers just haven’t come out yet, have they?
Reba: Mm. SOME of them have, but some of them haven’t.
T: But in our pictures, the flowers haven’t come out yet.

Reba’s response to John’s statement at the beginning of this excerpt is an indirect disagreement, perhaps referring to the fact that in the photo the blades of foliage curve and hang toward the ground, but flowers on stems “would be up.” Since the time that I had taken the photo, the day lily plants in the lab were beginning to look less like large blades of grass. I, therefore, mentioned looking at the plants “in person”. Carla, joined by Reba, had another source of evidence in mind.

When Carla mentioned something that she could show us, she was introducing visual evidence that the plant in our photo was not grass. *Bear Wants More* is a story set in the springtime. The mention of flowers along with the photograph seemingly brought to
mind an illustration in the familiar storybook, which was displayed near the meeting table. The illustration shows the same foliage and includes the stems and blossoms which had not yet emerged in our nature lab at the time of our photo.

This discussion in a small-group writing context with an explicit focus on nonfiction, thus, reflects the language mode intermingling that I discussed in relation to the concept of story-based evidence. In the case of this writing group meeting, the fictional reference took place in the midst of a discussion focusing on accurate word choice. Apparently, this language mode intermingling supported co-constructed precision.

The key classroom events that I have discussed indicate an intermingling of language modes during our work with nonfiction. The concept of story-based evidence refers to the use of fictional sources of evidence to support ideas related to a nonfiction book. The concept of co-constructed precision refers to how my students and I worked together in the context of the nonfiction writing groups to construct nonfiction and in the context of the read-aloud sessions to make meaning of the nonfiction work of others.

Attempting to accurately portray reality in words and pictures and seeking to provide support for the ideas presented are tasks associated with nonfiction contexts, such as the read-aloud and small-group writing sessions in this classroom study. As I have discussed, among the participants in this study these paradigmatic language tasks were frequently accompanied by narrative, playful, and fiction-oriented uses of language. These emergent themes are one implication for my own further research regarding the role of nonfiction books in constructing scientific discourse within communities of learners and regarding the students’ developing perceptions of the nature of science as a human endeavor. In the final section of this chapter, I will discuss further implications.
Summary

The following statements are a brief review of the findings of this investigation:

1. The role of science-related nonfiction books in constructing scientific discourse within this kindergarten community of learners was to support and extend an ongoing intermingling of purposes for activities, language modes used during those activities, and curricular foundations for classroom activities.

2. Various visual and verbal features elicited response during 16 interactive read-aloud sessions of eight selected nonfiction books: pictures, student contributions, teacher contributions, read-aloud text, and print. Pictures and student contributions were the two features that evoked the most response.

3. Authors’ and illustrators’ (or a photographer’s) representation of scientific ideas, along with transactions with the eight nonfiction books in this study, affiliated the books with the Discourse of science.

4. The community of learners constructed the activity of reading aloud nonfiction and connected the nonfiction literature to life outside the immediate read-aloud context by way of 10 categories of response: informing, playing, questioning, attention-focusing, evidence-providing, critiquing, linking to personal experience, linking to fiction, linking to shared experience, and linking to nonfiction.

5. Collectively, the community of learners appropriated ways of using language that represented a classroom scientific discourse. These language uses are represented by two emergent concepts and 10 response categories, which in turn represent the ongoing intermingling of voices from the science-affiliated nonfiction books and the everyday, experience-based cultures of the children.
In the next section of this chapter, I will describe the implications of these findings for early childhood teaching and learning and for further research.

Implications

Because the findings of this study are deeply embedded in the day-to-day social and academic life of a particular community of learners, they are not intended to be directly applicable to another classroom setting. Each learning community is unique. However, my goal throughout this report has been to tell the story of how my students and I constructed a scientific discourse with enough descriptive detail that other early childhood educators, researchers, or curriculum developers may compare this story to their own.

In this section, I will suggest ways that others involved in the education of young children may make meaning of the story I have told. According to the nature of teacher research, the implications for practice and research are integrated. I have organized these ideas under two headings. One section focuses on a common, and powerful, classroom context; the other focuses on teacher decision-making.

The Read-Aloud Tradition

As a result of this investigation, I more fully realized the importance of the read-aloud context. I had, of course, read about the significance of the setting in other research reports and in teaching resources, and I knew from experience that reading aloud was almost always one of the best times of the school day. However, through my close examination of the interactive read-alouds in this study, I gained a deeper appreciation of the read-aloud context as a gathering space for people and a meeting place of ideas.
The description of the social and cultural activities of my kindergarten community of learners—our construction of a “culture of intermingling”—illustrates the importance of playful and purposeful daily routines. Such routines are common in early childhood classrooms. They provide structure to the social and physical environment, engage children’s interest, and support them in becoming cooperative and productive classroom community members. When particular meaning is attached to them, these routines become traditions. Perhaps my description of these blended routines in my classroom will prompt other teachers to think about the cultures they create with their young students and the important role of that culture as a learning context, particularly regarding science.

Further, the particular routine of reading aloud may be considered a tradition. This traditional early childhood setting is an especially important way in which the story I have told in this report may be particularly meaningful to other teachers of young children. In further reflecting on the meaning I make of the read-aloud context in my own work with young children, I realize that it is a time for the intermingling of my concerns as a teacher, including nurturing unique personalities and skills while also implementing instructional activities that support established Standards. Reading aloud to children in the classroom is like holding all them on my lap at once and “living through” literature, including nonfiction, together. It is a child-centered time. It is a book-centered time.

It can also be a Standards-based time. In this study, I sought to describe and interpret my students’ response to nonfiction books that I read aloud to them. I considered the books to be affiliated with science as a particular way of talking about the natural world.
Over time, it seemed that the read-aloud context came to be a meeting place for the scientific ideas of the books to interact with other scientific and everyday ideas through the voices of the children.

Reading aloud science-related nonfiction books is one way to bring science content and language processes to life in the early childhood classroom. The traditional practice of reading aloud to children may support teachers in facilitating rich classroom discourse, providing their students with opportunities to appropriate scientific ideas, and maximizing instructional time. In this study, my students constructed our work with nonfiction as collaborative meaning-making activity and connected the nonfiction books we shared to other experiences and texts. This construction process took place within the familiar and supportive context of the read-aloud.

**Transformation through Literature Transactions**

One question addressed in this study focused on the transformation of individual learners. I was interested in finding out how students’ scientific discourse changed over time as they participated in nonfiction read-aloud sessions. As I studied the response profiles of individual students, I realized their differences and how they each contributed to the collective meaning–making activity of the read-aloud sessions. Multiple voices truly did contribute to the construction of our classroom scientific discourse. The findings regarding these multiple perspectives had immediate implications for my own teaching, as I used the information I gathered about my students in the read-aloud sessions to plan further science experiences, select additional fiction and nonfiction literature, and reflect upon our previous and ongoing science work.
To more fully tell the story of these individual response profiles and their role in teaching and learning in our community of learners, a deeper focus on the personal plane of analysis (Rogoff, 1995, 2003) is needed. Longer-term investigations using data collection and analysis strategies similar to the ones I used in this study may indicate how individuals transform. Further study may reveal how learners appropriate new uses of language and new ideas as they participate in nonfiction read-aloud sessions. Additionally, cross-referencing what elicits response with how individuals respond would help to create a clearer “picture” of an individual’s response profile. My purpose in conducting a longer-term, more finely tuned investigation of an individual’s response to nonfiction within a community of learners would be to better understand how a young learner brings ideas from a nonfiction book to life and how that learner comes to live in a new way.

Information about individuals is often a primary driving force in a teacher’s decision-making process. In this investigation, the information I gathered about individuals across science-related contexts guided my plans for what skills and concepts I needed to support. The group-oriented information helped me to decide how I would meet those needs within our community of learners.

In this way, the findings of the current study suggest ways that teachers may support their learning communities in living through nonfiction text, as children respond to the visual and verbal features of both the text and read-aloud context. A goal of such experiences with books is that students will carry away a stance toward science as something to be experienced from an efferent and aesthetic perspective; that is, science is an aspect of what they know and can do—and want to do.
Another teaching purpose involved in the children’s transactions with nonfiction books is that teachers may access their students’ diverse everyday ideas. In the current study, I read the selected books to my students as literature, allowing the children to respond to the words and pictures of the books and to the words and actions of others in the read-aloud setting. The interactive read-aloud sessions were opportunities for my students to offer their spontaneous response as individuals. This response was evoked during routine social events involving books that were in some way linked to our previous and ongoing shared experiences.

Teachers’ understanding of their students’ book-related discourse may help them to provide a supportive context for other related school science experiences as (a) teachers gather information about students’ current understandings and questions by listening and reflecting upon their response and (b) children are actively engaged in communicating their own ideas and interacting with those of others. Thus, interactive read-aloud sessions with nonfiction books, as well as the teacher-orchestrated activities that surround them, are opportunities for learners to transform their classroom scientific community and to be transformed.
Conclusion

The role of speech in human learning and development, the idea of everyday and schooled concepts, and the significance of formal schooling in the transformation of the learner and of society reflect the historical and sociocultural emphasis of Vygotskian theory (1978, 1986). These fundamental concepts have been represented in the current study through my use of a particular model of learning and development that focuses on apprenticeship relationships among learners and more knowledgeable others (Rogoff, 1995, 2003). Throughout this report, I have discussed my data collection, analysis, and findings according to this model. I have focused particularly on face-to-face interactions in the classroom, as the words and pictures of books and the words and actions of one another guided the way my students and I participated in learning with science-related nonfiction.

The model of apprenticeship has another meaning, however. Apprenticeship reflects the “passing on” of cultural practices, artifacts, and discourses from experts to novices, thus emphasizing the vital role of cultural meanings in school. Schooled concepts and the official school curricula, including the discipline of science, are not culturally neutral subjects, and even the youngest students are not culturally neutral “blank slates”. The “passing on” of knowledge is a process of appropriation, an ongoing dialogic relationship among everyday and schooled concepts, a cycle of individual and collective transformation.

Teaching and learning must, therefore, be culturally relevant; that is, students must have opportunities to interact with the official school culture by way of their everyday cultural meanings (Ladson-Billings, 1994). Culturally relevant teaching shows how
ideas, even those in published textbooks and nonfiction literature—come from people, like the learners in the classroom. The official school curricula are rooted in human activity, and by involving children in social activity in the classroom, teachers help them connect to the subject matter of school while honoring, and making use of, their “everyday selves”.

Such education has the potential to not only transform individual learners and their classroom contexts, but also their worlds. Over time these learners will participate increasingly in society outside the classroom, making decisions that affect themselves and others and that reflect their abilities to manipulate the tools of verbal thought “for the solution of practical problems in the experienced world” (Gallimore & Tharp, 1990, p. 194). Science, with its specialized physical tools and “tools of verbal thought”, is a systematically developed worldview that has particular relevance—and power—in addressing practical problems in our world. This significance of science in the everyday lives of humans and in their abilities to make effective decisions as consumers, citizens, and inhabitants of a shared planet underscores the need for culturally relevant science education. My hope is that through living and learning in a classroom where science is woven into daily interactions and traditions, my students will weave it into their lives outside the classroom.
Epilogue

In the school year following this study, I had the opportunity to “loop” from kindergarten to first grade with this group of students. Several from our kindergarten class moved, and a few new students joined our community. However, the majority of the diverse voices that had intermingled to create our classroom discourse of science in kindergarten continued to co-create the poem of science in first grade.

I remember an event from one mid-autumn afternoon. With our art teacher, my students had been using their “artists’ eyes” and their “scientists’ eyes” to closely examine the physical features of butterflies in photographs and books. They were using mixed media to represent these features in art projects that they worked on and discussed over time. I believe that these art experiences and our way of talking science in our classroom contributed to Rachel’s announcement one day that she had a science question to talk about: How do caterpillars know what color to be when they turn into butterflies?

This question engaged our class in an ongoing conversation that began with about 15 minutes of idea sharing right then. Maybe they got the color from flowers. Maybe God told them what color to be. Maybe there was something inside the chrysalis that covered their bodies with color. Ideas intermingled.

Several days later, visual information from a nonfiction book added to the intermingling of ideas. As students were spread throughout the room reading, writing, and working independently and, for the most part, quietly, a student loudly announced that he had found a clue. This clue was in a nonfiction book. The oversized book about insects that had become popular in recent days featured a double-page spread that showed pictures of caterpillars and their adult counterparts. The children had asked our question
to the art teacher on the previous week, and now they planned to take the book to class with them that afternoon. Thus, the intermingling of voices, the blending of ideas, moved my students along in their collaborative search for understanding of their fascinating natural world. They were weaving science into their lives.
APPENDIX A

NONFICTION CHILDREN’S BOOKS
### What Makes a Shadow? Revised Edition
Robert Clyde Bulla, illustrated by June Otani

**Overview of Book**
- conversational tone addresses “you” directly, asks questions
- illustrations (colorful detailed drawings) feature young children exploring shadows in a variety of familiar indoor and outdoor settings and accuracy of position of the sun and shadows of objects and organisms
- relationships among illustrations on successive pages provide a narrative structure to the book

**Teaching Purposes**
- follow-up to reading of Shadows Here, There, and Everywhere by Ron and Nancy Goor on the previous day
- extension of and connection to hands-on activities about light and shadows and to an on-line project about Groundhog Day observations in different U.S. locations
- on-going work to address some misconceptions about links between shadows and weather (linked to Groundhog Day)
- follow-up to students’ long-term interest in a library book with a guessing format, Guess Whose Shadow? by Stephen R. Swinburne; also an opportunity to address a possibly confusing statement in the guessing book

**Classroom Connections**
- observation of sunny weather and shadow of “Goshen Groundhog” (our own cardboard groundhog and part of an on-line data collection project)
- classroom explorations with flashlights, objects, and different surfaces; outdoor observation of and play with shadows
- sorting objects by “makes a shadow”, “kinda makes a shadow”, or “lets light through” by testing on the overhead projector
- class shared writing chart project featuring photos of shadows and of objects that made them (students’ stuffed animals)

**Science Standards Links**
- physical science content (text, illustrations); also, position of sun in sky throughout the day/earth science link
- model of children involved in science activity, investigating their world (illustrations)—nature of science/science as a human endeavor

### What’s the Weather Today? Rookie Read-About Science
Allan Fowler

**Overview of Book**
- combination of conversational and neutral tone, both questioning readers/listeners about personal weather observations and experiences and explaining aspects of effects of weather conditions on lives of people and relationship of location and weather patterns
- photographs of activities of people in various places and in various types of weather
- vocabulary review with thumbprint photos at end; index

**Teaching Purposes**
- a book linking our daily weather observing and recording activities
- an introduction to a collection of various nonfiction books about weather—a general overview

Continues on next page with “Classroom Connections” and “Science Standards Links”
### Classroom Connections
- outdoor experience with sunshine and shadows the day before
- observations of different weather conditions in different locations via the on-line project (photos and weather descriptions)—possible connection to places in photographs in the book
- daily routine of observing and recording the weather by placing a unifix cube in one of four baggies—sunny, cloudy, rainy, snowy; monthly routine of constructing a bar graph using the cubes then translating the graph to a more abstract version using children’s graphing software
- a large collection of “little books” from the library about various weather topics
- our class song about observing the weather

### Science Standards Links
- earth and space science content
- invitation in text to participate in observing and predicting the weather, “using” and “doing” science in daily life

### Winter
**Ron Hirschi, photographs by Thomas D. Mangelsen**

**Overview of Book**
- photographic essay—poetic representation of wildlife and habitat in a particular season in a particular part of the U.S.
- part of a series of four season books that link changes in wildlife behavior and physical appearance to seasonal changes in weather and environment; the end of each book leads in to the next season
- page-long afterword provides additional information

**Teaching Purposes**
- connection to current weather conditions and the current season of winter
- connection to seasonal changes observed in our nature lab

**Classroom Connections**
- seasonal observations of the weather conditions and the appearance of the Sweet Gum tree in our nature lab; documentation of the seasonal changes in the tree through monthly creation of “science murals” based on our observations
- autumn and spring field trips to a local park to observe plant and animal life
- display and exploration of all four season books by Hirschi and Mangelsen and later read-aloud of *Spring*

### Science Standards Links
- life science and earth-space science content
- set of books is product of science work of wildlife biologist/author and wildlife advocate/photographer—model of human endeavor of science/pleasure of doing science

### Spring
**Ron Hirschi, photographs by Thomas D. Mangelsen**

**Overview of Book**
- see above notes for *Winter*

**Teaching Purposes**
- connection to current weather conditions and the beginning of the season of spring
- connection to seasonal changes in our nature lab

**Classroom Connections**
- seasonal observations of the weather conditions and the appearance of the sweet gum tree in our nature lab; documentation of the seasonal changes in the tree through monthly creation of “science murals” based on our observations
- observations and measurements of our tulip plants, planted in the fall in our nature lab
- autumn and spring field trips to a local park to observe plant and animal life
- display and exploration of all four season books and previous read-aloud of *Winter*

Continues on next page with “Science Standards Links”
<table>
<thead>
<tr>
<th><strong>Science Standards Links</strong></th>
<th>-see above notes for <em>Winter</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Changing Seasons, Walkabout Book</strong>&lt;br&gt;Henry Pluckrose</td>
<td></td>
</tr>
<tr>
<td><strong>Overview of Book</strong></td>
<td>-full-page photographs and brief text survey human, plant, and animal life throughout the four seasons&lt;br&gt;-neutral tone</td>
</tr>
<tr>
<td><strong>Teaching Purposes</strong></td>
<td>-connection to our nature lab work throughout the seasons: planting bulbs in the fall and creating an information chart about our work; observing the Sweet Gum tree each month and creating science murals to document changes; observing and recording the weather throughout the seasons; crafting a class book about changes in our nature lab</td>
</tr>
<tr>
<td><strong>Classroom Connections</strong></td>
<td>-multiple shared activities, including observing and recording changes in our nature lab throughout the seasons, working in the lab differently throughout the seasons, taking fall and spring field trips&lt;br&gt;-various fiction and nonfiction links to changes in plants and animals throughout the seasons, including stories such as <em>Bear Wants More</em> and <em>Bear Sleeps On</em> (fiction) and the series of photographic essay books by Hirschi and Mangelsen (nonfiction)</td>
</tr>
<tr>
<td><strong>Science Standards Links</strong></td>
<td>-earth/space science content and life science content—a focus on patterns of change</td>
</tr>
<tr>
<td><strong>Be a Friend to Trees</strong>&lt;br&gt;Patricia Lauber, illustrated by Holly Keller</td>
<td></td>
</tr>
<tr>
<td><strong>Overview of Book</strong></td>
<td>-conversational tone&lt;br&gt;-text organization that enumerates key ideas about trees and their importance to people, animals, and our world, along with detailed colorful illustrations that, on some successive pages, provide somewhat of a narrative structure, particularly involving the activities of the people in the drawings&lt;br&gt;-labeled illustrations&lt;br&gt;-closes with information about how to “be a friend to trees” after explaining why to do so throughout the book</td>
</tr>
<tr>
<td><strong>Teaching Purposes</strong></td>
<td>-explicit examination of nonfiction vs. fiction and students’ conceptions about photographs and illustrations&lt;br&gt;-(second reading) follow-up to our spring field trip to a local park, where trees as habitats and trees as prominent bearers of “signs of spring” had been a focus</td>
</tr>
<tr>
<td><strong>Classroom Connections</strong></td>
<td>-long-term study of Sweet Gum tree in our nature lab&lt;br&gt;-field trip to park&lt;br&gt;-“being a friend to trees” by using paper carefully (e.g. using both sides, reusing scraps), placing items to recycle in a labeled cardboard box being reused for that important purpose</td>
</tr>
<tr>
<td><strong>Science Standards Links</strong></td>
<td>-life science content, focusing on organisms and their environment&lt;br&gt;- science in personal and social perspectives, focusing on resources/recycling and decreased use</td>
</tr>
</tbody>
</table>
### Animal Tracks
**Arthur Dorros**

**Overview of Book**
- Text and illustrations represent a walk through a wooded area on the way to a beaver pond; not really a narrative structure but book similar in organization to a story
- Illustrated clues and conversational tone of questions and description of the observed clues invite readers on the walk, to search for evidence and identify various wild animals, then later to look for animal signs in their own various surroundings, including city parks
- Labeled drawings on end papers
- Photograph of author/illustrator observing animal tracks at end of book
- Information about various ways to collect animal tracks at end of book

**Teaching Purposes**
- Recognition and use of the children’s strong interest in “guessing” books
- Opportunities for much enjoyment and for support of taking turns to speak during our (very) interactive read-aloud sessions
- Connection to the idea of using our “science eyes”—as we had done with the naturalist who led our recent field trip

**Classroom Connections**
- Recent field trip, including observations of animals in their habitats
- Several class favorite books for independent and buddy reading featuring a guessing format, most notably *A Children’s Zoo* by Tana Hoban, *Guess Whose Shadow?* by Stephen R. Swinburne, and our own class guessing projects (a previous one about shadows and another to follow, about wild animals)
- An immediate follow-up read-aloud with *Forest* by Ron Hirschi, illustrated by Barbara Bash and an introduction to their book *Ocean*, both of which feature text clues and require making guesses based on the clues

**Science Standards Links**
- Science as inquiry content—Readers involved in using evidence (from text and illustrations) and what they already know about the world to identify various animals
- Life science content, focusing on organisms and their environment
- Nature of science—Science as a human endeavor, modeled by the author/illustrator himself and “experienced” by the reader/listener through text and illustrations, during the observation “walk” through the book

### What Do You Do When Something Wants to Eat You?
**Steve Jenkins**

**Overview of Book**
- Cut paper illustrations detail the unique physical characteristics of the animals represented, against very simple but meaningful backgrounds
- Brief text on one page ending in ellipsis involves reader/listener in predicting behaviors of featured animals as the page is turned
- Text and illustrations survey “a few” of the ways that animals are protected from being eaten; beginning text (introduction) and ending (conclusion/question that connects to what reader would do) link the specific examples in the book to the “bigger picture” of survival/form and function
- Rich, descriptive, accurate vocabulary within highly interactive text

**Teaching Purposes**
- Follow-up to an informational video about animal disguises as defenses on previous day
- Sharing of another book featuring same illustrator as on another recent day
- Building upon a particular student’s (Kurt), as well as others’, strong interest in the details in nonfiction illustrations

Continues on next page with “Classroom Connections” and “Science Standards Links”
<table>
<thead>
<tr>
<th>Classroom Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>- ongoing study of animals and their habitats</td>
</tr>
<tr>
<td>- viewing of an informational video about animal disguises</td>
</tr>
<tr>
<td>- trip to the local zoo</td>
</tr>
<tr>
<td>- follow-up requested read-aloud of a popular classroom book with brief information about how animals keep safe and featuring pull-tabs that demonstrate animal defensive behaviors or physical characteristics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Science Standards Links</th>
</tr>
</thead>
<tbody>
<tr>
<td>- life science content</td>
</tr>
</tbody>
</table>
APPENDIX B

TRANSCRIPTION CONVENTIONS
Transcription Conventions

1. Name: = a student’s speaking turn (All names in transcripts and report are pseudonyms.)

2. T: = teacher’s speaking turn

3. . or ! or ? at end of print = end of speaking turn—the speaker stopped

4. --- at end of print = interrupted speaking turn—the speaker stopped

5. --- within print = interrupted speaking turn—the speaker continued speaking

6. ~ = speech inserted in space of interrupted speaking turn; used with convention numbers 4 and 5

7. ALL CAPITALS = emphasis—the speaker stressed the word or syllable

8. (            ) text within parentheses = description of observed behavior or paraphrase of speech

9. [           ] text within brackets = teacher researcher’s interpretation or explanation of words or actions

10. …. at end of text = gradual fade—speaker’s voice “trailed off”

11. … = omitted speech

12. .. = pause or brief self-interruption/correction in own speech
APPENDIX C

BUILDING TASKS OF LANGUAGE:
GEE’S (1999) DISCOURS ANALYSIS
### Six Building Tasks of Language in Use
(Table based on information quoted from Gee, 1999, pp. 85-86, 93-94)

<table>
<thead>
<tr>
<th>Building Task</th>
<th>Description and Related Questions</th>
</tr>
</thead>
</table>
| **Semiotic building**                             | Using cues or clues to assemble situated meanings about what communicative systems and ways of knowing are here and now relevant and activated  
-What sign systems, systems of knowledge, and ways of knowing are relevant and irrelevant in the situation?                                                                 |
| **World building**                                | Using cues or clues to assemble situated meanings about what is here and now taken as “reality,” what is present and absent, concrete and abstract, “real” and “unreal,” probable, possible, and impossible  
-What are the situated meanings of some of the words and phrases that seem important in the situation?  
-What institutions and/or Discourses are being reproduced in this situation and how are they being stabilized or transformed in the act? |
| **Activity building**                             | Using cues or clues to assemble situated meanings about what activity or activities are going on, composed of what specific actions  
-What is the larger or main activity (or set of activities) going on in the situation?  
-What sub-activities compose this activity?  
-What actions compose these activities and sub-activities?                                                                                                    |
| **Socioculturally-situated identity and relationship building** | Using cues or clues to assemble situated meanings about what identities and relationships are relevant to the interaction, with their concomitant attitudes, values, ways of feeling, ways of knowing and believing, as well as ways of acting and interacting  
-What relationships and identities, with their concomitant personal, social, and cultural knowledge and beliefs (cognition), feelings (affect), and values seem to be relevant to the situation?  
-How are these relationships and identities stabilized or transformed in the situation?                                                                    |
| **Political building**                            | Using cues or clues to construct the nature and relevance of various “social goods” here and now  
-What social goods (e.g. status, power, race, class, etc.) are relevant and irrelevant in this situation? How are they made relevant and irrelevant, and in what ways? |
| **Connection building**                           | Using cues or clues to make assumptions about how the past and future of an interaction, verbally and non-verbally, are connected to the present moment and to each other  
-What sorts of connections—looking forward and/or backward—are made within and across utterances and large stretches of the interaction?  
-What sorts of connections are made to previous or future interactions, to other people, ideas, texts, things, institutions, and Discourses outside the current situation?  
-How do connections of both sorts above help (along with situated meanings and cultural models) to constitute “coherence” in the situation? |
APPENDIX D

QUESTIONS TO GUIDE BOOK SELECTION
<table>
<thead>
<tr>
<th>Features to Consider</th>
<th>Questions/Prompts to Guide Book Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accuracy</strong></td>
<td>Aspects of the book to examine when determining accuracy:</td>
</tr>
<tr>
<td>- Thoughtful, critical reading of nonfiction is needed—with the teacher as a model and mediator in working with students.</td>
<td></td>
</tr>
<tr>
<td>- Multiple perspectives can be represented through use of book sets and a variety of sources.</td>
<td></td>
</tr>
<tr>
<td>- Author’s note, acknowledgements, additional biographical information about author—determine the author’s credentials, whether the text was reviewed by experts, the writer’s research process and sources used, and the writer’s perspective.</td>
<td></td>
</tr>
<tr>
<td>- Copyright date—determine if the information is up-to-date, especially in areas with rapidly expanding bodies of knowledge, such as the sciences, and in areas in which the acceptability of how various people and events are portrayed has changed, such as social studies.</td>
<td></td>
</tr>
<tr>
<td>- Overall consideration (for not only a single text, but for a collection selected for classroom use): the complexity of the treatment of the subject and range of coverage.</td>
<td></td>
</tr>
<tr>
<td><strong>Organization</strong></td>
<td>Types of organizational structures and their functions related to content/purpose of the text:</td>
</tr>
<tr>
<td>- Organization develops naturally from the content of a book and the purpose of the writer.</td>
<td></td>
</tr>
<tr>
<td>- Classroom purposes for examining organization—to support understanding of the information and to serve as models for student writing.</td>
<td></td>
</tr>
<tr>
<td>- Enumeration—for content that includes many subtopics.</td>
<td></td>
</tr>
<tr>
<td>- Sequence (e.g. counting and alphabet structures)—for content that includes numerous terms.</td>
<td></td>
</tr>
<tr>
<td>- Chronological—for content that explores changes or sequences of events that occur over time; often combined with other organization.</td>
<td></td>
</tr>
<tr>
<td>- Compare-contrast—for content that examines the qualities of a topic whole-by-whole; often an internal structure.</td>
<td></td>
</tr>
<tr>
<td>- Cause-effect—for content that examines causal relationships and their consequences; usually internal patterns of part of a combination of structures.</td>
<td></td>
</tr>
<tr>
<td>- Narrative Structures—for content that conveys information within the supportive context of a story; often the writer’s purpose is “to humanize subjects, engender empathy, and convey that events are subject to multiple viewpoints or interpretations” (p. 34); possibly confusing to students, distorting to information.</td>
<td></td>
</tr>
<tr>
<td><strong>Writing Style</strong></td>
<td>Elements of style:</td>
</tr>
<tr>
<td>- Skilled writers seamlessly integrate various techniques to create the style of a work and to “express their personal vision of a topic” (p. 42).</td>
<td></td>
</tr>
<tr>
<td>- Emotional involvement—the writer’s “investment” in the topic, beyond his/her knowledge of it.</td>
<td></td>
</tr>
<tr>
<td>- Language—the writer’s selection of words, combinations of phrases, which should be age-appropriate but not overly simplified and dull.</td>
<td></td>
</tr>
<tr>
<td>- Leads and conclusions—provocative statements and curiosity-arousing questions that engage a reader at the beginning and transitions or statements that encourage a reader to explore a topic further or that leave a reader feeling satisfied at the end.</td>
<td></td>
</tr>
<tr>
<td>- Vocabulary—Use of <em>proper</em> terms, even in books for the very young.</td>
<td></td>
</tr>
<tr>
<td>- Tone—how the writer “speaks” to the reader, such as in a conversational, humorous, neutral, or partisan tone.</td>
<td></td>
</tr>
<tr>
<td><strong>Accessibility of Information</strong></td>
<td>- Features through which readers are afforded opportunities for engagement include access features, which help readers “enter” the world presented by text and illustrations and to choose how they will use the information or reading experience for their own purposes.</td>
</tr>
<tr>
<td>- Visual features represent information in varying degrees of abstraction, which together form a “continuum of meaning”—the farther the representation is from the real world of children’s experience the less meaningful the representation may be.</td>
<td></td>
</tr>
</tbody>
</table>

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APPENDIX E

NATIONAL SCIENCE EDUCATION CONTENT STANDARDS K-4
Overview of National Science Education Content Standards K-4
The following table is an outline quoted from information contained in the NSES website.

<table>
<thead>
<tr>
<th>CONTENT STANDARD A: SCIENCE AS INQUIRY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Abilities necessary to do scientific inquiry</td>
<td></td>
</tr>
<tr>
<td>• Ask a question about objects, organisms, and events in the environment</td>
<td></td>
</tr>
<tr>
<td>• Plan and conduct a simple investigation</td>
<td></td>
</tr>
<tr>
<td>• Employ simple equipment and tools to gather data and extend the senses</td>
<td></td>
</tr>
<tr>
<td>• Use data to construct a reasonable explanation</td>
<td></td>
</tr>
<tr>
<td>• Communicate investigations and explanations</td>
<td></td>
</tr>
<tr>
<td>Understandings about scientific inquiry</td>
<td></td>
</tr>
<tr>
<td>• Scientific investigations—asking and answering a question, comparing findings with current scientific knowledge</td>
<td></td>
</tr>
<tr>
<td>• Different questions require different types of investigations. Some types of investigations are describing objects, events, and organisms; classifying objects, events, and organisms; and experimenting (fair test).</td>
<td></td>
</tr>
<tr>
<td>• Simple instruments extend the senses, providing more information to scientists.</td>
<td></td>
</tr>
<tr>
<td>• Scientists base their explanations on evidence (observations) and on what they already know about the world (scientific knowledge).</td>
<td></td>
</tr>
<tr>
<td>• Scientists make their findings public, using enough descriptive detail so that others may repeat an investigation.</td>
<td></td>
</tr>
<tr>
<td>• Scientists review and ask questions about the work of other scientists.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CONTENT STANDARD B: PHYSICAL SCIENCE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Properties of objects and materials</td>
<td></td>
</tr>
<tr>
<td>• Objects have many observable properties (e.g. size, color, shape, weight, temperature) and the ability to react with other objects (or substances). Properties can be measured using tools.</td>
<td></td>
</tr>
<tr>
<td>• Objects are made of one or more materials, can be described in terms of the materials from which they are made, and can be sorted according to these properties.</td>
<td></td>
</tr>
<tr>
<td>• Materials can exist in different states (solid, liquid, gas); heating or cooling can change a material from one state to another.</td>
<td></td>
</tr>
<tr>
<td>Position and motion of objects</td>
<td></td>
</tr>
<tr>
<td>• The position of an object can be described relative to that of another object or to the background.</td>
<td></td>
</tr>
<tr>
<td>• Tracing and measuring an object’s position over time is a way to describe the motion of the object.</td>
<td></td>
</tr>
<tr>
<td>• Pushing or pulling changes the position or motion of an object; the degree of change is related to the strength of the push or pull.</td>
<td></td>
</tr>
<tr>
<td>• Vibrating objects produce sound; pitch varies according to rate of vibration.</td>
<td></td>
</tr>
<tr>
<td>Light, heat, electricity, and magnetism</td>
<td></td>
</tr>
<tr>
<td>• Light travels in a straight line until it strikes an object. Light can be reflected (mirror), refracted (lens) or absorbed by an object.</td>
<td></td>
</tr>
<tr>
<td>• Burning, rubbing, and mixing substances are some ways that heat is produced. Heat can move from one object to another by conduction.</td>
<td></td>
</tr>
<tr>
<td>• Electricity in circuits can produce light, heat, sound, and magnetic effects. Electrical circuits require a complete loop through which an electrical current can pass.</td>
<td></td>
</tr>
<tr>
<td>• Magnets attract and repel each other and certain kinds of other materials.</td>
<td></td>
</tr>
</tbody>
</table>
CONTENT STANDARD C: LIFE SCIENCE

The characteristics of organisms
- Plants and animals have life cycles. Details of life cycles are different for different organisms.
- Plants and animals closely resemble their parents.
- Many characteristics of an organism are inherited; other characteristics result from an individual organism’s interactions with the environment.

Organisms and their environments
- All animals depend on plants—some eat plants for food, others eat other animals that eat plants.
- An organism’s patterns of behavior are related to the nature of that organism’s environment (number and kind of other organisms in the environment, availability of food, physical characteristics). When the environment changes, some organisms survive and reproduce and others die or move.
- All organisms cause changes in the environment where they live—some beneficial and some detrimental to the organism and others.
- Humans depend on their natural and constructed environments. Humans change environments in ways that can be either beneficial or detrimental for themselves and other organisms.

CONTENT STANDARD D: EARTH AND SPACE SCIENCE

Properties of earth materials
- Earth materials are solid rocks and soils, water, and the gases of the atmosphere. Earth materials have physical and chemical properties that make them useful in different ways—they provide many of the resources humans use.
- Soils have properties of color, texture, capacity to retain water, and the ability to support the growth of many kinds of plants.
- Fossils provide evidence about the plants and animals that lived long ago and about the nature of their environment.

Objects in the sky
- The sun, moon, stars, clouds, birds, and airplanes all have properties, locations, and movements that can be observed and described.
- The sun provides the light and heat necessary to maintain the temperature of the earth.

Changes in the earth and sky
- The surface of the earth changes. Some changes are due to slow processes (e.g. erosion, weathering); other changes are due to rapid processes (e.g. landslides, earthquakes, volcanic eruptions).
- Weather changes from day to day and over the seasons. Weather can be described by measurable quantities, such as temperature, wind direction and speed, and precipitation.
- Objects in the sky (e.g. the sun and moon) have patterns of movement.
CONTENT STANDARD E: SCIENCE AND TECHNOLOGY

Abilities of technological design
- Identify a problem
- Propose a solution
- Implement proposed solution(s)
- Evaluate a product or design
- Communicate a problem, design, and solution

Understandings about science and technology
- People have always had questions about their world. Science is one way of answering questions and explaining the natural world.
- People have always had problems to solve and have invented tools and techniques to solve them.
- Scientists and engineers often work in teams with different people doing different things to contribute to working on a problem, design, and solution.
- Women and men of all ages, backgrounds, and groups engage in a variety of scientific and technological work.
- Tools help scientists make better observations, measurements, and instruments for investigations.

Abilities to distinguish between natural objects and objects made by humans
- Some objects occur in nature; others have been designed and made by people to solve human problems and enhance human life.
- Objects can be categorized as natural or designed.

CONTENT STANDARD F: SCIENCE IN PERSONAL AND SOCIAL PERSPECTIVES

Personal health
- Safety and security are basic human needs.
- Individuals have some responsibility for their own health (dental hygiene, exercise, cleanliness).
- Nutrition is essential to health.
- Different substances (e.g. tobacco, alcohol, over-the-counter medicines, and illicit drugs) can damage the body and how it functions.

Characteristics and changes in human populations
- Human populations include groups of individuals living in a particular location; population density is the number of individuals of a population living in a given amount of space.
- The size of a human population can increase or decrease.

Types of resources
- Resources are things that humans get from the living and nonliving environment to meet the needs and wants of a population.
- Some resources are basic materials (e.g. air, water, soil); others are produced from basic materials (e.g. food, fuel, building materials); and some resources (quiet places, beauty, safety and security) are nonmaterial.
- The supply of many resources is limited. Resources can be extended through recycling and decreased use.

Changes in environments
- Environments are the space, conditions, and factors that affect an individual’s and a population’s ability to survive and their quality of life.
- Changes in environments can be natural or influenced by humans.
- Some environmental changes occur slowly and others rapidly. The consequences of changing environments rapidly differ from consequences of changing environments more slowly over time.

Science and technology in local challenges
- People continue to invent new ways of doing things, solving problems, and getting work done; new ideas and inventions often affect other people in good and/or bad ways. It is helpful to think about effects of inventions and ideas on others in advance.
- Science and technology have greatly improved food quality and quantity, transportation, health, sanitation, and communication. These benefits are not available to all people in the world.
CONTENT STANDARD G: HISTORY AND NATURE OF SCIENCE

Science as a human endeavor

- People have practiced science and technology for a long time.
- Men and women have made a variety of contributions through the history of science and technology.
- Although women and men using scientific inquiry have learned much about the objects, events, and phenomena in nature, much more remains to be understood. Science will never be finished.
- Many people choose science as a career and devote their entire lives to studying it. Many people derive great pleasure from doing science.
APPENDIX F

READ-ALOUD SESSION INFORMATION
Read-Aloud Sessions

R-A 1 and R-A 2  March 3, 2004 and March 4, 2004

R-A 3 and R-A 4  March 11, 2004 and March 15, 2004

R-A 5 and R-A 6  March 17, 2004 and March 22, 2004

R-A 7 and R-A 8  March 22, 2004 and March 29, 2004

R-A 9 and R-A 10  March 31, 2004 and April 1, 2004

R-A 11 and R-A 12  April 20, 2004 and April 23, 2004

R-A 13 and R-A 14  May 6, 2004 and May 11, 2004

R-A 15 and R-A 16  May 20, 2004 and May 21, 2004
Small-Group Nonfiction Writing Session Information

Project Title: *The Wonders of Spring: A Nonfiction Book about our Nature Lab*

Classroom Unit of Study: Spring, Seasonal Changes

Groups and Meeting Dates:
I  Carla, Reba, Peter, John          April 1 and 6, 2004  
II  Kurt, Frances, Sean, Ashley          April 1 and 6, 2004  
III  Laura, Rachel, Ronnie, Michael       April 2 and 5, 2004  
IV  Judy, David, Carrie, Debra          April 2 and 5, 2004  
V  Lawrence, Olivia, Kevin          April 2 and 6, 2004

Project Title: *The Great Big Book of Guessing the Animals*

Classroom Unit of Study: Animals—Habitats, Visual Characteristics

Groups and Meeting Date:
I  Laura, Michael, Reba, Lawrence       May 25, 2004  
II  Peter, Kurt, Ashley, Olivia      May 25, 2004  
III  Ronnie, Rachel, Judy, John      May 25, 2004  
IV  David, Frances, Carla         May 26, 2004  
V  Kevin, Debra, Carrie         May 26, 2004

Due to his absence, I met with Sean individually on another date.
<table>
<thead>
<tr>
<th>Building Task of Language</th>
<th>Number of Text Units in Writing Group Transcripts (out of 1800 text units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity Building</td>
<td>1,052</td>
</tr>
</tbody>
</table>

**Student Talk:**

Reba and Carla, taking turns: Claw and Paw rhyme. Claw, paw! Bed, red! Dan, ran. Tan, can. (I/Spring)

Michael, typically a quiet listener during the read-alouds: …That one’s cloudy (pointed to photo of gray sky) and that doesn’t make a shadow, and that one (pointed to photo of clear sky) does make a shadow and it’s not that cloudy. It’s sunny out. (III/Spring)

Kurt: And what does THIS say? (pointed to printed out sentence) (II/Spring)

Michael: Do you want me to tell you something funny? (I/Animals)

Judy: Not every animal has feathers. (III/Animals)

**Teacher Talk:**

What can we say for that picture in our nonfiction book? (I/Spring)

We’re telling things that are real about the nature lab, and here are some of the things that you’ve said…. (III/Spring)

What are some things you can say about it, without saying, “It’s a rabbit”? (I/Animals)

Ooohh. That’s gonna be tricky. But I think your clues will help people really think, won’t they? (III/Animals)

**Connection Building**

199 (Many also coded as “Activity Building” due to nature of students’ role in the nonfiction writing task.)

**Student Talk:**

Rachel, referring to her outfit: It’s so sunny out…but I didn’t wanna wear this! (III/Spring)

Kurt, referring to the choice of yellow paper for the group’s page: Yeah, ‘cause it’s spring. Remember on those spring books? (II/Spring)

David: …There’s giraffes at the zoo! I saw it! Because…I went there with my daycare! (IV/Animals)

Michael: It, where the president lives, um, my cousin, he went there, and they went to the zoo, and the gibbon flung poop. (I/Animals)

**Teacher Talk:**

…When we go to the nature lab, we’ll look at that in person. (I/Spring)

referring to John’s statement that the tree branch in a photo looks like a claw: But that’s what it looks like….Scientists think like that, and use their imaginations. (I/Spring)

referring to a rabbit, for our clue book: And could you see it around [our town], where we live? (I/Animals)

And the other day, remember, you said another real good clue…. (IV/Animals)


