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Identifying and Encouraging Math In Children's Out-of-School Activities In the Rural Lowcountry of South Carolina

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To my family, as this experience was truly a family effort.

ABSTRACT

Research shows that children of different backgrounds and cultures learn and perform differently in mathematics despite similar intelligence levels and mathematics instruction (Alvarez & Bali, 2004). Ethnomathematics strives to explore and explain such phenomena in terms of the complex role culture plays in one's background experiences and perceptions that influence cognition and how school is experienced (Ascher, 1991; Barton, 1996; Bishop, 1994; D'Ambrosio, 1994). The importance of recognizing and utilizing the mathematical concepts imbedded in students' everyday activities is stressed in the field of ethnomathematics (Ascher, 1991; Bishop, 1994; Presmeg, 1998). In order to relate students' out-of-school experiences to content learning for the most accessible, effective math instruction, educators must have a deep understanding of students' experiences and how mathematical concepts relate to these.

This qualitative research aims to shed light on the out-of-school activities that a group of 4th grade students from the same rural area of the Lowcountry of South Carolina participate. The manner in which the students participate in these activities, including any use of mathematical concepts, was explored. A technique called dialogue journaling, in which students write about their out-of-school experiences with the teacher responding with written questions and comments (Peyton, 1993), was tailored for the purposes of math education. This dialogue journaling was used to learn about students' activities, any utilization of mathematical concepts involved in these activities, and students' perceptions of the embedded mathematics. The journals were also explored as a means

for classroom teachers to encourage students to apply more mathematical concepts in their out-of-school activities.

It was found these students participate in a large range of daily activities. Activities that were common for many of the students included watching television, riding bikes, playing on the computer, playing video games, sports, horseback riding, hunting, riding four-wheelers, golf carts, and go-carts. Some activities were unique to individuals such as observing spiders and modeling in fashion shows.

Mathematical ideas embedded in the manner in which these students participate in their activities began to emerge. These concepts include simple counting, skip counting, patterns, using money, measuring and estimating distance and weight, division, and probability. The students did not readily perceive themselves as using many mathematical ideas during their activities. Mathematical ideas that were recognized by students include simple counting, using money, and measuring.

Dialogue journals proved to be an efficient strategy for learning about activities in which students participate, how they participate in such activities, and their perceptions of these activities. The majority of the students liked having written conversations with their teacher in the dialogue journals, but did not like having to respond in the journals for homework.

Dialogue journals were able to be used to encourage and push students to apply more mathematical thinking when considering their daily activities in some cases, but not all.

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List of Abbreviations

TIMMS .....Trends in International Mathematics and Science Study

MAP..... Measure of Academic Progress

PASS..... Palmetto Assessment of State Standards

CHAPTER 1

MATH + CULTURE = MORE QUESTIONS

Research Statement

It is difficult to discuss the state of mathematics teaching and learning in the U.S. without hearing a reference to the Trends in International Mathematics and Science Study (TIMSS). Due to the United States' low performance on TIMMS in relation to other industrialized nations, attention on how mathematics is taught in select Asian countries has increased dramatically as American educators look for the key to success for effective math teaching. Now knowledge of Singapore Math, a teaching method developed to emulate math instruction in Singapore, as well as how the Korean standards compare to the typical U.S. state's standards are common among American math educators (Hoven & Garelick, 2007). The latest TIMMS report of 2007 has shown overall improvement for the United States, but with race and ethnic disparities causing continued concern (Kirkpatrick, 2009).

A recent trend in mathematics education in the United States is the transition to Common Core State Standards. These standards were developed as a means to provide all students, despite their location, to be taught with the same clear, high expectations that should enable them to be successful in college and/or careers (National Governors Association Center for Best Practices, 2010). At this point, 45 states, the District of Columbia, four territories, and the Department of Defense Education Activity have adopted these standards (National Governors Association Center for Best Practices,

2010). The National Council of Teachers of Mathematics (NCTM), an organization whose aim is to support teachers in providing equitable mathematics education, is on the coalition for effective implementation of these standards (nctm.org/standards/mathcommoncore/).

Whether one is looking at math education and achievement at the international, national, or local level, it is hard to ignore differences that emerge for students of different cultures, races, and backgrounds. It all points to discrepancies in student access to math learning. Investigating the instructional practice of teaching in countries, states, counties, and schools that have experienced more success than others is important. It is natural to learn from and share ideas with others. But with the continually deepening understanding of the nuances of culture the question must be asked: How feasible is it to borrow or lend educational ideas and practices among different cultural groups? In light of the advantage many Asian countries seem to have in mathematics education as well as the achievement gap for minority racial and ethnic groups, the role of culture in math education must be thoroughly explored. The results of such explorations have implications for how comparative research is conducted and used. These results also affect how knowledge of the cultural backgrounds of educators and students is utilized for more effective instruction.

Research in ethnomathematics over the last three decades has deepened our understanding of the role of culture in mathematics education. It leads us to pose new questions and to reframe old ones. How do the daily math practices among different gender, socioeconomic, and cultural groups compare? Effective teaching recognizes and utilizes the fact that students bring their individual experiences and funds of knowledge

into the classroom. How do we acknowledge and use students' cultural backgrounds to build effective and appropriate curriculum, without falling into the pitfalls that can incur when an outsider "expert" tries to interpret and place value on components of another's culture?

The search for understanding how mathematical concepts are most effectively taught and learned is a never ending journey for educators. The importance of relating students' experiences and interests to content learning is commonly recognized among educators. In order to achieve math instruction that connects to students' experiences and interests, educators must have an understanding of their specific students' interests and how mathematical concepts relate to these interests. They must have avenues to help them utilize this information for more effective math instruction.

Research Purpose

The purpose of this research is to add to the knowledge base of the everyday use of mathematics as it is found in children's out-of-school activities. The study sheds light on the activities and experiences of 4th grade students from a rural community in South Carolina's Lowcountry, a unique region whose daily mathematical practices have experienced little investigation.

This research also aims to give insight into a teaching method, dialogue journaling, which may assist classroom teachers in uncovering math concepts embedded in students' out-of-school activities as well as provide an avenue for teachers to guide students to utilize more mathematical concepts in these activities. Research on dialogue journals in math class have centered on the use of journals as a means for students to organize and explain their thinking about a specific problem or math in general. (Koirala,

2002; Burns & Silbey, 2001; Gordon & MacInnis, 1993; Borasi & Rose, 1989; Bell & Bell, 1985; Nahrgang & Peterson, 1986). Dialogue journaling as a means to encourage math applications outside of school has not been researched. The purpose of expanding this understanding is for its use in making more informed and appropriate decisions in curriculum design, leading to more effective teaching and learning of mathematics with this population.

Major Research Questions

The research questions under investigation are:

1. What kinds of everyday activities do a group of rural, 4th grade students from the Lowcountry area of South Carolina participate in outside of school?

2. What types of mathematical concepts, if any, are these students using in these activities? How do these students perceive these activities in relation to mathematical concepts?

3. How can dialogue journaling be used as a strategy to gain information about these students' experiences and be utilized to engage students in further mathematical applications within these activities of choice? How do these students experience this strategy?

Type of Study

Maxwell (2005) described five research goals for which qualitative studies are a good fit. These include understanding meaning for the participants, understanding contexts in which participants act, and understanding processes. With the overall intention of expanding understanding about the experiences and perceptions of a group of students, this research is best undertaken with a qualitative approach. Recognizing that

"research design should be a reflexive process operating through every stage of a project" (Hammersley & Atkinson, 1995, p.16), a flexible design was used, allowing six case studies involving surveys, interviews, and journal conversations to be conducted in the most fitting time frame and manner. Conducting case studies is necessary in order to produce intensive data that reveals mathematical concepts used in these students' out-of-school activities, to determine how these concepts are used and perceived, and to better understand how these students experience dialogue journaling.

Conceptual/Theoretical Perspectives

There are many roads of educational philosophy and theory that may lead one to recognize the value of exploring the out-of-school activities of students within a particular community. There are many roads that may lead an educator to recognize the value of exploring the use of dialogue journaling for math learning. The two main educational theories that led me to this point and guided my research are ethnomathematics and constructivist theory.

Ethnomathematics is the study of the history and cultural roots of math education, as well as the implicit math in everyday activities (D'Ambrosio, 1985; Skovsmore & Vithal, 1997). A major goal of ethnomathematics is to recognize culturally unique mathematical practices and contexts and the connection between student experiences and school mathematics (Orey, 2006). It is through this ethnomathematics lens that I was led to explore the mathematical experiences in the everyday life of students within the particular cultural region of South Carolina's Lowcountry.

Constructivist theory is the concept that people construct new knowledge by connecting it to previous experience (Bruner, 1966; Cannella & Reiff, 1994; Richardson,

1997). This complements ethnomathematic's goal of recognizing connections between school math and everyday experiences and led me to explore dialogue journaling as a strategy to build a connecting bridge.

Journal dialoguing in the English classroom is a continued written conversation between the teacher and student in which the teacher responds to student entries with questions and comments as a means of learning about student backgrounds and to develop literacy skills (Peyton, 1993). Dialogue journaling in the Mathematics classroom refers to student writings reflecting on and explaining the thinking processes involved in various classroom math experiences (Borasi & Rose 1989). For the purpose of this study, dialogue journaling refers to a blending of these uses, a written conversation between the teacher and student in which students' free-time activities were explored with a mathematical lens, and students were encouraged to recognize and apply more mathematical concepts in their activities. This form of dialogue journaling was chosen for its value as a means of learning about the ethnomathematic background of individual students, as well as its value in forming a bridge to connect classroom learning to students' everyday activities of school. It is these principles of ethnomathematics and constructivism that influenced my analysis of data, as I searched for how well dialogue journaling can uncover students' ethnomathematic experiences and how well it can be used to foster students' application of math concepts. The dialogue journaling was also used as a means of exploring students' impressions of mathematics learning and the journaling strategy.

Situated Knowledge and Related Assumptions

Ever since I was a young student, I have been curious about culture and how

others experience school in different settings. My insatiable quest for information about others in the context of school begins as early as my time spent as a teacher cadet in high school, choosing the topic of the Japanese educational system for my final term paper in 1991. I also hounded the exchange students for discussions comparing their experiences in their home school to our American school. Later experiences teaching in Slovakia, Bulgaria, the Navajo Reservation, and in a predominantly racial minority school in South Carolina only elongates my list of questions about the effects of social class, race, and culture on teaching and learning, as many seemingly logical assumptions are proven to be ill-conceived.

More recent events have led to a focus on mathematics education. My oldest son showed an early aptitude and interest in mathematics. Also, my teaching duties narrowed down for several years to primarily one subject, math. With my ever growing awareness of the importance of mathematics to solve mankind's most challenging problems, the constant search to be a more effective mathematics teacher for my students, as well as the constant search for the best math resources to supplement my son's schooling, naturally led my explorations to run into topics such as Singapore Math and ethnomathematics.

Another factor that shapes my perspective on math instruction and learning is my own experiences as a math student, my experiences dreading it, loathing it, and being confused by it. These memories motivate me to strive for ways to make math understandable for my students, so that they never have to feel what I felt sitting in a math classroom. Using an understanding of ethnomathematics as a framework makes sense to me because it recognizes the uniqueness of the experiences of the student and allows for this background to be the beginning point for math instruction and learning.

This helps reduce a disconnect between classroom instruction and the student's life, a disconnect that was never bridged for me as a student.

The most crucial assumption that I am making serves as the backbone for the purpose of this research, the assumption that math is not culture free and that math as presented in school can look different than math as used in everyday activities (Presmeg, 1998). Based on the research about ethnomathematics, I accept that students have better access to mathematical ideas and applications when ideas imbedded within a culture are used for curriculum development (D'Ambrosio, 1985; Gerdes, 1998; Powell & Frankenstein, 1997; Presmeg, 1998).

Another obvious assumption that I make within this study is that mathematical concepts *can* be found imbedded in activities and the methods in which children chose to play. I believe this assumption stems from my ability, as well as that of other educators, to find ways in which to use a nonacademic topic as a springboard to connect to required academic content. It also stems from observations of my own two boys at play, as they chose to play games which require estimating, measuring, and adding or subtracting.

A third assumption made is that identifying mathematical concepts in a culturally unbiased manner is difficult to achieve. A challenge to research such as this is the difficulty of breaking free of limits created by one's own cultural background and experiences that could influence the identification of mathematical concepts in children's games. As the primary instrument of research, my observations were thus analyzed through my worldview lens (Merriam, 1998). I have been a teacher in the public school systems, teaching state math standards in preparation for state and national tests for the past 13 years. This has surely drawn the boundaries of my view of what constitutes real

or valuable math and this must be dealt with in order to not overlook mathematical thinking intertwined in student activities.

Situating the Research Questions

The first two research questions explored are: 1) What kinds of everyday activities do a group of rural, 4th grade students from the Lowcountry area of South Carolina participate in outside of school? and 2) How do these students perceive these activities in relation to mathematical concepts? These questions are guided by concepts founded in ethnomathematics research. Recognizing the role culture plays in the learning of mathematics (Ladson-Billings, 1997; Gustein, et al., 1997) led me to question the effects of Lowcountry culture on these students' math experiences in their free-time. My third research question is: 3) How can dialogue journaling be used as a strategy to gain information about these students' experiences and be utilized to engage students in further mathematical applications within these activities of choice? How do these students experience this strategy? This group of questions was developed using principles of constructivist theory, the concept that people construct new knowledge by connecting it to previous experience (Bruner, 1966; Cannella & Reiff, 1994; Richardson, 1997). Understanding the importance of linking learning to past experiences led me to explore the effectiveness of dialogue journaling aimed at encouraging more mathematical usage during out-of-school activities.

Definition of Terms

Dialogue journaling- a written conversation between the teacher and student in which students' free-time activities is explored with a mathematical lens, and students are encouraged to recognize and apply more mathematical concepts in their activities through

teacher comments and questions

Ethnomathematics- a field that refers to the intersection of culture and math (Ascher, 1991) and explores the mathematical contributions of all peoples, the math in everyday practices of a culture, and the use of one's culture to inform math education

Everyday math- math that is used in non-academic settings and for non-academic purposes

Out-of-school activities- any activity engaged in that is not school related or engaged in for school purposes

Limitations

This research is designed to provide insight into a limited researched population, and as thus is not intended to be generalizable to other children of the same age around the country. Environmental and economic differences inevitably led to some differences in available activities and student interests. Although this research uncovered some out-of-school activities that are similar or even identical to students of another population, broad generalization of study results is cautioned against. *How* children participate and experience activities can vary greatly, and thus teachers must explore their own particular group of students. Intensive research was conducted in order to help other educators assess the applicability to their own student population.

In order to appropriately explore the research questions posed, it is necessary to

use my own students as participants, thus presenting the possibility of biases interfering with the data gathering and/or analysis. However, this was dealt with through constant awareness, reflection, and communication on how this may have influenced conclusions drawn (Maxwell, 2005).

Summary

This chapter has given some background to the road that has led to the questions being posed, the goal of finding answers to these questions, and the theories undergirding this research's approach. Chapter Two more thoroughly covers literature that informs this particular research, and Chapter Three describes and defends the design and methodology proposed. Chapter Four presents and analyzes the data collected, and Chapter Five addresses the research questions while offering recommendations for future research and implications for professional practice.

CHAPTER TWO

REVIEW OF RELATED RESEARCH

Culture and Learning

The role of culture in learning is of primary importance to this proposed research. Culture is defined as the values, traditions, relationships, and worldviews of a group of people united together by history, geography, language, social class, and/or religion (Nieto, 2000). According to Nieto, better understanding of attitudes and values inherent in a culture is necessary for a deeper understanding of how learning is affected by culture, as it directly affects how one perceives, interprets, and communicates learning.

In a document designed for an instructional session entitled "The Classroom Mosaic: Culture and Learning", Darling-Hammond et al. (2012) point out that schools have a culture in and of themselves, with its own norms and ways of thinking. This culture may be congruent or incongruent with the students' home and community cultures. Incongruity leads to complications for students' learning. An aim of multicultural education is to remedy these mismatches by the use of an *equity pedagogy* (Banks, 1993) in which all students have equal access to learning due to educators' understandings, awareness, and ability to connect students' backgrounds to challenging learning goals.

Garcia (1993) reviewed research on culturally diverse settings in which academic achievement was high and found that an emphasis on communication between teachers and their students was included as a common feature. Journals and questionnaires are

recommended ways of learning about students' backgrounds and communities in order to inform a multicultural perspective of teaching (Darling-Hammond et al., 2012). This research explored the use of journal dialoguing as a form of communication emphasis. Along with questionnaires, it served as a major data gathering tool to research the culture of this particular Lowcountry community.

Ethnomathematics

Mathematics had traditionally been seen as value and culture free (Presmeg, 1998), as *the truth*, immune to being influenced by or influencing bias. But research is showing the impact that culture has on cognition (Ladson-Billings, 1997). This points educators to the importance of culturally relevant pedagogy (Gustein et al., 1997).

The discourse around ethnomathematics brings valuable concepts to the forefront which helps frame research on the interplay of culture and mathematics education. Ethnomathematics is a term coined by D' Ambrosio (1985) originally to refer to the mathematics embedded in everyday practices of a cultural group. This definition has since been expanded by D'Ambrosio and debated by many. Currently, a fairly accepted definition is that ethnomathematics includes the study of the history and cultural roots of math education, as well as the implicit math in everyday activities (Skovsmore & Vithal, 1997).

Barton (1996) attempted to synthesize the various writings and perspectives on ethnomathematics in his work. His research draws out different intentions of its use, including for curriculum development, how mathematics education is culturally situated, and researching how math education affects society and supports particular political systems. Considering D'Ambrosio's studies on the process of knowledge-making

showing that different forms of thought can lead to different forms of math, Gerdes's stance that math education can serve liberatory purposes in recognition of the social politics involved, and Bishop's work on identifying pre-mathematical practices that are present in every culture, Barton concludes that the common thread in ethnomathematics is that it is an "interpretive program between math and culture" (p.214).

In Vithal's and Skovsmore's (1997) critique of ethnomathematics, they note the similarities with critical math as both are a reaction to modernization theory, being greatly concerned with cultural imperialism. From this basis, a general theme of ethnomathematics is to use the ideas imbedded within a culture for curriculum development instead of importing a curriculum. Presmeg (1998) firmly ascribed to this philosophy, calling for the recognition of students' ethnicity as a resource in the mathematics classroom. The danger in this is that this stance, meant to affirm people's cultures, could be used as a basis for segregation, with similarities to the rhetoric used in apartheid's educational system (Vithal & Skovsmose, 1997). Another criticism they have is that ethnomathematics is an ideological construct and does not give enough attention to the relations between culture and power.

Ascher viewed ethnomathematics as the intersection of math and culture (Barton, 1996) which ties up many of the ideas presented in the literature. It is this endeavor, to discover where, when, why, how, and to what affect these intersections occur, that provides a starting point for analyzing research. Thus discussion and critiques of ethnomathematics leads to useful guidelines and points to consider when looking at any research that involves the teaching and learning of mathematics among various cultures. How do we appropriately acknowledge students' cultures in avoidance of "color blind"

instruction that ultimately leads to the teacher's culture becoming the only culture valued (Presmeg, 1998), and yet avoid problems that can incur when using the students' culture as a basis for instruction, such as the difficulties arising by having a member from the outside trying to interpret and place value on components within another culture?

Rural Mathematics Education

Discourse on rural mathematics education aims at revealing and exploring the unique context that the rural setting presents for mathematics education. Research confirms that lifestyles, perspectives, and priorities typical in rural communities contrast with that of non-rural communities (Haas & Nachtigal, 1998; Nachtigal, 1982; Seal & Harmon, 1995; Campbell & Silver, 1999; DeYoung, 1995). Due to factors such as physical geography, history, and economic foundations, rural cultures can even vary greatly from one rural context to the next, with rural southern Appalachia differing from the rural Mississippi bayou for example (Bush, 2005). Connect this recognition of distinct rural cultures with the recognition that culture influences teaching and learning, and the importance of understanding math education in terms of its unique rural context becomes apparent.

However, research focused on the rural context of mathematics education is very scant (Bush, 2005; Silver, 2003; Schultz, 2002; Kannapel & DeYoung, 1999). Bush (2005) observed that research on rural mathematics and place-based pedagogy is lacking as is research on ethnomathematics that is focused on the rural contexts.

> Many of these contexts are rural, but oddly enough, "ruralness" is rarely considered as a salient influence. These studies focused exclusively on differences among the wealthy and impoverished, the powerful and the oppressed, or the majority and the ethnic minority. (p. 4)

And despite research and literature recognizing the uniqueness of various rural settings, none has been uncovered that explores math education in the southern Lowcountry. The literature that does exist is typically focused on communities in the Appalachians or in developing countries (Bush, 2005; Howley, C., Howley, A., & Huber, 2005).

Existing literature on rural mathematics education often includes a deficiency theory perspective, in which underachievement, as defined by middle and upper class society, is explained in terms of a disadvantaged economic and social environment as found in Danek's, Calbert's, and Chubin's (1994) discussion. Other literature attempts to reverse this trend by exemplifying the importance of using the advantages and strengths of the rural setting as a basis to build mathematics education upon (Howley, 2005; Kannapel & DeYoung, 1999; Williams, 1989).

Finding ways to provide access to mathematics learning that connects to students' lives and communities is a goal of those interested in rural mathematics education (Greer et al., 2009; Bush, 2005; Kannapel & DeYoung, 1991). In an article on improving research on mathematics education in rural settings, Bush (2005) stated that ethnomathematics research can help rural educators connect academic mathematics to students and their communities, noting that ethnomathematics makes more comprehensive connections than place-based pedagogy with "stronger bridges between mathematics and culture" (p.6). Barton (1996) discussed various ethnomathematical methodologies that are applicable to the goals of my research. One is that of descriptive research in which student beliefs about mathematics and its teaching and learning is explored. Another is *mathematizing* in which a culture's informal mathematics is connected to formal ideas. This type of research would include investigating teachers'

strategies at connecting students' lives and environments with classroom math instruction. Without understanding these perceptions and roles of mathematics in its rural setting, educators' efforts may fall short (Bush, 2005).

Constructivist Learning and Mathematics

Constructivism is the learning theory that people construct their own knowledge by building on one's existing ideas, experiences, and understandings (Van de Walle, 2007). Current understandings of constructivism stem from the research and writings of Dewey, Piaget, Bruner and Vygostsky and are the underlying foundation of many trends in education (Cobb, 1996; Richardson, 1997). This construction of new learning requires active thinking on the part of the learner as new learning is integrated with what is already known (Baroody, 1987; Fosnot, 1996; von Glaserfeld, 1996). The depth and number of connections made influences the extent of new learning. Recognizing the role that previous experiences play in learning new material leads constructivist educators to not simply question whether a student understands a concept, but how he/she understands it and what ideas to which the student is connecting (Van de Walle, 2007).

Literature on the topic points out that the challenge in doing this lies in transforming this theory of learning into practice (Richardson, 1997; Mackinnon & Scarff-Seatter, 1997). Fosnot (2005) warned that constructivism is not a theory of teaching, but a theory about learning. However, she noted that analyzing this theory can lead one to teaching strategies that support the construction of authentic understanding and suggests that supporting cognitive construction can be done by giving students opportunities to seek out patterns and ways to model their world mathematically, which she refers to as mathematizing the activity. Good instruction helps "students construct

their own ideas using ideas they already have" (Van de Walle, 2007, p. 28). As Richardson (1997) pointed out, the constructivist classroom aims to encourage interactions of students' prior and new learning, understanding that integration will lead to new knowledge not only being applied during school activities, but applied to other activities as well. A constructivist framework helps educators understand how learning occurs, but does not specify particular strategies or models (Simon, 1995). Brooks and Brooks (1999) recognized that commonalities in constructivist informed approaches can be found however, including the focus on using student interests and prior experiences as a spring board for new learning, as well as encouraging dialogue about understandings, questions, and experiences.

It is these understandings on constructivism that point to the relevancy of exploring strategies undergirded by this constructivist perspective. These strategies enable the teacher to uncover students' experiences and encourage students' involvement with math learning by actively connecting academic learning to out-of-school life and out-of-school life to academic learning.

Journals in the Classroom

Research and literature on the use of journals in the math classroom pertains to journals in which students write to problem solve, organize thoughts, and express mathematical concept understandings and difficulties (Borasi & Rose, 1989; Burns & Silby, 2001; 1986; Bell & Bell, 1985; Nahrgang & Peterson, 1986; Vukovich, 1985).

Burns and Silby (2001) pointed out several types of advantages that math journals give to math learning and instruction. Writing about a math problem or concept guides students to work through confusions and gain deeper understandings. Math journals are

also a means of evaluation, revealing both strengths and weaknesses in student understanding. They can be used as a reflection component at the end of a math lesson allowing students to express their feelings about math, their learning, concerns, and questions. Burns and Silby also gave suggestions for how teachers respond to students' math journal entries, suggesting comments that lead students to deeper thinking and show interest in student thinking in place of general, broad comments.

Borasi and Rose (1989) examined the unique role math journals play in combating the limited view of mathematics that students often hold. This narrow view of mathematics merely entailing memorizing steps for routine exercises, leads to an ineffective approach to learning for true, long term, conceptual understanding. Borasi and Rose suggested using writing in math to facilitate development of deeper learning and attribute this concept's foundation to a Vygotskyan perspective of learning that recognizes connections of writing as communication and its role in learning. Journal writing is thus seen as a meaning-making process, building connections between what is being learned to prior knowledge and experiences (Mayher, Lester, & Pradl, 1983).

This research expands the use of journal writing for math instruction and learning by focusing on its intersection with students' daily lives outside of school.

Math in Children's Games

There has been much researched and written in regards to ancient and traditional games used in various cultures that involve mathematical thinking. Berken (2004) has written about traditional games of cultural groups such as the Navajo and Maori. Mosimege and Nkopodi (2009) researched the incorporation of a traditional game in classroom instruction in South Africa. Claudia Zaslavsky (1982) extensively researched

three-in-a-row games used from ancient cultures to computer games and has written a book. Research such as this tends to focus on using the games to expose students to activities involving math from other cultures or from the student's ancestors' repertoire.

Research in the area of everyday use of mathematics has focused on the most obvious required needs of math outside of school, such as using money in stores. Research focused on the everyday use of mathematics in play activities, activities of students' choice, is either in reference to early childhood classroom's play sessions or is focused on one type of game. Research in the area of students' play activities has primarily focused on what attracts them to these activities, health issues, social interactions, or values transmitted (Newman et al., 2007; Lawry et al., 1995; Elkins et al., 2004; Kremer-Sadlik & Kim, 2007). No research has been located yet that inventories and categorizes the activities of choice of today's students that utilize math concepts. There also has been no research located that explores the encouragement of further use of mathematical concepts during students' free time activities.

My research study connects the areas of the everyday use of mathematics and children's free time activities in the Lowcountry of South Carolina. It enables us to see what kinds of math the participating children are willing to engage in when involved in their chosen activities. This study explores how these children experience educational strategies aimed at increasing the use of mathematical concepts within these free time activities. The overall aim was to identify which mathematical concepts these children are encountering in their activities of choice, the context in which these concepts are used, and how this information can be utilized to expand children's math experiences.

Case Study

The case study as a research approach is covered in this section due to its pertinence to this study. The research questions of this study define a particular group that is to be studied in a particular moment in time. Following Merriam (1998), this group of students at this location represents a bounded system and therefore, is recognized as a case. This research design is appropriate when it is impossible to separate the variables from its context (Yin, 1994). Yin states that the use of a case study is particularly useful for answering *how* questions. Case studies are centered in real-life contexts and produce a rich account of the phenomenon under study (Merriam, 1998).

There are numerous types of case studies, but the intent can help categorize it, such as descriptive or interpretive (Merriam, 1998). Descriptive case studies describe, typically with the intent of presenting information about a topic that has received little previous research. Interpretive case studies also rely on description but additionally have the intent of using the description to develop categories to view in light of theory.

Interviews are always going to be a means of obtaining data in a qualitative case study (Merriam, 1998). Its purpose is to help the researcher understand things from the participant's perspective (Patton, 1990). In order to gain the rich data needed to illuminate the phenomenon under study, the researcher conducts the interview with open-ended questions, understanding that the participant defines his/her world form his/her unique perspective.

Summary

This chapter has provided a review of literature pertinent to this study by both informing this study and providing a lens through which every aspect can be viewed.

The next chapter will describe the methodology and strategies chosen to gather and analyze data.

CHAPTER THREE

DESIGN AND METHODOLOGY

Methodological Approach

Following Merriam (1998), this study aims to focus "on discovery, insight, and understanding from the perspectives of those being studied" (p.1) and therefore followed a qualitative design. This qualitative research required a flexible design using grounded theory principles as case studies and action research is conducted. Conducting case studies was necessary in order to unearth any mathematical concepts that may be used in these students' play time, to determine how these concepts are used and perceived, and to get at the specifics of how these students experience dialogue journals.

Site selection, criteria, and justification

Site selection for this research recognized that different geographic regions contribute in the creation of a unique regional culture. Activities pursued, the way in which these activities are pursued, and students' perceptions of these activities are local-culturally based. One rural area of a state is not equivalent to another. Therefore, in order to gain data that is truly representative of students living in rural areas of the Lowcountry, a rural area of the Lowcountry must be the site chosen for the research. The B.F. Elementary (pseudonym) school is in the Lowcountry, surrounded by a national forest through which the Palmetto Trail, swamps, and creeks meander. Due to this

location, there are not many businesses located in the area. The school serves eight small communities within a 30 mile radius. Most of the residents in this area attended B.F. Elementary School as children, as did their parents and grandparents. The majority work outside of the area, thus limiting community participation at the school during the day.

B.F. Elementary has approximately 805 students, 19.5% African-American, 79.5% Caucasian, and 1% other. This Title I school has 73.95% of its students qualifying for free or reduced lunch.

Last school year, B.F. Elementary continued its transition as an arts-infused school by opening its Academy of the Arts program. Through a lottery system, students were selected to fill two classes at each grade level, from 1st through 5th grade. Interested teachers applied and interviewed for selection as an Arts Academy teacher.

South Carolina adopted the Common Core Standards July 14, 2010. For South Carolina, the 2012-2013 school year is considered a transition year, 2013-2014 a bridge year, and 2014-2015 a full implementation school year. The Lowcountry school district county in which the students of this study reside, teachers are expected to teach the Common Core Standards on a daily basis, with the Common Core Standard written in daily plans, and the Common Core aim for each lesson posted in the class room and referred to frequently during lessons.

B. F. Elementary School, as well as the school district in which it lies, greatly relies on the standardized test scores from the Measure of Academic Progress (MAP), a nationally normed test, and the Palmetto Assessment of State Standards (PASS), the statewide test, to assess student, teacher, school, and district performance. Both tests provide data considered for decisions such as inclusion in the accelerated classes, special

education classes, retention and promotion, and sometimes for teacher incentives. These test scores are poured over by administrators and teachers during staff developments to inform and direct class instruction and programs.

Participant selection, criteria, and justification

One class of 4th grade students who attend B.F. Elementary was chosen for the opportunity to participate in this study. Students of the elementary level were chosen in recognition of findings that racial achievement gaps begin in the elementary years, although research varies as to exactly when in elementary school this occurs (Alvarez & Bali, 2004).

One aim of this research was to explore ways in which a teacher may uncover his/her students' out-of-school activities and a strategy (dialogue journaling) that a teacher may use to encourage the utilization of more math concepts in these everyday activities. Thus it was necessary that this action research be conducted by the participants' teacher. It was most feasible for my own class of 4th graders to be the participating class in order for them to go through the experience in the manner that is being explored, with the classroom teacher requesting questionnaires and dialogue journals of them.

My class is one of two 4th grade Academy of the Arts classes. Therefore, many of the students were in the same class together last year, during their 3rd grade year. All but five of the students were in the arts program last year. During the open house at the beginning of the school year, six out of the attending 14 parents informed me that their student struggles with math. Standardized test scores on both MAPS and PASS indicate that the majority of the students in this class are stronger in reading than in math.

Every student in the class participated in the initial background data gathering questionnaire and math attitude survey, as well as used a dialogue journal. These students completed a final questionnaire and attitude survey near the end of the three month period. They were also presented questions about their experience with the dialogue journaling as their last entry.

With the use of the data obtained in the initial survey, in conjunction with my intimate knowledge of the students as their self-contained classroom teacher, six students were selected to participate in two interviews with parent permission (Appendix D). Purposive sampling was used due to the necessity of having participants with the most potential to add to the understanding sought after in this study (Merriam, 1998). In order to most accurately understand the activities this group of students is involved in and their perceptions of math involved, the case-study participants chosen represented the range of the students in the classroom in terms of gender, race, interests, socioeconomics, math performance, and math attitudes. Including the voices of both boys and girls in this research is of interest due to the effect culture can have on gender variations in math attitudes and performance (Else-Quest, Linn, & Hyde, 2010). Following Maxwell (2005), this purposeful sampling served the point of providing data that would have been missed with random sampling. The intensity sampling's criteria allowed not only the inclusion of the ranges found but also ensured that the typical student was also represented in terms of common after-school activities.

The parents of these case-study students were asked to complete a questionnaire about their child's activities for both clarification and triangulation purposes (Appendix E).

Methods

Due to the fact that students of different ages and from different geographical regions have access to different activities, this study focused on a group of 4th grade students from the same area. Twenty-four 4th grade students in the same class in an elementary school in a rural area of the Lowcountry of South Carolina participated in this study. Data collection tools included math attitude surveys, free-time questionnaires, dialogue journals, and six case studies involving interviews.

Math Attitude Survey

All 24 participants completed a math attitude survey at both the beginning and conclusion of the semester. The survey contained questions taken from the Fennema-Sherman mathematics attitudes scales (Fennema & Sherman, 1976) (Appendix B). The Fennema-Sherman Mathematics Attitudes Scales is a Likert-type scale, originally developed as part of a grant from the National Science Foundation, to measure nine domains considered affective variables related to the learning of mathematics (Fennema & Sherman, 1976). I modified the scale to use language appropriate for fourth graders and to measure five of the domains deemed most pertinent to this study: success, confidence, anxiety, usefulness, and motivation. Students responded to these questions on a scale with five choices ranging from "not at all" to "a lot." Two open ended questions were added to the survey to collect information on students' thoughts about how math is or may be a part of their everyday life. The initial survey was used to help guide the choice of six case-study participants that represented the range of math attitudes. The survey completed near the end of the study was used as a means of capturing any possible patterns and changes when compared to students' initial attitude

surveys. As collected data is reported in Chapter Four, more detail is given as to how data gathered from the math attitude survey was organized for analysis purposes, allowing for a total number of positive responses and negative responses for each question to be compared within and among each student category of all boys, all girls, and African-Americans.

Free-time Questionnaire

Students also completed a written questionnaire that I created with both closed and open-ended questions about their out-of-school activities (Appendix A). Students completed this questionnaire at both the beginning and end of the semester. The first question was an open ended question, asking for their perception of which activity they spent the most time participating in when they had free-time over the past week. The following questions asked whether they had participated in particular types of activities during the week and for details about those activities, such as activities with wheels, toys, reading, and exploring. The final question asked again which activity they had spent the most time on during the week. This question was repeated at the end of the questionnaire in case, after reflecting upon their weekly activities as the other questions required, they had a different answer than when they initially answered it for the first question. Chapter Four contains details explaining how data collected from the free-time questionnaire was organized for analysis purposes, allowing for comparisons between boys and girls, as well as African-American students, and for noting changes from the first and second administering of the questionnaire.

Dialogue Journals

Recognizing the importance of the context of these activities (Merriam, 1998),

these students then responded to an ongoing, written dialogue with the researcher in a journal booklet about their after school activities 2-3 times per week over the course of three months for homework. Students began the journal by writing about what they usually do after school. The researcher responded to these entries by writing further questions to obtain more details about their activities and any mathematical concepts used. As opportunities arose, the researcher posed questions that challenged students to view their activities with a mathematical lens and/or to utilize math concepts during their activities which were not already in use.

Case Studies

In order to capture examples of the full picture and richness of the activities preferred by these 4th graders, the mathematical usage in such activities and their experiences with the journal dialogue strategy, this study also included a case study of six of these students. This case study included identical free-time questionnaires for the participants' parents to complete about their child's activities, and two 15 to 25 minute video-taped interviews (Appendix C). Interviews were video-taped in order to ensure that no verbal or non-verbal information was overlooked in the data gathering stage. The questionnaires completed by the students and parents and the student interviews provided triangulation.

As seen in Table 3.1 below, the math attitude survey, free-time questionnaire, and dialogue journals completed by all students, as well as the interviews of the case-study participants and the afterschool free-time questionnaire completed by the case-study participants' parents were used to answer the first research question. Data collected to answer question two was obtained through the open-ended questions from the math

attitude surveys and from the dialogue journals that all students completed, as well as the interviews of the six case-study participants. Data for the third research questions were obtained through the dialogue journals and the case-study interviews.

Table 3.1
Data collection design matrix

		DATA SOURCES		
		Participant Group 1: *Students* *(whole class)*	**Participant Group 2: *Students* *(6 case-studies)***	**Participant Group 2:** *Parents* of 4 case-studies
RESEARCH QUESTIONS	1. Research Question: What kinds of activities do 4th grade students in a rural area of the Lowcountry of South Carolina choose to participate in outside of school?	-afterschool activity questionnaire - dialogue journals	-afterschool activity questionnaire -dialogue journals -interviews	-afterschool activity questionnaire
	2. Research Question: What types of mathematical concepts, if any, are students using in these activities? How do these students perceive these activities in relation to mathematical concepts?	-math attitude survey -dialogue journals	-math attitude survey -dialogue journals -interviews	
	3. Research Question: How can the strategy, dialogue journaling, be used as a means to gain information about these students' experiences and be utilized to engage students in further mathematical applications within these activities of choice? How do these students experience this strategy?	-dialogue journals	-dialogue journals -interviews	

Data Analysis

Recognizing the important role that memos play in facilitating thinking, reflection, and qualitative analysis (Maxwell, 2005) memos were taken both during and after the gathering of the different forms of data. Memos were taken in the margins of the surveys, questionnaires, and transcripts from the videoed interviews. In the dialogue journals, they were taken on post-it notes placed inside, so as to leave them in a

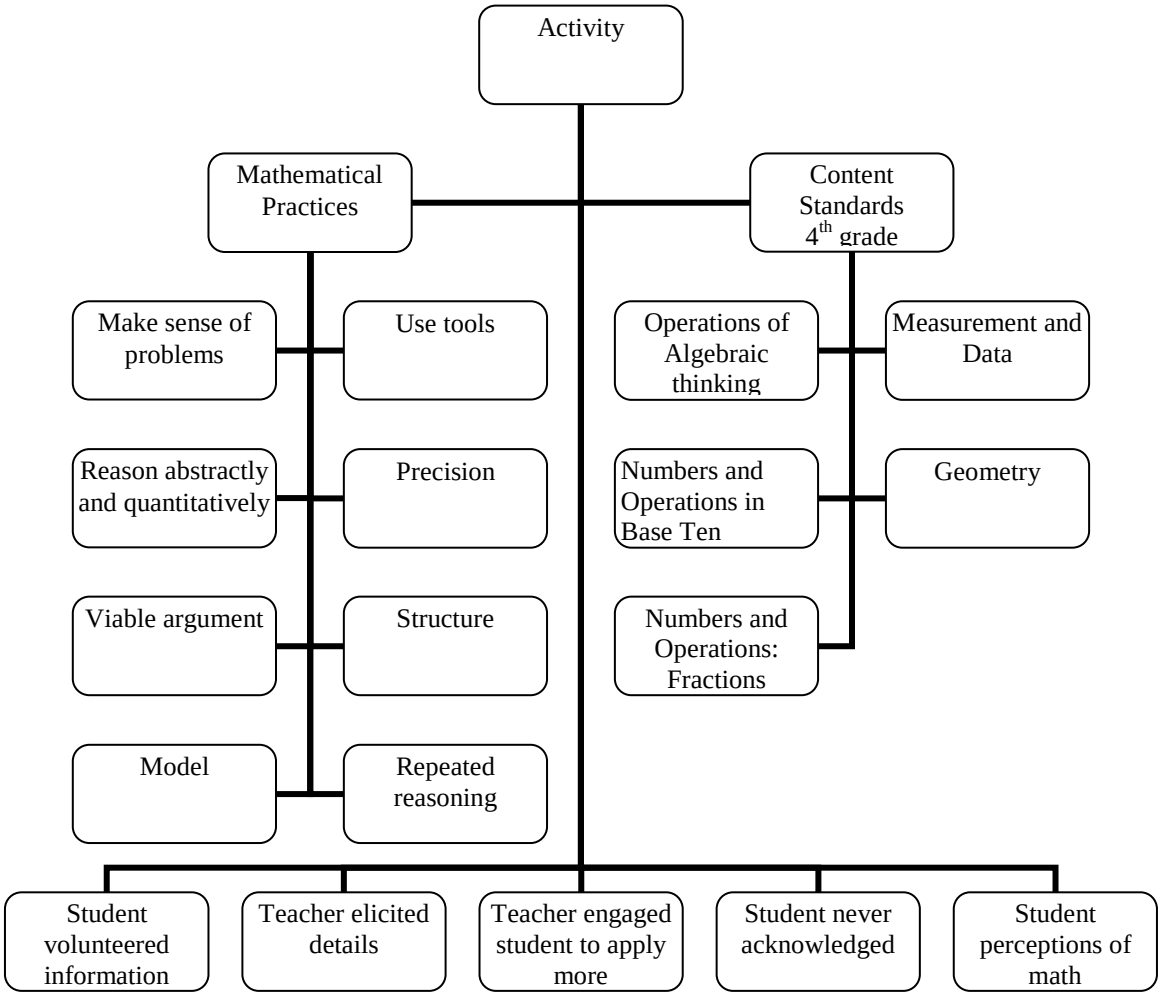
returnable condition for the students. These memos noted several types of things, such as types of math and activities students mentioned, attitudes about math emerging in discussions, and my reflections and questions. These memos were the basis for the first set of organizing codes developed.

The act of developing categories for coding is in itself a form of data analysis (Glesne, 2011; Maxwell, 2005; Merriam, 1998). Through the process of manually coding and comparing to draw out commonalities and uniqueness of activities, embedded mathematical ideas in these activities, student perceptions of mathematical ideas in their activities, and reactions to the dialogue journaling experience, this set of codes was further refined as some categories were expanded and some were collapsed. Some bits of data fit in more than one category, as some pieces were relevant to the answering of more than one research question. Following Strauss (1987), data were not coded with the aim to count things as in quantitative research, but to "fracture" (p.29) and rearrange data in order to assist in analyzing in terms of correlations between the activities, school mathematics, and students' perceptions.

Gibbs (2007) stressed that coded data is the point from which the researcher begins to look for correlations and explanations. Figure 3.2 shows the basic skeleton around which mathematical codes were arranged for my analysis. The Common Core Standards' math domains (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010) were used for the clustering of mathematical ideas due to its relevance in the teaching of mathematics in South Carolina. With such a framework, patterns and correlations began to emerge, such as students who regularly hunt more readily refer to distances in abstract measurements when describing

hunting activities, but not in other activities.

Figure 3.2
Math coding framework



Role of the Researcher

As a teacher of math at the 4th grade level in a rural school in the Lowcountry area in South Carolina, I am close to the phenomenon being explored. I am in a prime position to explore what and how students of this population participate in free-time play activities and how students respond to teacher initiatives at applying more math concepts into their play outside of school. To the students, the most appropriate and natural

avenue for having them do writing assignments about their activities and math applications comes from the classroom. The purpose of part of the research was to explore how students respond to their teacher's efforts at encouraging more math utilization outside of school. This authenticity would be lost if I conducted this research with students that were not my own students.

However, care was taken to ensure that students were made to feel comfortable and free to speak honestly during the interviews. It was pointed out to students that the attitude surveys will remain anonymous to help nullify concerns of honest answers affecting my impressions of them. Students were repeatedly assured that these methods of data collection would not impact their grades and would be kept confidential.

Trustworthiness

An important strategy that was employed throughout the study to ensure that data collection was rigorous and valid was to consciously consider threats of trustworthiness as standard procedure. Data was constantly and rigorously examined, with discrepancies looked for instead of ignored (Maxwell, 2005). This process included peer review to point out any hasty assumptions made on my part. Triangulation in the form of parent surveys, student surveys, student interviews, and student journals was used reveal any incongruities as to what and how each student in the case study play in their free-time. The dialogue journaling that all participants engaged in, typically two to three times a week over the course of three months, allowed for intensive data gathering, providing details to give a fuller picture of how students deal with being asked to apply more math concepts to their activities.

Ethical issues

No ethical issues were involved with this study. My actions, as part of this research, did not include any thing that any motivated teacher would not do, from math attitude surveys to discussing and journaling with students about what they like to do in their free-time, to encouraging students to apply more mathematics in their out-of-school activities. Ethical issues that could have arisen would have involved sensitive information revealed in student journals or interviews, such as comments indicating inappropriate student activities, abuse, etc.

Risks and benefit

There were no risks for any participants. Benefits included reflecting on their free-time activities and improved mathematics instruction that was connected to their free-time interests.

Summary

This chapter has described the qualitative methodology and strategies used to gather and analyze the data for this study. Rationale was given for the choices made throughout this research, from participant selection to the manner in which interviews were conducted. The role of the researcher was discussed, as well as study implications. Chapter Four presents and analyzes the data collected from the attitude surveys, free-time questionnaires, dialogue journals, and interviews.

CHAPTER FOUR

RESEARCH FINDINGS

Chapter One introduced the background to this study, including its purpose, theoretical basis and relevance. Chapter Two presented a review of literature relevant to this topic. Chapter Three presented the methodology, both the approach and reasoning, for this qualitative study. This chapter reports the pertinent data gathered through these methods, as determined by the ideas that emerged through constant comparative analysis. Following Merriam (1998), data collection and content analysis occur at the same time with the researcher as the primary instrument. It cannot be ignored that the data presented here was deemed important based on my judgments from the careful analysis of the primary concepts that emerged from the data. This chapter is organized by conveying the findings of each strategy employed: the math attitude survey, the free-time survey, and the dialogue journals. This is followed by accounts of each of the six case-studies used to further shed light on the topic.

*Some student misspellings and grammar are corrected for readability in the reported data.

Math Attitude Survey

The math attitude survey, an adaptation of the Fennema-Sherman math attitude survey (Fennema & Sherman, 1976) (Appendix B), was used at the beginning of the

school year and then again near the end of the first semester. Its purpose was to begin painting a picture of this class's, as well as individual student's, perceptions about math class, their math abilities, the applicability of math, and to note any major shifts of attitude and perceptions that may have occurred during the first half of the school year. This data provided information to help choose the six case-study participants that represented the range of math attitudes and perceptions.

There were twenty items answered on a scale with five choices ranging from "not at all" to "a lot". Example questions include "Math is not important to me outside of school," and "Learning math is hard for me" (Appendix B). The student responses to each of these were tallied. Then, not counting the responses that were exactly in the middle of the range, an overall count of total responses for each question from the negative side were compared to that of the positive side. The results were first compiled by separating the boys' responses from the girls. Then the results were also looked at by compiling the African Americans' responses together, both boys and girls, in order to compare and ensure that the African-American perspective was assessed. Occasionally some students skipped an item on the survey, either on purpose or by accident. No tally was recorded in these cases.

Reflected on the math attitude survey administrated at both the beginning and end of the semester, overall most girls think that math is important to learn. There was an increase from survey one to survey two in the number of girls who do not like math. However, more girls seem more confident in their ability to learn math by the second

survey, yet not when it comes to learning more challenging math. There was an increase from survey one to survey two as to how many girls feel math can be used in play outside of school.

The majority of boys also think that math is important to learn. The number of boys that like math decreased as well, with close to half not liking it. There was an increase in how many have expectations to use math outside of school, but only about half the boys feel they could use math when playing outside of school according to both survey one and two. There was very little change from survey one to survey two in how the boys feel about math class which was split fairly evenly. There was also very little change between the surveys in their perception of their ability to learn math, with most being confident in their math abilities and in their abilities to take on more challenging math.

On most of the survey questions, the African-American responses, which were also included in the girls' and boys' compilation, were a reflection of what was found on the overall boys' and girls' groups' surveys. There were a few questions, however, on which the six African-American students' responses went a different direction or more strongly in a direction than the class as a whole. By the time of the second survey, more than half said they think about and see math outside of school. All said that they expect to use math when out of school. The number of African-American students that claim to be happy during math class went up, and the majority is confident in their general math abilities and their ability to take on more challenging math.

In some areas, data gathered with the survey seems incongruent. For example, in the second survey, close to half the girls agreed that they did not like math class, but then

a few questions later, several more than half of the girls also said that they were happy in math class. The nature of the survey did not reveal the students' interpretations of the questions, which may explain the seeming incongruities. Perhaps a separation of the math content and classroom environment led some to answer differently on similar questions. Therefore, it is difficult to make many clear statements based on the scale portion of the survey.

On the first survey the students completed, "counting" was the most common response by all student groups to the two open-ended questions about ways they do or could use math outside of school. Eight girls and four boys, including one African-American girl and boy, noted "counting". Three girls also mentioned playing school, and five girls mentioned using multiplication cards as ways to use math outside of school and homework. Three boys mentioned using math in games, one mentioned kickball, and one mentioned helping other people with their math.

On the second attitude survey, counting was still the most common answer by the girls to how math was or could be used in their activities. Playing school was again mentioned by three girls. But on the second survey answers using math with money for shopping was also mentioned by three girls including multiplying prices in store. Using math when on four wheelers, figuring how much time, and how far were also mentioned by the girls.

Counting was also the most common response by the boys as to how math was or could be used in their activities on the second survey. However, many boys gave more specifics of what they would count, such as "count the nails in a bucket". Several responses from the boys mentioned using math with money. Other responses from the

boys included helping dad measure, building a shed, on a four wheeler, making paper airplanes, using a compass, and using math cards.

The African-American responses to the open-ended questions, which were also included in the overall girls' and boys' compilation, did not indicate any noticeable differences.

Table 4.1
Girls' Math Attitude Survey Responses

ALL GIRLS (14 total)	August 2012: 1st Survey		December 2012: 2nd Survey	
	Disagreed with "not at all" or "a little"	Agreed with "some" or "a lot"	Disagreed with "not at all" or "a little"	Agreed with "some" or "a lot"
1. Learning math is a waste of time.	10	2	10	1
2. Math is important to learn.	1	11	2	12
3. I avoid having to do more math.	9	3	8	4
4. I like math.	3	8	6	6
5. I think about and see math outside of school (not counting homework).	4	6	9	5
6. I use math outside of school (not counting homework).	3	6	9	5
7. I can use mathematics in many ways when I'm playing outside of school.	7	4	5	8
8. I don't expect to use much math when I'm out of school.	5	6	5	6
9. Math is not important to me outside of school.	6	4	7	7
10. I would like to spend more time in school doing math.	4	5	10	2
11. I enjoy math class at school.	3	6	6	5
12. I am bored during math class.	9	3	8	5
13. I am happy during math class.	5	5	3	9
14. I feel nervous and anxious in math class.	7	3	4	8
15. I don't understand what's going on during math class.	9	2	7	2
16. I am sure that I can learn math.	3	8	3	11
17. Learning math is hard for me.	8	3	8	2
18. I think I could handle more challenging math.	5	4	7	4
19. I can get good grades in math.	2	6	3	10
20. I'm not the type to do well in math.	7	4	8	4

Table 4.2
Boys' Math Attitude Survey Responses

ALL BOYS (10 total)	August 2012: 1st Survey		December 2012: 2nd Survey	
	Disagreed with "not at all" or "a little"	Agreed with "some" or "a lot"	Disagreed with "not at all" or "a little"	Agreed with "some" or "a lot"
1. Learning math is a waste of time.	6	3	7	2
2. Math is important to learn.	1	6	1	9
3. I avoid having to do more math.	7	3	6	3
4. I like math.	2	7	4	4
5. I think about and see math outside of school (not counting homework).	7	1	8	2
6. I use math outside of school (not counting homework).	7	1	6	1
7. I can use mathematics in many ways when I'm playing outside of school.	4	4	3	5
8. I don't expect to use much math when I'm out of school.	3	5	6	2
9. Math is not important to me outside of school.	8	2	7	1
10. I would like to spend more time in school doing math.	5	4	5	5
11. I enjoy math class at school.	4	4	4	6
12. I am bored during math class.	6	3	5	5
13. I am happy during math class.	4	5	4	6
14. I feel nervous and anxious in math class.	8	2	7	2
15. I don't understand what's going on during math class.	4	2	4	3
16. I am sure that I can learn math.	2	7	1	9
17. Learning math is hard for me.	6	2	7	2
18. I think I could handle more challenging math.	1	6	1	6
19. I can get good grades in math.	0	8	2	8
20. I'm not the type to do well in math.	8	1	9	1

Table 4.3
African-American Math Attitude Survey Responses

AFRICAN-AMERICANS (6 total: 4 girls, 2 boys)	August 2012: 1st Survey		December 2012: 2nd Survey	
	Disagreed with "not at all" or "a little"	Agreed with "some" or "a lot"	Disagreed with "not at all" or "a little"	Agreed with "some" or "a lot"
1. Learning math is a waste of time.	5	1	4	1
2. Math is important to learn.	1	4	0	6

3. I avoid having to do more math.	5	1	4	2
4. I like math.	0	5	1	4
5. I think about and see math outside of school (not counting homework).	2	3	2	4
6. I use math outside of school (not counting homework).	3	3	3	3
7. I can use mathematics in many ways when I'm playing outside of school.	1	4	1	4
8. I don't expect to use much math when I'm out of school.	3	3	6	0
9. Math is not important to me outside of school.	4	2	4	2
10. I would like to spend more time in school doing math.	2	4	2	3
11. I enjoy math class at school.	1	5	2	4
12. I am bored during math class.	4	2	3	2
13. I am happy during math class.	3	3	1	5
14. I feel nervous and anxious in math class.	4	2	2	3
15. I don't understand what's going on during math class.	5	1	3	2
16. I am sure that I can learn math.	2	4	1	5
17. Learning math is hard for me.	4	1	5	1
18. I think I could handle more challenging math.	1	3	1	4
19. I can get good grades in math.	1	5	1	4
20. I'm not the type to do well in math.	5	0	5	1

Free Time Questionnaire

The Free Time Questionnaire (Appendix A) was completed by all students in the class at the beginning and end of the semester. Its purpose was to get an overall inventory of the main activities that the students consider their main free time activities, thus collecting data for the first research question. In order to capture students' initial perception of their activities and their final response after spending time reflecting on their various activities, the first and last question on the questionnaire, question 1 and 12, asked students what they spent the most time doing in their free time. Questions 2 through 11 asked for details about what they did as well as other things that they spent time playing/doing. Understanding that using a longer period of time helps to ensure that

concepts gleaned from the data match the participants' realities more accurately, students were asked to complete this free time questionnaire twice with a semester's worth of time in between (LeCompte & Preissle, 1993).

The data gained from the responses were first compiled by separating all of the girls' answers from the boys'. After analyzing the responses of the girls and boys, the responses of the African-American students were then compiled together for comparison reasons.

The first time the questionnaire was completed, of the fourteen girls in the class, question one was answered with T.V. by four girls as an activity on which they spent the most time (See Table 4.4). Playing school was mentioned by two girls as receiving the most time. Other activities which received the most time according to question one included four wheeling, hunting, the computer, Wii, dolls, movies, and talking with friends. Several of the girls responded with more than one activity on both questions 1 and 12. Nine of the girls put a different response for question 12 than they had on question 1, despite it being an almost identical question, asking for the same information. By the time question 12 was being answered on the first questionnaire, only 1 girl continued to answer that watching T.V. was her main activity for the week. Some girls had changed their initial answer by question 12 with activities such as sleeping, playing at the park, reading, and drawing as being the main activities for the week. One factor for this change may have been that after some reflection on their activities required by questions 2 through 11, they realized they had actually spent more time on something different than their initial response. But another factor may have been students mistakenly assuming that they should not put the same answer twice.

On the first survey, two of the ten boys answered that video games received most of their time on question one. There were two responses of watching T.V. and two responses of hunting. Other responses include visiting Hilton Head, dirt biking, drawing, and playing games as receiving most of their free time over the week. On question 12, some boys had changed their answer as to how they spent most of their time to answers of playing with Legos, four-wheeling, and video games.

T.V. watching was the most common activity shared by students, both boys and girls, as seen on both surveys (See Table 4.5). On the first questionnaire, the boys had more hunting and reality type of shows listed than the girls did. The girls had young people's sit-coms listed more often than the boys did. On the second questionnaire completed in December, Christmas movies appeared on both the boys' and girls' T.V. lists.

Four-wheeling was the second most common activity among both boys and girls according to both surveys. Several boys mentioned using the four wheelers for hunting, whereas no girls mentioned using the four wheelers for hunting.

On both surveys, a higher percentage of girls stated that they play imaginary games than boys. More of the girls than boys also noted spending free time reading and doing art. There were also a higher percentage of girls that stated they played with toys. This perception seemed interesting to me in light of the fact that boys having and playing with toys at school is a much more common occurrence than with girls.

The responses of the six African-American students did not have noticeable differences in terms of activities listed or most common responses in comparison to the rest of the class's responses (See Table 4.6). Three of the six African-American students

had different answers for questions 1 than questions 12 on the first questionnaire, despite the two questions asking for the same information.

Table 4.4
Girls' Questionnaire Responses

All Girls (14 total)	Questionnaire 1 August	Questionnaire 2 December
1. What activity did you do the most when you had free time this past week?	T.V. (4 responses), played school (2 responses), hunting, played with cat, played with tent, Wii, math, four-wheeler, ride horse, computer, dolls, movies, played at uncle's house, talked with friends	Played with cousins (2 responses), played outside, played in woods, wrapping gifts, phone, four-wheeler, golf cart, hunting, read, multiplication practice, drawing, T.V. talk with friend
2. Did you play any video or computer games? If yes, name the games you played the most.	6 girls replied yes: Mario (3 responses), horse games (2 responses), cool math, surfer, Just Dance, Wipe out, Dance Central, Pixie	8 girls replied yes: Wii, Wii sports, Office, Zombie, paper toss, girlgames4u.com, Facebook, subway surf, Ice Temple
3. Did you play any sports? If yes, name the sports you played the most.	6 girls replied yes: soccer (3 responses), kickball (2 responses, dodge ball (2 responses), baseball (2 responses), football, basketball, softball, tennis	7 girls replied yes: football (2 responses), running, basketball, tennis, kickball, Frisbee, tag, baseball, soccer, dodge ball, adventure games
4. Did you play with things on wheels, like bicycles, skateboards, scooters, ripstiks, or four-wheelers? If yes, which did you play?	8 girls replied yes: bicycles (6 responses), scooters (5 responses), four-wheelers (4 responses), go-cart (3 responses), golf cart	9 girls replied yes: bicycles (6 responses), four-wheelers (5 responses), golf cart (2 responses), scooter (2 responses), wagon, go cart
5. Did you play any pretend or imaginary games? If yes, what did you pretend?	6 girls replied yes: played school (3 responses), animal nurse, monsters, sharks in pool	6 girls replied yes: trapped by a witch, vacation at Disney World, Adventure, Princess, CSI agents, walk dead, police games, angry men on trampoline
6. Did you play with any toys this week? If yes, what toys did you play with?	7 girls replied yes: dolls (2 responses, legos, money, pet shop, horse toys, connector toys	8 replied yes: Barbies (2 responses), phone (2 responses), Monster High Dolls, baby dolls, dolls, Legos, elf doll hide-n-seek, slime
7. Did you watch T.V.? If yes, what shows did you watch the most?	14 girls replied yes: examples- Good Luck Charlie (2 responses) Pair of Kings (2 responses), Let's Make a Deal, Charm, Sharks, I Love Lucy, American's Funniest Videos, America's Next Top Model, NASCAR, Love and Hiphop, Toy Story, Toons, iCarly, Victorious, Spongebob, Fred, Second Chances, ANT farm	14 girls replied yes: Ridiculousness (2 responses), Spongebob (2 responses), Good Luck Charlie (2 responses), Victorious, Superbad, Benchwarmers, Say Yes to the Dress, Animal Whisperer, BET, The Grinch, Santa Escapade, The Fockers, Duck Dynasty, Full House, Austin and Ally
8. Did you go exploring outside?	5 girls replied yes: sandbox	4 girls replied yes: woods (2

If yes, what do you see and do when you explore?	looking for sharks teeth, trail ride, climb tree, saw deer, spiders, sticks in hair, trees	responses), uncles pond with turtles and bass, squirrels, fed uncle's cows, old pool with trash
9. Did you read for fun? If yes, what did you read?	7 girls replied yes: Froggy books (2 responses), Sharks, First Day Jitters, Secret Tree, Chapter book	5 girls replied yes: instructions to play horse, Paranormal, Magic Tree House, How Many Toes Does a Pig Have?, Junie B. Jones
10. Did you do any art activities, such as cutting, drawing, painting, or coloring? If yes, what did you do?	10 girls replied yes: tie dye (2 responses), painting, flower project for deceased mother, paint on computer, draw family, Justin Bieber, Perry, Bear, people	5 girls replied yes, ornaments, painted a cup, paint, puppets, necklace, light house
11. Is there anything else you played this week that isn't reading, drawing, exploring, a computer/video games, a toy, a pretend game, or something with wheels? If yes, what was it?	7 girls replied yes: played with new dog (2 responses), clogging, gymnastics, skating, pranking family, hunting	7 girls replied yes: clean room (2 responses), see Christmas lights, sleep, Swing and play on slide, I Spy on the trampoline, shopping, write a puppet story, played with pets
12. What did you spend the most free time doing this week?	Played with cousins, clogging, sleeping, gymnastics, skating, shopping, Wii, drawing, T.V. played school, reading, writing, mudding with mom, four-wheeling, golf cart, go-cart, spelling, at park	Pretend trapped by witch, reading Paranormal book, hunting, sleep, played with sister, shopping for Christmas, computer games, wrapping gifts, played with dog, played with friend, rode horses, babysat, watched movies, talked with friends

Table 4.5
Boys' Questionnaire Responses

All Boys (10 total)	**Questionnaire 1 August**	**Questionnaire 2 December**
1. What activity did you do the most when you had free time this past week?	Video games (2 responses), T.V. (2 responses), hunting (2 responses), Hilton Head, dirt bike, drew, played games	video games (3 responses), watch news, mudding, Accelerated Reading tests, dog hunting, bottle hunting, lift trees, watch pig
2. Did you play any video or computer games? If yes, name the games you played the most.	9 boys replied yes: Black Ops (3 responses), Call of Duty (2 responses), Mario (2 responses), football, Minecraft, Assassin, hunting, Harry Potter	7 boys replied yes: Black Ops (2 responses), football, Pokeman, fishing, Backugon, Call of Duty, Office Jerk, Angry Birds, Trash Pack
3. Did you play any sports? If yes, name the sports you played the most.	5 boys responded yes: football (5 responses), baseball (2 responses), soccer (2 responses), basketball	5 boys replied yes: football (3 responses), basketball, baseball
4. Did you play with things on wheels, like bicycles, skateboards, scooters, ripstiks, or four-wheelers? If yes, which did you play?	7 boys replied yes: four-wheeler (7 responses) bike, skateboard	5 boys replied yes: four-wheeler (4 responses), scooter, bicycle, dirt bike
5. Did you play any pretend or imaginary games? If yes, what did you pretend?	1 boy replied yes: playing antique picker	1 boys replied yes: War

6. Did you play with any toys this week? If yes, what toys did you play with?	2 boys replied yes: legos, dirt bike, toys	3 boys replied yes: Hotwheels, Bey Blades, Legos, Trash Pack
7. Did you watch T.V.? If yes, what shows did you watch the most?	9 boys replied yes: Hunting shows (2 responses), American Picker, Swamp People, Turtle Man, Monster Buck, Spongebob, 48 hours, Jessie, Suite Live of Zack and Cody	9 boys replied yes: Disney Channel, Dogs 101, Spongebob, Pokemon, Hunting Duck Dynasty, News Lab Rats, Christmas movie, The Rundown
8. Did you go exploring outside? If yes, what do you see and do when you explore?	6 boys replied yes: hunting (3 responses), tracking blood from shot deer, corn pile, found lake, deer, hogs, cows, woods,	4 boys replied yes: climb tress, hunting, woods getting bottles, deer
9. Did you read for fun? If yes, what did you read?	1 boy replied yes: Magic Tree House	1boy replied yes: Magic Tree House
10. Did you do any art activities, such as cutting, drawing, painting, or coloring? If yes, what did you do?	4 boys replied yes: drew car, Carolina flag, deer, gas pump	1 boy replied yes: coloring
11. Is there anything else you played this week that isn't reading, drawing, exploring, a computer/video games, a toy, a pretend game, or something with wheels? If yes, what was it?	3 replied yes: playing in mud, shot bb gun, shot gun	3 boys replied yes: burn bonfire, shooting 12 gage, birthday party
12. What did you spend the most free time doing this week?	Video games (3 responses), TV (2 responses), hunting (2 responses), dirt-bike, Legos, four-wheeling	Video games (2 responses), news, burning wood, four wheeling (2 responses), dog hunting, hunting, playing with Trash Pack, bikes

Table 4.6
African-American Questionnaire Responses

African-Americans (6 total)	**Questionnaire 1 August**	**Questionnaire 2 December**
1. What activity did you do the most when you had free time this past week?	TV (2 responses), dirt-bike, dolls, movies, play games, computer	Playing with friends (2 responses), wrapping gifts, phones, Accelerated Reader tests, video games
2. Did you play any video or computer games? If yes, name the games you played the most.	5 replied yes: Black Ops (2 responses, Call of Duty, dance, football, Pixie	4 replied yes: girlgames4u.com, Black Ops, Wii, fishing, office Jerk, Temple Run, Angry Birds
3. Did you play any sports? If yes, name the sports you played the most.	3 replied yes: football (3 responses), soccer (2 responses), baseball, basketball, kickball	4 replied yes: baseball (2 responses), football, Frisbee, tag
4. Did you play with things on wheels, like bicycles, skateboards, scooters, ripstiks, or four-wheelers? If yes, which did you play?	4 replied yes: four-wheeler (3 responses), scooter, bike	3 replied yes: four wheeler (3 responses)
5. Did you play any pretend or imaginary games? If yes, what did you pretend?	None	1 replied yes: Vacation at Disney World

6. Did you play with any toys this week? If yes, what toys did you play with?	2 replied yes: dolls (2 responses)	1 replied yes: Monster High Dolls
7. Did you watch T.V.? If yes, what shows did you watch the most?	6 replied yes: Shake It Up, ANT Farm, hunting shows, Love and Hiphop, Suite life, Charm, Toy Story, Toons	6 replied yes: Hunting Duck Dynasty, Ridiculousness, BET, Christmas movie, Santa Escapade, Good Luck Charlie
8. Did you go exploring outside? If yes, what do you see and do when you explore?	2 replied yes: deer, hogs, tree	none
9. Did you read for fun? If yes, what did you read?	1 replied yes: Froggy	3 replied yes: Paranormal, Junie B. Jones, Magic Tree House
10. Did you do any art activities, such as cutting, drawing, painting, or coloring? If yes, what did you do?	3 replied yes: tie dye, flower, car	1 replied yes: coloring
11. Is there anything else you played this week that isn't reading, drawing, exploring, a computer/video games, a toy, a pretend game, or something with wheels? If yes, what was it?	2 replied yes: prank family, skating	4 replied yes: cleaning room, hunting, sleep, birthday party
12. What did you spend the most free time doing this week?	T.V. (2 responses),played with cousins, spelling, at park, mudding on dirt bike	Four-wheeler (2 responses), read, baby sat, bike, sleep, wrapping gifts

Dialogue Journals

Qualitative research aims to uncover how people construct and understand their reality (Merriam, 1998). The dialogue journals were a primary instrument used to delve deeper into students' free time activities, probing at the how and why of their activities. These dialogue journals were also a crucial instrument for exploring students' awareness and perceptions of any mathematical ideas involved in their free time activities. Additionally, the dialogue journals provided a platform for me, as their math teacher, to encourage them to consider and practice mathematical concepts that they may not have considered before in relation to their free time activities. This section of Chapter Four presents the data gleaned from the journals, arranged by the research question to which it pertains.

Question 1: What kinds of everyday activities does a rural group of 4th grade students

from the Lowcountry area of South Carolina participate in outside of school?

The dialogue journal writing began with me asking students to write about what they did over the weekend. From that point on, every dialogue journal conversation was unique, as my responses and further questions were dependent upon their responses. Activities students brought up for discussion include four-wheeling, fishing, video games, playing with Legos, going to the roller skating rink, riding bicycles, playing sports outside, riding horses, cooking, reading books, watching T.V., playing with stuffed animals, art projects, shopping with parents, watching movies, observing spiders, playing on trampolines, swimming in ponds, lakes, and pools, playing school, doing chores, gymnastics, digging big holes, writing stories and songs, going to church, working in gardens and fields, spending time at parents' or grandparents' workplace including an office, sheet rocking bathrooms, and a tow truck, and taking care of pets including pigs, hamsters, dogs, cats, hermit crabs, horses, and birds.

Question 2: What types of mathematical concepts, if any, are these students using in these activities? How do these students perceive these activities in relation to mathematical concepts?

The dialogue journal writings discussed what activities students had been doing, how they do and think about them, as well as possible mathematical concepts when applicable. Following Connelly and Clandinin (1990), this narrative analysis aimed to uncover the way these students experience their world. There were few occasions revealed within the journals where a student's use of mathematical concepts in his/her activities was mentioned voluntarily. One student mentioned the weight of a deer he shot. When asked how he knew its weight, he described how they weigh a deer with a game

weighing tool. This same student wrote about fishing with his 12 foot Breambuster pole.

Here is an example of a written conversation between one of my female students and me that reveals the range of activities she participates, how she perceives these activities, and the context in which she faces mathematical situations.

Me: I'm beginning to understand how much you love four-wheeling. Do you have any tips or tricks to riding four-wheelers well? Do y'all grow corn every year?

Student: One tip is to be cautious of your surroundings and watch out where you're going. Another tip is to not turn sharp when you're going around a curve or fixing to turn. We do grow corn every year. This was one of our best years yet. I love living in the country.

Me: Living in the country is a great life. What do y'all do with all that corn? I can't grow things. I even accidently killed a cactus recently. A cactus! What do you think life in the city would be like?

Student: We sell it for $9.00 a bag. We have 100 bags. We haven't picked the rest of the field yet. I'm glad I don't live in the city. Because I like to go mudding and deer hunting and go swimming in our pool. I really like to help my papa garden. How did you kill a cactus? I think living in the city would be a lot of shopping and traffic. I think it would be kind of boring.

Me: 100 bags…$9 each. How much money would that be total? What do you do to help pick? And how do you help Grandpa garden? Maybe my cactus got too much water. I had it next to the sink so maybe it got splashed a lot. It was kind of moldy.

Student: Well we have more now so I'm not quite sure. I help pick okra, potatoes, peppers. Just make sure they get enough water and maybe not too much. Soap could've splashed up on it. Ewww. Gross mold. That's probably why it died.

Despite the student bringing up the cost and amount of corn on her own, at this point she did not view this as a mathematical situation in need of further evaluation, perhaps due to the changing amount of bags of corn.

Although very few math concepts were revealed on the students' own initiative in journal discussions, a few more mathematical situations emerged when asked pointed questions about details of their activities. The most common instances include the distance from game when hunting, counting and skip counting while earning points in ball sports and video games, measuring when cooking, and prices of purchases. A single example is a boy mentioning repetition of a pattern when crocheting when questioned on how it is done.

Me: …What did you do this past weekend?

Student: This weekend I went to my Nanna's house. And I learnd a little about crowsaying.

Me: What did you learn exactly about crocheting? Tell me about Nanna. (My grandmother would shoot at the squirrels that got in the birdfeeders!)

Student: I learnd how to make a chain. My Nanna is a good crocher. She made me a blanket that she had croched me.

Me: A blanket! That must have taken a long time and a lot of patience. When you crochet, how do you do it? What steps do you do? I tried knitting once and I would think they are kind of alike. How often to you see your Nanna?

Student: When I crochet it does repeat to make a chain, like a pattern. Well crocheting has one needle. Knitting is with 2 needels. I go under, over, catch and pull, under, over, catch and pull, and keep doing this again. I see my nanna about 3 times a month.

Me: I didn't even know that crocheting has one needle. The one time I knitted, I tried to make my dad a sweater vest, but someone had to undo a lot of what I did to make the arm holes and fix it. The whole thing ended up being too small anyway. It was a pattern though, 5 one way, 5 the next for 5 rows. It made a square pattern.

Question 3: How can dialogue journaling be used as a strategy to gain information about these students' experiences and be utilized to engage students in further

mathematical applications within these activities of choice? How do these students experience this strategy?

A wealth of information about students' lives, interests, thoughts and perceptions was discovered through the use of dialogue journals. This was obtained through questioning that led students to give details that shed light on how they go about their activities.

When appropriate, I used the discussion to try to engage students in describing their experiences in mathematical terms, similar to what they learn or may learn in school in order to push from behind, guiding students to make connections. At this point I had to recognize the strain in my roles as both researcher and participant teacher, leading to conflicting goals. As the teacher, I had to aim for students to learn to represent their world and thinking in a particular way, the way that is required in the teaching standards and on standardized tests. As a researcher performing a study informed by ethnomathematics, I was aware that the teaching standards, as a driving force of math education, are culturally situated, reflecting the values of those in power (Skovsmore & Vithal, 1997). Concerned that my actions could classify as "cultural imperialism," I felt I had to proceed to perform my job as classroom teacher (Bishop, 1990).

In numerous instances, students showed that they were more inclined to describe things in broad or imaginative terms. For example, in one dialogue journal discussion with a female student I finished a comment with, "I would love to hear more about the show. I wonder how fast you skate!" She responded, "The fashion show was nice. We had it at the fire department. I skate really fast, like I can't stop." I then tried to get her to quantify her speed by writing, "How fast is 'really fast'?" She responded with, "Like

lightning." In this particular case, her response may indicate the perception that something that can't be touched is immeasurable. Although she is likely aware that the speed of a car can be determined, she may be unable to connect the concept of measuring speed within this different context of skating, perhaps due to limited experience with measuring speed at her age.

Another example of a student showing reluctance to quantify his description of his experiences is in a written conversation about what he did at the beach. After being asked which beach he went to and what he did there, he responded, "Isle of Palms. We digged in the sand and swim in the ocean and throw the tennis ball." I then asked, "How deep of a hole did you dig? How far do you think you throw the tennis ball?" His response was returned, still in un-quantified terms; "I digged pretty deep. I throw pretty far. Then my brother and cousin came."

In a discussion about a video game with another student, I asked how many points that student was able to get in the four minutes allowed. He responded, "You have to kill people to get points." I asked again, "How many points do you usually get?" He responded, "As many as possible." With yet another way of asking the question, I tried again with, "How many points do you usually get in four minutes? What's the most points you have ever gotten?" He responded, "I've gotten over 2,000."

These many examples reveal that in these situations, students were more apt to think of their experiences in imaginative or comparative terms rather than quantifiable terms.

Other times the dialogue journal discussions allowed opportunity to push students to expand their thoughts about their activity with more mathematical thinking. For

example, in a dialogue conversation with a student about her jump roping, I asked if she ever did any patterns and gave my own example with a pattern of steps. She responded with her own pattern of repeating steps. I then pointed out that the steps could be recorded with letters and labeled her pattern. She then pointed out that I had made a mistake in my labeling and corrected my work.

Numerous times the dialogue journal discussions seemed ripe for engaging students in mathematical discussions where I presented a problem that had to be solved in order for them to think about their activity from another angle. For example, I was challenging a student to describe the Megadrop ride at a fair in more detail. She determined that it was about 20 foot drop. I then asked her how many of herself she would need to be that tall. She correctly figured that, being five feet tall, she would need four of herself to reach twenty feet. Another boy was asked to compare his own height to the height he was climbing a tree to look at a bird's nest.

In another example, after one student mentioned that while babysitting her sister, she had to change eight diapers a day, I questioned her to consider how many diapers the baby was going through in one week. A few students were asked to think about how many hours a week or month of their life they were spending on watching T.V. based on earlier comments of how many hours a day they watched. In a discussion about the Call of Duty video game often played, a student answered that he had once earned over 2000 points in four minutes. I then challenged him to figure out how many points that would be in a one minute, and he correctly concluded that it would be 500 points a minute.

An example of encouraging the organization of mathematical thinking in relation to student activities occurred in a dialogue journal discussion about the types of guns

used for hunting. The student was explaining which were more powerful and goes further, so I drew a simple table for him to fill in to compare the types of guns he hunts with and the distances they shoot.

Me: So what do you think you like about hunting so much? Growing up, I shot tennis cans back in the woods. They had metal tennis ball cans back then. It is so much easier to shoot lying on my stomach.

Student: What I like about hunting is I love the outdoors. I don't hunt with nobody. But when I dog hunt I hunt with my friend. The game I hunt is white tail deer, rabbits, squirrels, and other stuff. My best shot is standing up.

Me: How far do you go when you hunt with dogs? What's the longest you've ever waited in one place while hunting? Always be careful.

Student: We go on roads about 100 feet away from other people. The longest I waited was 7 hours.

Me: You must be very patient to wait 7 hours. What do you think about for 7 hours?

Student: How I'm going to kill the deer. I think how still I need to be the whole time. I'm thinking of how I'm going to skin it and if it will drop down away or it's going to run away and I not going to find it. Will I be nervous when I shoot at him and how excited, how happy I'll be.

Me: Sounds like you really have to use those skills we practice in the concentration circle, all about focus and control. It's really neat the way you described it. I like the way you try to stay focused on your goal, visualizing how you want things to turn out. Can I share it with the class? And maybe my own kids? So I don't know much about guns. Tell me all about them.

Student: Yes you can. My guns are these: Shot guns, 20 gauge, .410, 12 gauge and these are my rifles: 30-30 and 293. A rifle is more powerful than a shot gun. A rifle goes farther.

Me: So how far do these guns shoot? Maybe you can make a table like this:

(I labeled a table and the student filled in the information.)

Type of Gun	Distance it shoots
1. shot gun 12	70 yards

2.	.410	70 yards
3.	rifle	100 yard
4.		

Me: Interesting. That's helpful. How do you decide which one to shoot with? With tennis, people choose racquets partly based on how much it weighs. They don't want it too heavy but not too light. They try to find the best balance of control and power that fits their style of game.

Student: A rifle is to kill a deer. A shot gun is to kill small game.

Other examples of using dialogue journal entries about their activities to engage in discussions with mathematics include prompting a boy to describe his Lego creations in terms of its dimensions and its volume with nonstandard units of the amount of Lego people it can hold and discussing the weight of pets with several students.

After the end of the semester, all the students in the class were asked to reflect during class by writing in their dialogue journals about their experience with the journals. They were asked whether they liked it, what they liked about it, what they didn't like about it, and what they learned, if anything. Most students gave it mixed reviews. The most common positive statements mentioned enjoying being able to have a conversation with the teacher. The most common negative statements mentioned it being too much homework. The most common statements about what was learned mentioned improving spelling and/or writing. Not one student noted anything dealing with math learning or awareness.

"I think it is too much work. That's why I don't like it. I liked that we got to talk because you talk about your children."

"I feel so, so glad we finally got back in writing journal."

"I like when you text back. It is fun. I do not like it takes up time from playing

with people."

"It was fun. I liked it all. I did not have a least favorite part of it. I learned that you did not have to speak to talk."

"I love to do the journals. I was sad that you took them away. I like to have a private conversation with you. I was sad when you took them away. I learned to write better!"

"How I thought about our journals is I like it because you know you get to express your feelings and nobody know how you feel. Only the teacher does because you write, not talk where everyone can hear you. I LOVE IT. There wasn't one part I didn't like about it. I learned that I can write better!"

"I like it because we get to talk to you. I liked talking about G….. and did not like some of the questions you put. I got better at writing."

"I love doing the dialogue journal. It was fun because you were asking nice of you asking important, sade, funny, and good questions."

"Sometimes like it and sometimes did not. I like is to see what Ms. Hyatt was writing. I didn't like it was homework. I learned new words that you wrote."

"I don't really like the journals. I like hearing about your childhood. It made too much homework. I got better at my spelling and writing."

"I love journal dialogues! They're fun! I feel like I'm texting. I don't get to do that stuff much! I love it. There is NOTHING I don't like about it because I love it! I learned about your awesome cool life!!!!!!!!!!!!!!!!!!! I got better at knowing people care about the things I have or about my life!"

"I really don't like these because I don't like writing, reading and writing."

"I really like it because nobody will crash into our conversations. Instead of talking, we could write and talk too. My writing has gotten a lot better."

"Yes because you get to write stuff and learn how to spell big words that are like on animal planet."

"I loves it because we get to talk back and forth . I learn my writing."

"I think we should not do the journals because I would like to have more play time. What I like about it is I get to keep all my memories in it. What did I learn how to do is to spell better."

"I like the journals because the best part is when you check-up on me and how my

day was and what I'm doing, and you're the best mom-like-teacher. Lov'in it!!!"

"I didn't like the journal dialogues. It was boring. The only thing I did like was telling you what I did. I didn't like doing it. I felt stressed out over all the writing."

"I hate the journal entry. It's just a waste of time. I didn't like nothing about it."

"I hated the journal thing because it was not a good thing for me. All I like was talking about things. I hate work too with the homework. But I like the teacher."

"I love doing journals because I feel like I can express my feelings because I know you will understand what I'm feeling and I want to say thank you for being there as a teacher. Thank you so, so much."

"I liked journal dialogues. I liked responding back."

"Well, I like how we communicated. But I do not like doing it for homework. I did like writing. I learned how to spell words."

"I did not like it. I do not want extra homework."

Case-Study Interviews

Six students were chosen as case-study participants that involved two one-on-one interviews to further immerse into these particular students' free time activities, including their perceptions and mathematical thoughts. Purposeful sampling was used to ensure that the students represented the gender, racial, academic, math attitude range of the class. They were also chosen based on their responses to the free time questionnaire in order to shed light on activities that many of the other students were also participating. Their interviews are considered in conjunction with their math attitude surveys, free time questionnaires, and dialogue journals for a fuller picture.

Case Study 1: Skylar

Skylar is a small, White student with thin, straight, light brown hair and green eyes. When I am in close proximity to her, she often reaches out to hug me. I was her

homeroom, math, science, and social studies teacher two years ago during her 2nd grade year. During her third grade year, I taught her dance twice a week for 40 minutes classes during the second semester as part of our arts program. This year I teach her all of her 4th grade core subjects. Her grades and standardized test scores rate her as an average math student and average to high student in reading. She takes medication to help her focus. I see her volunteering and participating in class an average amount compared to her classmates. She lives with her mother, step-father, and younger brother and sister. After school she attends the daycare provided at the school, but often complains that it is too loud and boring and asks if she can go with me after school, claiming that she is easy to take care of by saying, "Just give me some junk food, and I am GOOD to go!" She knows both of my sons through the afterschool daycare and occasionally asks me about them or tells me something they said or did.

On Skylar's autobiographical information sheet at the beginning of this school year, she noted science as her favorite subject and a strength. Her biographical information, free time questionnaire, parent's questionnaire, interviews, and journal dialogue reveal playing the Wii, chores, watching T.V., four wheeling, and horseback riding as her main interests and/or activities.

According to her dialogue journal writing, she typically rides horses once a week, although she occasionally has weekends where she rides a lot, such as a special weekend in the mountains at a horseback riding camp. During Skylar's first interview on the recess ground, she was asked about how she spends most of her time. She immediately brought up horseback riding, despite this not actually being what she spends the most time doing. While discussing her other activities of chores and watching television, she

did not offer many details and spoke with her head hanging down as she picked at the grass on which we were sitting. When the subject changed back to horseback riding however, she perked up, began looking at me directly and using her hands to expressively talk.

Me: What do you think you spend the most time doing outside of school?

Skylar: If I'm at my house, then I ride my horse.

Me: Is that every day?

Skylar: Kind of.

Me: I thought you said in your journal that you do that about once a week.

Skylar: (Nods)

Me: So what do you do the rest of the time?

Skylar: Chores.

Me: Chores? Do you do that every day?

Skylar: (Nods)

Me: What sort of chores do you do?

Skylar: …Dishes. They want me to do dishes, take out the trash, clean my room and the bathroom.

Me: You do this sort of stuff every day?

Skylar: (Nods)

Me: Do you have to be asked to do it? Reminded to do it? Or you just automatically do it?

Skylar: Sometimes my mom reminds me to do it.

Like many of her classmates, Skylar did not seem oriented towards describing things in exact or approximate numbers. For example, in Skyler's dialogue journal she

was asked how fast her horse goes. She responded, "It is really fast." When asked how tall her horse was she replied, "The horses are really tall." When asked how far she usually rides she responded, "As far as her little butt can go." I then responded with, "And how far do you think that is?" She responded, "Very far."

However, when questioned specifically during her second interview as to how math might be involved in her favorite activity of horseback riding, her first idea was that of distance. Skylar describes distance in relative terms.

Me: Do you think there is anything about horseback riding, or that you do when you're horseback riding, getting ready to, or afterwards that uses math or math ideas?

Skylar: Mmmm…..No. Not really…..Sometimes.

Me: 'Sometimes' what?

Skylar: I have to use the distance like how far to go. Like I gotta runway for the airplane to come..

Me: (interrupting) Do what!?

Skylar: …to see how far I go. This runway for the airplane. We have an airplane. I use it to see how far I'm going to go.

Me: You have an airplane!?

Skylar: Mmm mmm.

Me. Wow. And so what does that have to do with…?

Skylar: We have like…a long thing.

Me: Runway?

Skylar: Mmm mmm.

Me: How long is the runway? Do you know?

Skyar: I have no clue. It goes all the way to the third house which is really

far, because it's down a dirt road, so it's *really* long.

Me: Yeah. They need a lot of room.

Skylar. He has a Wii too. We went over there close to Thanksgiving.

Me: So you said, "to figure out far to go." So how do you figure out how far to go?

Skylar: Well, it depends on how much I want ride and for how long. Sometimes I ride half around it, and sometimes I just go all the way around it.

Me: Half around what?

Skylar: Around the runway.

Me: But isn't the runway straight? So you go up one side of it and back the other?

Skylar: I just go straight to the middle and, because my neighbor has a lake, and I go around that.

Her first math attitude survey done in August indicates a student who primarily enjoys math class, is confident in her math abilities, but doesn't see too much potential for math usage outside of school other than counting. Her second math attitude survey completed in December shows a bit of a decline in her enjoyment and confidence in math class. However, her belief in the potential of mathematics usage outside of school increased slightly. Her examples of possible ways to use math outside of school also appears to have expanded. On her first math attitude survey "counting my toys" and "counting things outside of my house" were her only ideas for using math. By December this stretched to include measuring how far she goes and how long it takes to get places.

Case Study 2: Rashad

Rashad is an athletic, African-American boy with glasses, full of energy, who is always looking for a way to help. He is not shy and is always willing to lead, frequently

getting the class started with singing songs, choral reading, dancing, or our other activities, sometimes before I even want the class to begin. During the first semester, he dropped out of the school's chorus group, saying that it was a little boring. He plays the drums for his church and played football on a team during the fall. Rashad's grades and standardized test scores show him to be an average student in both reading and math. His participation level during class is very high.

On Rashad's autobiographical information sheet completed at the beginning of the school year, math was noted to be his favorite subject. He wrote that his hobbies include eating ice cream and playing sports, enjoys school because he enjoys learning, and that he would like to be a firefighter when he grows up. Rashad's free time questionnaires from the beginning of the semester and the end of the semester were very similar, showing video games, fishing, hunting, riding four wheelers and bikes, watching hunting shows, and playing sports outside as his weekly activities.

During our first interview, Rashad primarily talked about all the outside sports that he plays with his siblings and cousins that all live on the same plot of land with him. We further discussed this in the second interview.

Me: Do you think any of these activities that you play: tag, whiffle ball, baseball and such…Do you think any of them use math or math ideas?

Rashad: Uh…(Shakes head.) Well, sometimes we do science. We plant seeds.

Me: How does that go? Does anything ever come up the way you want it to?

Rashad: (Shakes head.)

Me: Why do you think that is?

Rashad: I don't know.

Me: The squirrels always mess up what we plant. (Rashad nodding.) Do you

think any of these activities could use math?

Rashad: (Nods.)

Me: How so?

Rashad: Like, you could measure.

Me: Measure? What might you measure?

Rashad: A basketball goal.

Me: Like how high up it is?

Rashad: Yeah. Cause my basketball goal, you can put it up how high you want.

Me: How high do you think you usually have yours?

Rashad: Probably like….from here to there. (Motions with hand from floor to ceiling.)

Me: How high do you think that is?

Rashad: ….six…..feet

Me: Six feet? Any other ways you can think of that these games use or could use math ideas?

Rashad: (Shakes head.) I can't think of any right now.

Me: Okay. That's fine. In basketball, how many points is a basket?

Rashad: Two or three?

Me: How do y'all do it?

Rashad: Well, we play School Basketball. There's this game called School Basketball. You start from kindergarten and then you go to first grade, then second, until you graduate.

Me: Is that like, where you stand in a certain spot to shoot and work your way around?

Rashad: (Nods.)

Me: Does it matter how many people play? You can play with two, five…?

Rashad: Yeah. It doesn't matter. I was in the 8th grade spot one time, and I couldn't make it. It was too hard.

Case Study 3: Carissa

This school year is Carissa's, a Latina with dimples and a big personality, first school year at the school. She previously attended another school within the district, about 20 minutes away, but has changed from living primarily with her mom to that of her dad. She visits her mom on the weekends. Her standardized test scores indicate that she is of low to average ability in math and a high level reader. She is a very vocal student, with a high level of participation. She is quick to speak up during math class to ask for things to be explained one more time, and often comes to me during breaks, lunch, and even recess, to ask for help and extra math practice. Despite her frequent claims to being bad at math and "not getting it", she maintains a high B in math on report cards, likely due, at least in part, to her persistence.

On her autobiographical information sheet filled out at the beginning of the year, Carissa answered the stem "If I had one wish, it would be…." with "…to be good at math." She wrote that she wanted her teacher to know that she loves science and once got chased by a cow. When she grows up she would like to be a veterinarian.

During our second interview, Carissa and I explored the possibility of mathematics in her activities. She did not see much math imbedded in her activities as she played them, but tried to think of ways that math could be incorporated. This discussion reveals a limited view of the meaning of mathematics, as she believes math must always involve a number.

Me: We've talked about a lot of stuff you do. Let's start with the trampoline. Is there any math ideas that you use or could use when playing on the

trampoline?

Carissa: Well, if you're doing flips, you could add math to it. It's hard to explain it unless you're jumping. Like, you could use fours. Like three fours of a jump…or maybe you could times..

Me: Okay. Cool. Do y'all talk about that sometimes? Doing three fourths of a turn?

Carissa: No. (Shakes head and wrinkles nose.)

Me: Now, y'all play something where someone's underneath to make them fall.

Carissa: Yeah, like look at. These are my feet and these are their feet and you try to flip 'em in the air. (Gesturing with hands to demonstrate.)

Me: What about playing that game? Or watching your brother play Call of Duty? Is there any math used?

Carissa: Probably. Probably because there's so many, like, guns and knives and so many numbers.

Me: What are the numbers about? Do you know?

Carissa: It's like, well, sometimes the numbers are, like, on the bombs or sometimes they have a map and sometimes they would have numbers that tell them, like which place they shot the most people.

Me: Do you know what the #s on the bombs mean?

Carissa: (Nods.) How much time 'til it blows up.

Me: Oh, it's a count-down…..What about points? Are points done by counting by 10s?

Carissa: Count by twos. For each person shot you get two. (Giggles.) Are you going to show this to our parents or something?

Me: No. Remember I promised it's just to help me remember what you say. What about four-wheeling? Any math ideas involved with that?

Carissa: Well, like the way that she (the friend who owns the four-wheeler) rides. The tracks that we go down.

Me: What about the tracks might be math?

Carissa: Mmm. Well we have a lot of tracks. Like the wheels we go mud bogging and they can go by fours, like four eight..cause there are four wheels.

Me: Is there anything, like, on the controls that involves math.

Carissa: It has numbers.

Me: What are the numbers about?

Carissa: No wait. It has letters. It's like A..B..C..Y.

Me: What is that? Does it have to do with gears?

Carissa: A is on the little button. That's how you shoot.

Me: Oh! You're talking about on that game.

Carissa: Yeah. It's the controller.

Me: Oh I thought you were talking about four wheeling.

Carissa: Well on the four wheeler, her mom has this little like, touch screen. She's getting too big for her four wheeler.

Me: Does it have like a speedometer to tell how fast you're going?

Carissa: Oh she can't go that fast or her motor will blow up and we would probably have been alright because we go like, really slow.

Me: Is there anything that tells you how fast you're going, like a car does?

Carissa: (Shakes head.) Just the engine when it cranks up. (Imitating engine sound.) HMMMMMM. Well, it gets louder.

Discussing crafts that she and her friend do together:

Me: What do *you* like? You keep telling me what Sheila likes. What does Carissa like to do?

Carissa: Well, a lot of beads! I love beads, like the ones where you can like…she has the thing you can do beads and it ties into your hair, like right here. I love doing those. And I always make like, patterns. Like you know those little like wire things and they're like…it's rubber?

Me: Like gimp string I think?

Carissa: Yeah. And you tie it and make a pattern. She's really good. She's teaching me a little. I don't know how to do it as good as her. It's a lot of cool designs. You could add numbers like… Hmm…trying to think of a times table.

Me: Do you know patterns are math ideas too? When you do patterns, you're doing math.

Carissa: How?

Me: You know how when you have patterns like, yellow, blue, blue, yellow. That's a math concept right there. An ABBA pattern.

Carissa: How do you use *letters* like ABBA as math?

Me: Well, math is not just numbers. Math is looking at the systems, the structure of everything around us. (Whistle blows ending recess.)

Case Study 4: Rachel

Rachel is a soft-spoken, slightly taller than average, African-American girl with dimples. She receives special education services for reading, writing, and math. She was dismissed from speech at the beginning of this school year. She is sensitive, crying rather easily compared to her peers. I taught Rachel math, science, and social studies two years ago during her second grade year. This year I am her homeroom teacher and teach her all her 4th grade core subjects. Her third grade teacher (who also teaches Sarah dance twice a week this school year) and I have discussed the amount of growth we have seen in Rachel over the past few years in terms of her confidence level and willingness to speak up. The degree to which she has come out of her shell from the beginning of 2nd grade to now is very noticeable. She participated in all aspects of this study except for the second interview. She was out of school for a lengthy period for medical reasons, and did not return within time to participate in a second interview.

On the autobiographical information sheet that Rachel filled out at the beginning of the school year, she noted math as her favorite subject and playing with friends as her hobby. She wrote that going on a plane was the most exciting thing she's ever done, and that if she had one wish, it would be to fly.

During the only interview we had, when asked what she had been spending the most time doing, she said playing with her birds.

Rachel: Sometimes the only birds I like are the love birds mostly, 'cause those other birds, every single day they, when I come out, when me and my mama come out of our rooms, they chirp a lot and it gets on my nerves. And sometimes when my sister comes home, she takes them out and cuts their wings.

Me: Do they have to be cut regularly?

Rachel: Yeah. So they won't like, fly away.

Me: Oh. I thought you just clip them and that's it. So you have to keep cutting them?

Rachel. Yeah. My mom, first she gives them food and sometimes she clips their wings. She keeps a list because sometimes they look alike, but they, um, when they look alike, she checks 'em to see how many are still there 'cause she don't know if they're, you know, dead or not.

Me: Where do y'all keep 'em?

Rachel: We keep them in our kitchen.

Me: How many are there?

Rachel: About 12.

Me: About 12. How big are they?

Rachel: Uh, the love birds are like this size. (Indicates with hands about the size of a large potato.)

Me: That's still pretty big.

Rachel: The, I think, canaries, are like, a little bit bigger. (Indicates with hands

the size of a large pineapple.) We're trying to get a new cage. My mom is buying us some more cages and getting a little shed that she can put them in because they make a big mess.

…….

Me: So when you play with them, what do you do?

Rachel: Sometimes I take, like, take a little cage and take 'em in my room and play.

Me: Oh okay. Do you play with them while they're in the cage though?

Rachel: Like, my mom, she has these little bells and she, like the little things birds have, and I play with them and sometimes they hop like that and it makes me laugh because it's like they got a broken leg.

Case Study 5: Stephie

Stephie is a small, White girl with light brown hair who is quiet but always willing to answer questions or read for the class. She has very good class behavior, seems to be liked by all her classmates, and wants to be a teacher when she grows up. During individual reading class time, she likes to sit in front of the board and pretend that she is reading to her own class. She squeals, "Yippee!" whenever I hand her extra worksheets or old workbooks for her to take home to play school with. Stephie's mother works across the street at a church's daycare, and often comes to the school to volunteer and watch Stephie participate in school activities. Her grades and standardized test scores indicate that Stephie is of average math and high reading academic ability.

On her autobiographical information sheet that Stephie completed at the beginning of the school year, she mentioned softball, cheering, and wanting to be a teacher in several answers. Math was declared her favorite subject and visiting Disney World as the most exciting thing she has done.

During the first interview, Stephie discusses her main activities of playing school and riding four-wheelers and go-carts.

Me: What have you been spending the most time doing lately in your free time?

Stephie: Um..usually riding my four-wheeler or golf cart…or playing school.

Me: Which one do you think you probably do the most of?

Stephie: Probably school.

Me: Why do you think that is?

Stephie: Because I love, every day after school, I have this, like last year my teacher had these papers in class. I asked if I could have them so I have papers and like, a little white board.

Me: Why do you think you end up doing that even more than the four-wheeler and golf cart?

Stephie: Because I play that every day.

Me: Why do you play that every day? Why do you not play on the golf cart or four wheeler as much?

Stephie: Usually because I'm so tired because after I get home after daycare, I've been outside all day so I come inside and play a little bit and then go back outside.

Me: It's kind of nice to be inside sometimes. Are you allowed to go ride your four-wheeler or golf cart pretty much whenever you want or..?

Stephie: Um, I can ride it whenever I want to but the last few days, there' been this boy on his four wheeler has been driving up and down the driveway and going really fast and we don't know who he is so mom hasn't let me go out there.

……

Me: What about on the weekend? Is your weekend kind of different?

Stephie: My weekend's a little bit different. Sometimes, I have cousins that live in front of me and all around me so I usually play with them on a golf cart or four-wheeler or something like that or ride my horse. Last weekend I went to a rodeo.

As we discuss how she plays her main activities, she describes a game that she plays with her sister and cousins, a game of hide-and-go seek in the dark with the four-wheelers. The team that is hiding may get off of the four-wheeler, but must be in view of

the four-wheeler that they got off of.

Me: What about the other activities? What about four-wheeling. Do you think there's any kind of math that is kind of built into four-wheeling?

Stephie: Putting people into groups, like teams.

Me: Okay. So how is math used when you do that?

Stephie: 'Cause we have to first count up all the people and see if it's an even amount, and then if there are an even amount, we'll put it, like say that there's four people, we'll put it in groups of two.

Me: What if it's an odd number?

Stephie: Then we'll have, like one group….we'll have one more. Like one less group than one they're playing. Say there's like, five, you would have three people in one group and two people in another.

She estimates the speed of each gear when asked. "Well, I know that the first gear is just, you're starting off, and so it probably goes like, 5mph without changing it. And the 2nd gear, It will probably go,..um…like…maybe…15, 20 and the third gear will probably go like,…I can't be exact, but I would probably say about, um, uh, about 30 maybe. Then 4th gear will probably go about 40."

We discussed the gas gauge in detail, as I tried to determine if she would connect the gauge to benchmark fractions such as one half or one fourth.

Stephie: Like, one side will have an F and one side will have an E and if you're in the middle, you're okay. But if it's leaning toward the E a lot, you have to put more gas in it. And like as soon as you put gas in it, it goes all the way to F, full.

(As she complies with a request to draw what she is describing:) It's like a round circle and say, this side was an F and this side had an E.

Me: Are there little marks?

Stephie: Um, yeah. (Nodding.)

Me: Do you know where the marks are?

Stephie: Um, I know there's one straight in the middle (pointing to the middle of the gauge drawing). And there's one about right there and some there (making marks at about the one-sixth and five-sixths spots). I don't know where else. Maybe right in between there (putting marks about halfway between the midpoint and the other two points that she has made).

Me: So this thing (referring to a gas gauge that she had drawn earlier explaining how she knows if she needs gas), do you think it looks like any sort of math you've studied before?

Stephie: Um….maybe….

Me: I mean, if not, that's okay. I'm just wondering if you can think of any similarities on some school math.

Stephie: (Smiling and shaking her head.) I don't think so.

Me: What about um, the gears and the miles per hour? How is that like anything you've done in school?

Stephie: I haven't done it in school yet, but I always, when I'm driving, I'm on this side (indicating her right) of the car and mama's on this side and I'm always looking how much speed we're going. And this thing right here (Referring to the picture of the four-wheelers gas gauge) is kind of like a car.

At this point, Stephie does not perceive information from gauges in terms of school-like fractions. Although she has studied fractions in previous school years, the fact that we had not yet begun our fraction unit for this school year, may have played a role in this.

Case Study 6: Paul

Paul is a lively and active White boy with freckles, whose father jokingly introduced himself to me at open house this year, apologizing that I had to have his son in class this school year. Paul is a leader among his peers with a good sense of humor, who despite having talkative and playful tendencies, usually quickly corrects his behavior with polite apologies. His school grades and standardized test scores show him to be an

average to high level student in both math and reading. Paul's conversations and comments usually revolve around team sports and hunting. He is on the same football team as Rashad and other classmates. His younger sister is in a classroom two doors down from ours, and his middle-school aged brother has been good friends with my oldest son for several years.

On his autobiographical information sheet at the beginning of the year, Paul mentioned that he was excited about school, math is his favorite subject, he is good at hunting, baseball, and subtracting, and would buy a mountain if he had a million dollars. Hitting a homerun was proclaimed as the most exciting thing he has ever done. He hopes to be a policeman like his father when he grows up.

In Paul's questionnaire, dialogue journals, interviews, and parent's questionnaire, hunting is the prime choice of topic, although he also discusses football practices and games in which he participates. In both of Paul's math attitude surveys, he shows strong confidence in his ability to learn math, but little value in learning or using math, either in or out of school.

When asked about what sort of mathematical ideas can be found in his activities, after a moment of thinking, counting was his response. He said that he must count the points on a buck's rack to know if it is old enough for him to shoot. He also mentioned counting how many dogs he sees when dog hunting, and counting how many corn husks are on the ground by the corn pile. When further questioned about the possibility of more math being involved, he breathes out a sigh and says that he can't think of anything else. But upon further questioning and probing, Paul reveals mathematical concepts embedded in his hunting that he has yet to recognize as mathematics. I remind him if of the

distances involved in assigning 3 or 5 yard penalties in the football games he and his siblings play and suggest that this is math. He agrees with a nod. I ask him if he has to think about distances when he's hunting as well. At this point, Paul begins to talk about the role that probability plays with distance and gun choice, although he does not suggest that these types of considerations are math related.

> Well, when you're dog hunting, if you have a shot gun you have to use, if a deer is kind of far and you are going to try and take that chance and try to shoot it, it would be a fifty-fifty because if it was far, maybe only eight or nine pellets would hit out of like, twenty. But if it's close up, probably like eighteen out of twenty would hit it. So I wait until the deer get close up.

He then explains the difference between the rifle and shot gun, and the manner in which the pellets of a shot gun spread out from its source as it travels.

Paul: Well, if you are in a tight spot and the deer is running as fast as it can go and you have a rifle, I wouldn't shoot it because if you miss you will probably scare it and it will never come back. And if you hit it, if you hit it dead on, it would kill it, but if you didn't hit it dead on, then it wouldn't kill it.

Me: So if you had a shotgun you would?

Paul: Probably. Because it would spread.

Me: Shot guns spread. How far out does it spread?

Paul: If it was close it wouldn't spread that much but if it was far, it would have more time to spread. So it'll probably spread about that far out (holding out his hands about one and one half feet). Not that much, but you would have to shoot out in front of it, because it's not as fast as a shotgun.

Me: Like, how far would it need to be to full spread? You said, "far." How far is "far" do you think? Two yards or half a mile or..?

Paul: Uh, probably like, maybe fifteen yards for it to go its full spread.

Chapter Four has presented a summary with illustrations of the data collected in

this study based on concepts that emerged through constant analysis. Chapter Five summarizes the data and discusses them from an ethnomathematics and constructivist standpoint.

CHAPTER FIVE

DISCUSSIONS AND CONCLUSIONS

The purpose of this study was to uncover and explore the types of activities a class of fourth graders in the Lowcountry of South Carolina participates in outside of school and any mathematical ideas and concepts that may be embedded in the manner these children participate in such activities. One strategy employed for this research was the use of dialogue journals, in which the student and teacher-researcher wrote back and forth, having conversations about their activities and, as appropriate, any math related ideas. Therefore, another goal of this study was to investigate the use of these dialogue journals, both its effectiveness and the students' experience with them.

In this chapter, the research findings from Chapter Four will be summarized and discussed for each research question separately, reflected upon in light of this study's theoretical underpinnings of constructivism and ethnomathematics, valuing the students' culture, experiences, and perceptions of their mathematical world. This is followed by a discussion of the implications, recommendations, limitations, and a summary of conclusions of this study.

Discussion

Question 1: What kinds of everyday activities does a rural group of 4th grade students from the Lowcountry area of South Carolina participate in outside of school?

An exhaustive report of every activity the students in this class often participates is unfeasible due to the great range and variations of activities. However, a list of many

of the most common activities among this group, as well as examples of more unique activities of individual students can be compiled from the analysis of the data obtained from the free time questionnaires, dialogue journals, and interviews. These students regularly participate in many activities that would likely be considered typical for 4th grade students in most locations in the United States, such as watching television, riding bikes, playing computer and video games, and taking care of and playing with pets. Activities of pretending and imagining sometimes stem from the television shows that they watch, such as pretending to be CSI agents and American Pickers. Sports such as kickball, baseball, football, and basketball were also very prevalent as typical weekly activities. Common activities for these students that are options due to the environment and geography in which they live include horseback riding, hunting, four-wheeling, and riding go-carts.

One thing encountered was that a student's first response to what they do with most of their free time may be different from how they actually spend the majority of their time. These students often responded to such a question with what stood out to them as the most unique or fun thing that they have done and not necessarily how most of their time was spent.

There were some variations between the boys' and girls' activities. Although there was overlap of most every activity, the boys' computer and video game choices stood out overall as different from that of the girls. Also, playing school and playing with dolls were mentioned by more than one girl, but not one boy responded with these activities. Although some of the girls do go hunting, not as many are hunting as often as the boys. Watching television shows, playing video games, and riding four-wheelers is

just as prevalent among the girls as the boys.

The African-Americans in this group reported activities that reflected the class as a whole, sharing many of the same common activities with individual unique activities as well, such as modeling in a fashion show, playing with pet birds, jumping rope, and writing songs.

Question 2: What types of mathematical concepts, if any, are these students using in these activities? How do these students perceive these activities in relation to mathematical concepts?

In light of the amount and range of activities uncovered in this study, it is difficult to comprehensively answer with all of the mathematical concepts students may be using in their free time. It was impossible to thoroughly peel back all the layers of so many activities to reveal how the students go about their activities. It is also possible that using the Common Core State Standards, a cultural artifact itself, as a lens to detect mathematics, may have limited what I recognized as math. However, through the dialogue journals, survey responses, and case-study interviews, some mathematical concepts did begin to emerge.

Bishop (1988) asserts that there are pre-mathematical practices that exist in every culture; measuring, location, designing, playing, and explaining. There were numerous examples of students naturally using, with awareness, counting in their after-school activities. Many of the students were inclined to give lengths, weight, speed, and other measurements in vague terms or by comparisons. However, students that hunt do seem apt to use approximations of distance in yards and weight in pounds as they regularly hunt. There were two specific examples where students noticed patterns in their

activities. One student articulated probability scenarios with his shot gun and the number of bullets spreading. He did not however, recognize that drawing conclusions such as "8 out of 20" was a mathematical idea.

At this point based on student responses, many of the students' perception of what entails mathematics is limited to numbers for counting. Some students have begun to expand their thinking about mathematics to include measuring time and distance, a counting of something abstract as opposed to counting actual objects. Other than simple counting, measuring, or using money in a store, students rarely perceive their free time activities as involving any mathematical concepts.

Question 3: How can the strategy, dialogue journaling, be used as a means to gain information about these students' experiences and be utilized to engage students in further mathematical applications within these activities of choice? How do these students experience this strategy?

A wealth of information was uncovered about how students spend their time, how they go about their activities, and how they feel about it through the use of the dialogue journals. Students brought up many activities that they were frequently spending time on that had not been recorded on the free time questionnaires. For example, one girl participates in fashion shows, another girl was excited to talk about the football games she was watching daily on T.V., and many students spend time helping in the kitchen and enjoy cooking. I learned from one boy that his grandmother was teaching him to crochet and that he often plays school with his stuffed bear. More students were fishing at least once a week than the questionnaires had shown. Another student spends time looking for and observing spiders on a daily basis and frequently gets to ride in a tow truck on the

weekends as his father works. These are activities that were not learned from the responses on the questionnaires.

Through dialogue journal discussions, I was able to begin discovering how the students engaged in their activities in order to begin uncovering math concepts that may be embedded in the way these students participate in these activities. Many discussions revolved around the goal of particular video games and the scoring process. It was learned what students were cooking and how they decide on the needed amount of an ingredient. Other discussions revealed students' perceptions of how far guns shoot, how fast four wheelers go, and how much fish and game weigh, all part of many students' weekly activities.

However, using the discussions to encourage mathematical thinking was often challenging. This was perhaps due to the fact that the students were never told that noticing mathematics in their activities or engaging in mathematical discussions was a goal of the dialogue journals. It was my intention to discreetly guide the students into discussing their activities in terms of mathematical ideas. Perhaps because they did not know this was a goal, it was more difficult to engage them in that style of conversation. An example is in a dialogue journal discussion I was having with a boy about the speed of a race car.

Me:	How fast do you think the car your dad drove compares to the car you rode in Myrtle Beach?
Student:	My dad drove our car fast. The race car seem faster.
Me:	How fast?
Student:	It was faster than a cheetah.
Me:	And how fast is that?
Student:	It was fast like a train. It was really fun.
Me:	Have you ever been on a train?
Student:	No. I have never been on a train.

There are other examples as well in the dialogue journals of other students, despite the probing and repeated questions never produced responses in mathematical terms. This reveals some students' natural inclination to think of their activities in non-standard measurement terms. The journals also facilitated in uncovering these students' comparison choices as well as their experience basis for comparisons. Research in ethnomathematics shows that in daily practice, modes of cognition may be very different from what is taught in school (Int. Study Group of Ethnomathematics, 1985).

The dialogue journals also exposed areas of emerging mathematical concepts. For example, in a dialogue journal discussion about cooking, I asked a student how much water and oil she used to make her cake. She answered that she needed ½ inch for both. Although her response shows that she recognizes height in terms of fractions, it shows that she has yet to apply principles of volume in cooking situations.

There were some situations in which I was able to encourage mathematical thinking in terms of their activities such as patterns in jump roping, the distance that hunting guns shoot, dimensions of Lego creations, and various math problems based on their particular experiences.

One issue dealt with in the dialogue journals was that many times students only answered certain questions, often skipping over the ones which may have led to a more mathematically focused discussion. For example, in a discussion about how a girl plays in the sprinkler by jumping, I responded, "How high can you jump? I think playing in the sprinkler is a great thing to do, but my husband doesn't like my kids to do it. He's worried it will mess up the grass. What else have you been up to?" She responded to the last question only; "I also have been watching my brother's football games. He plays for

the Wolves. They haven't won a game yet but I hope they do one day. I wish I could cheer for them but I can't because of gymnastics." These unanswered questions may be due to students avoiding the questions that didn't interest them and instead focusing on the questions that most interested them. Another factor may have been the sheer number of questions being asked. When students did not answer certain questions, it was usually the last question which they answered, perhaps because it was the last question on their mind. In order to alleviate this issue, I began to leave space after questions as a cue for students. This helped guide students to respond to each of the questions. For example, I had several questions I wanted to ask a student about his spider observations. Instead of putting all of the questions together as I had been doing, I spaced each part out to give him room for his responses, which he used to address all of my questions with both diagrams and writing.

Despite the many discussions in the journals being led towards mathematics in relation to their activities, the math attitude survey shows a decrease in the amount of girls and boys that claim to think about and see math outside of school, though a noticeable increase of girls and slight increase of boys who state that using mathematics is a possibility in their free-time play.

The students as a whole enjoyed having the opportunity to carry on a conversation with their teacher in the dialogue journals and write about what they have been up to. However, the fact that it was given as homework was disliked by most. As a self-contained classroom teacher teaching all subjects to the same group for the duration of the school day, it would not be too difficult for me to alter the dialogue journal writing assignment and use time during the school day for it. For example, it could be used to

integrate mathematic topics into writing practice and instruction. This would take away the negative feeling that their journal writing was taking away from their play time. However, for a math teacher who only sees her/his class for a limited time for a math block, it may be a difficult choice to use math instruction time for dialogue journal writing. A resolution to this may be to allow for the dialogue journal writing to be on a more voluntary basis, such as an activity choice for when a student has finished their assignment.

Implications

This study shows that much can be learned about students' mathematical understandings, as well as misunderstandings, by exploring their perceptions of their free-time activities. Activities in which students participate outside of school deserve to be explored with an ethnomathematical lens due to its ability to uncover the contexts in which these students typically face particular mathematical situations. An ethnomathematics perspective practiced in the classroom leads to math content being rooted in the mathematics of the culture of the students (Skovsmose & Vithal, 1997).

After seeing so much proof that many students rarely view distances and speeds in their experience in standard units, I know that I will spend a great deal more time on transitioning from nonstandard to standard units and creating experiences where they can practice with standard units in situations similar to their free time activities. The dialogue journals have revealed that many of the students are not transferring their measurement learning in school to their outside world, so translating their outside world into classroom situations and discussions may be in order.

Significance/Contributions

It is desired that information gleaned by this research be used to support teachers in analyzing and reflecting upon the value of their students' out-of-school activities. It may assist teachers of students that participate in similar activities as in this study by informing instruction that connects more math concepts to students' out-of-school activities. However, it is again cautioned that just because two students participate in the same activity, it does not mean that they would use identical mathematical concepts or perceive or experience it the same. The plethora of activities uncovered in this research could be used as springboards to create interesting lesson plans and examples that students will find interesting and be able to connect with their lives.

The data can also be used as a comparison basis with children's math play in other cultures. Such a comparison may help our understanding of the many layers of culture that affect math cognition, perhaps leading us to uncover why certain types of mathematics instruction may be more or less successful among a particular population.

Acknowledging the need to consider the cultural background of the students sitting in our classrooms, the biggest challenge is in determining how to best evaluate and implement teaching practices in respect to cultural background and its cultural implications.

Recommendations

One recommendation for further study would be to research the effect on the amount and type of mathematical discussions students engage in during dialogue journal discussions if students are made aware that mathematical discussions is a goal of the journals. Perhaps students would realize more quickly that certain questions asked by the

teacher were actually looking for comparisons, estimates, and measurements in mathematical terms if these intentions were not kept discreet as they were in this study. Making this mathematical purpose explicit to the students in the beginning may yield more productive written conversations in terms of the mathematics in their everyday activities than found in this study.

This research uncovered a broad range of activities that one class of rural, Lowcountry students participated. It was impossible to thoroughly delve into the embedded mathematical ideas in all of these activities within this one study. Research focusing on the students' perceptions and the embedded math of one or two of these activities, as well as the students' perceptions of the mathematical elements of the activity, would complement the findings of this study.

Limitations

The results of this study describe the particular group of students that participated in this study. The findings are influenced by the geography, both physical and cultural, in which these students live and is dependent upon this particular group's interests in a particular moment of time. Therefore, its degree of transferability must be assessed by the reader.

A challenge to research such as this is the difficulty of breaking free of limits created by one's own cultural background and experiences that could influence the identification of mathematical concepts in children's activities. The role of preconceived ideas of what constitutes real or valuable math had to be faced in order to minimize the overlooking of mathematical thinking intertwined in these activities. With me as both the classroom teacher and researcher, every step of this research, from the questions students

were asked to mathematical ideas noticed in the data, was influenced by my understandings and perceptions of my students, their activities, and mathematics. An issue that I particularly struggled with was dealing with my view of what constitutes mathematics, so heavily indoctrinated am I to the formal education system's definition of math. This study was conducted using an intimate and experienced knowledge of elementary school math curriculum as a lens for identifying math concepts intertwined in the students' activities. This culturally based lens may have limited the view of mathematical concepts. It may not have been possible to tease out all math concepts using limited observations, journal writing, and the Common Core State Standards as an evaluation tool. Ascher (1991) states that it is a colonial assumption that all cultures have math concepts that can be described in conventional math terms. This may likely have blinded me to other mathematical ideas embedded in the way these children participate in their out of school activities.

Final Conclusions

The out-of-school activities of this group of twenty-four 4th graders of South Carolina's Lowcountry include a large range of variety, such as observing spiders, roller skating, modeling in fashion shows, cooking, crocheting, writing stories, and playing guitars and drums. Common activities that these students perceive as their main activities include watching T.V., playing video games, taking care of various pets, horseback riding, four-wheeling, hunting, playing school, playing ball sports outside with friends, siblings, and cousins, and playing on trampolines.

Race did not prove to be a factor in choices of activities among these students, although gender did have some effect on the choices and manner in which activities were

participated. Some of the activities are dependent upon the physical and cultural geography in which these students live.

Most students had to use effort to conceive of any mathematical ideas embedded in their free-time activities. This appears to be related to their limited view of the definition of mathematics. Many of the students perceived math as entailing mainly counting and numbers. By the end of the study, more students were beginning to include the counting of abstract amounts, such as with measurement, as opportunities for mathematical thinking in their activities. Race did not appear to be a major factor in perceptions of mathematics within free-time activities, although this could be explored more.

The most noticeable mathematics found embedded in these students out of school activities include probability used with the use of shot guns, measurement in terms of distance, weight, and time, patterns in art and jump roping, using money, and skip counting in some sports and in many video games.

Dialogue journals proved to be a useful vehicle for uncovering the types of activities in which students are involved as well as their thinking about these activities. Overall, most of the students did enjoy having conversations with their teacher in the dialogue journals, but did not like having it as another homework assignment. Some mathematical ideas embedded in the students' activities as well as mathematical misconceptions were uncovered through these written conversations. As a tool for ethnomathematical research, the dialogue journals have much potential, as they reveal the context of student experiences and provide a method for uncovering any connections to implicit math in everyday activities (D'Ambrosio, 1985, Skovsmore & Vithal, 1997).

Using dialogue journals to encourage students to apply more mathematical ideas to their free time activities proved to be a bit of a challenge, perhaps partly due to the students being uninformed of the mathematical goal of the journals. This also points to the possibility that the students do not readily transfer school mathematical learning to daily life and may need more direct guidance in making these connections, thus assisting students in placing more value on math as a beneficial tool for their daily life.

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APPENDIX A- FREE TIME SURVEY

FREE TIME SURVEY

Take a few moments to think of the things you did and played when you had free time this past week. Then answer the following questions.

1. What activity did you do the most when you had free time this past week? _____

_____

2. Did you play any video or computer games? Yes / No

If yes, name the games you played the most.

_____

_____

3. Did you play any sports? Yes / No

If yes, name the sports you played the most.

_____

_____

4. Did you play with things on wheels, like bicycles, skateboards, scooters, ripstiks, or fourwheelers? Yes / No

If yes, which did you play?

_____

_____

5. Did you play any pretend or imaginary games? Yes / No

If yes, what did you pretend?

_____

_____

6. Did you play with any toys this week? Yes / No

If yes, what toys did you play with?

_____

_____

7. Did you watch T.V.? Yes / No

If yes, what shows did you watch the most?

_____

_____

8. Did you go exploring outside? Yes / No

If yes, what do you see and do when you explore?

_____

_____

9. Did you read for fun? Yes / No

If yes, what did you read?

_____

_____

10. Did you do any art activities, such as cutting, drawing, painting, or coloring? Yes / No

If yes, what did you do?

_____

_____

11. Is there anything else you played this week that isn't reading, drawing, exploring, a computer/video game, a toy, a pretend game, or something with wheels? Yes / No

If yes, what was it?

_____

_____

12. What did you spend the most free time doing this week? _____

_____

APPENDIX B- MATH ATTITUDE SURVEY

Date _____

Bubble your answer. Do not spend much time with any one question, but do answer all of them. There is no right or wrong answer. The correct answer is the one that is most true for you and how you feel about it most of the time.

1. Learning math is a waste of time.	Not at all	a little	sort of	some	a lot
2. Math is important to learn.	Not at all	a little	sort of	some	a lot
3. I avoid having to do more math.	Not at all	a little	sort of	some	a lot
4. I like math.	Not at all	a little	sort of	some	a lot
5. I think about and see math outside of school (not counting homework).	Not at all	a little	sort of	some	a lot
6. I use math outside of school (not counting homework).	Not at all	a little	sort of	some	a lot
7. I can use mathematics in many ways when I'm playing outside of school.	Not at all	a little	sort of	some	a lot
8. I don't expect to use much math when I'm out of school.	Not at all	a little	sort of	some	a lot
9. Math is not important to me outside of school.	Not at all	a little	sort of	some	a lot
10. I would like to spend more time in school doing math.	Not at all	a little	sort of	some	a lot
11. I enjoy math class at school.	Not at all	a little	sort of	some	a lot
12. I am bored during math class.	Not at all	a little	sort of	some	a lot

	○	○	○	○	○
13. I am happy during math class.	Not at all	a little	sort of	some	a lot
	○	○	○	○	○
14. I feel nervous and anxious in math class.	Not at all	a little	sort of	some	a lot
	○	○	○	○	○
15. I don't understand what's going on during math class.	Not at all	a little	sort of	some	a lot
	○	○	○	○	○
16. I am sure that I can learn math.	Not at all	a little	sort of	some	a lot
	○	○	○	○	○
17. Learning math is hard for me.	Not at all	a little	sort of	some	a lot
	○	○	○	○	○
18. I think I could handle more challenging math.	Not at all	a little	sort of	some	a lot
	○	○	○	○	○
19. I can get good grades in math.	Not at all	a little	sort of	some	a lot
	○	○	○	○	○
20. I'm not the type to do well in math.	Not at all	a little	sort of	some	a lot
	○	○	○	○	○

These are ways I use math when I'm not in school: _____

_____

_____

_____

These are ways that I *could* use math when I'm not in school: _____

_____

_____

_____

APPENDIX C- INTERVIEW QUESTIONS

Semi-structured Interview #1

(Goal: to determine the types of activities students are involved in outside of school and school work.)

1. What activity have you been spending the most time doing in your free time?

2. Why have you been spending so much time doing this? (Circle any sentences that are true for you.)

Some possible reasons: It's my favorite. This is what my friend, cousin, brother, or sister wants to play. It was one of the only things I could play at the time.

3. How often do you do this activity?

Almost every day. Maybe once or twice a week. Every week or so. A few times a year

4. How long do you usually do this before stopping?

30 minutes or less around 1 hour around 2 hours more than 2 hours

5. What do you like most about this? What do you think makes this fun for you?

6. What do you like least about it?

If it the activity under discussion is a type of play:

7. Are there any rules to this game?

8. Do you and your friends make up any rules for this game?

9. Do the rules or goals of the game change as you play?

10. How do you play?

Semi-structured Interview #2

(Goal: to uncover the participant's perception of math conceptions used in any of their activities that require mathematical thinking. Questions will vary depending on the particular activity being discussed.)

- Do you think any of the activities you often do use math or math ideas?
- How is this used in the game/activity?
- Is this math a fun part of the game/activity for you, or would it be better if it wasn't a part?
- Is this like anything you've studied before in school?
- Do you think any of the activities you often do *could* use math or math ideas?
- How could it be used in this game/activity?
- Do you think putting this math to it will make it more fun, or would you not like it as much?
- Are there any math ideas or math thinking used in the activity that maybe you haven't talked about in school before?

APPENDIX D- FREE TIME QUESTIONNAIRE FOR PARENTS

Please take a few moments to think of the things that you noticed your child doing and playing when he/she had free time this past week. (I understand that you will not likely know the details of everything they did.) Then answer the following questions based on what you observed.

1. What activity did he/she do the most when he/she had free time this past week?

_____

2. Did he/she play any video or computer games? Yes / No
   If yes, name the games played the most.

_____

_____

3. Did he/she play any sports? Yes / No
   If yes, name the sports played the most.

_____

_____

4. Did he/she play with things on wheels, like bicycles, skateboards, scooters, ripstiks, or fourwheelers? Yes / No

   If yes, which were played with?

_____

_____

5. Did he/she play any pretend or imaginary games? Yes / No
   If yes, what did he/she pretend?

_____

_____

6. Did he/she play with any toys this week? Yes / No

If yes, what toys were played with?

_____

_____

7. Did he/she watch T.V.? Yes / No

If yes, what shows were watched the most?

_____

_____

8. Did he/she go exploring outside? Yes / No

If yes, what was likely seen and done when exploring?

_____

_____

9. Did he/she read for fun? Yes / No

If yes, what was read?

_____

_____

10. Did he/she do any art activities, such as cutting, drawing, painting, or coloring? Yes / No

If yes, what did he/she do?

_____

_____

11. Is there anything else played this week that isn't reading, drawing, exploring, a computer/video game, a toy, a pretend game, or something with wheels? Yes / No

If yes, what was it?

_____

_____

12. What did he/she spend the most free time doing this week?

_____

APPENDIX E- CONSENT FORM

Consent Form

Identifying and Encouraging Math in Children's Out-of-school Activities in the Rural Lowcountry of South Carolina

Research conducted by Sherry Hyatt

Dear Parent/Guardian,

I am writing to ask permission to conduct educational research using your child as a case-study participant, in which I will interview your child about their out-of-school experiences and math thinking.

As part of my doctoral program through USC in Curriculum and Instruction, I am required to do a dissertation involving educational research. My research will explore the mathematics that is involved and/or applicable in the everyday afterschool activities of students. I believe that this information can benefit your child by providing more in-depth information about the types of activities that interest him/her as well as any types of math applications he/she naturally has experience with. This knowledge will help guide my math instruction with your child. I also hope to use this information to encourage students to apply more mathematical thinking in their everyday activities.

Activity	Where	When
4-6 students are interviewed about their daily out-of-school activities and their math learning/ experiences.	At school	2-3 times during Semester 1; 20 minutes each

Any information that is obtained in connection with this study and that can be identified with your child will remain confidential. His/her responses will not be linked to his/her name or your name in any written or verbal report of this research project. Interviews may be videotaped in order to help me recall details of their responses. However, these videotapes will not be shown to anyone else or used for any other purposes.

For more information concerning this research, you may contact:
Sherry Hyatt: (843) 899-8950, (843) 819-1275, email- hyattsc@bcsdschools.net
Rhonda Jeffries (Faculty advisor) (803) 777-5270, email- rjeffries@sc.edu

If you have any questions about your rights, you may contact: Thomas Coggins, Director, Office of Research Compliance, USC< Columbia, SC 29208 tel- (803) 777-7095 Fax- (803) 576-5589 email- tcoggins@mailbox.sc.edu

Participation in this study is voluntary. You are free not to have your child participate or withdraw at any time, for whatever reason, without negative consequences. In the event that

you do withdraw your child from this study, any information already provided will be kept in a confidential manner.
Thank you,

Sherry Hyatt

I have read the contents of this from and have been encouraged to ask questions. I have received answers to my questions. I give my consent for my child to participate in this study, although I have been told that I may withdraw him/her at any time without negative consequences. I have received a copy of this form for my records and future reference.

Name of Parent/Legal Guardian (please print)
_____

Print Child's Name _____

Signature of Parent/Legal Guardian _____ Date _____