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INTEGRATING CHILDREN'S LITERATURE AND MATHEMATICS

By  
Karen E. Moore

A Thesis

Submitted in partial fulfillment of the requirements of the  
Master of Science in Teaching Degree  
of  
The Graduate School  
at  
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June 30, 2008

Approved by

Dr. Marjorie E. Madden

Date Approved June 30, 2008

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## ABSTRACT

Karen E. Moore

INTEGRATING CHILDREN'S LITERATURE AND MATHEMATICS

2008

Dr. Marjorie E. Madden, thesis advisor

Master of Science in Teaching

This study is a qualitative study that explores what happens when children's literature is integrated into the teaching of mathematics. The subjects for this study are five fourth and fifth grade students in a resource room located in a southern New Jersey elementary school. For this study, students participated in a math unit using children's literature to teach fractions and probability. Data collected includes student response journals, observations of students, student work, and my teacher research journal. This data is analyzed utilizing the qualitative approach, where themes are identified and linked back to the initial question. The findings reveal many benefits to integrating children's literature and mathematics. The students are able to make connections to their own lives through the stories that they read and feel motivated to learn while participating in the math lessons.

## ACKNOWLEDGEMENTS

My father, mother, and brother:

Thank you so much for your continued support and encouragement. You have always given me the love and support I needed especially throughout the last five years. I could not have done it without you!

Jason

I know you are just as glad as I am that this is all finished. Thanks for being there for me and giving me all the love and encouragement I have needed.

Friends

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Dr. Madden

You have always pushed me to do my best work and I thank you for all of your help. I really appreciate all of your guidance and no matter how many times you had to read this, it was going to be perfect. Thanks for making this experience enjoyable.

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## Chapter I:

### Scope of Study

“Dingggg, dinggggg” sounds the morning bell as the school day begins. As I gaze around the room, twenty children are seated quietly eagerly awaiting their first instructions. “Take out your math books please and turn to page 36,” whispers the teacher. Some students peer into their paper filled desks and search furiously for their textbook.

“Today we are going to discuss time,” she directs. A little blonde girl in the front row raised her hand and excitedly comments, “I know how to tell time. It’s 8:45.” The teacher congratulates the student for her effort but remarks that everyone should be familiar with telling time and today they are going to discuss how much time has passed. Another girl in the last row, Tina, slumps down in her chair and has a frustrated look on her face. I can tell this is a difficult concept for some students as I see the puzzled looks on their faces.

The teacher continues the lesson and writes a time on the board, 10:30. She then writes 12:00 next to the previous time and asks the students, “How much time has passed between 10:30 and 12:00?” Some students quickly start writing down numbers and are trying to solve the problem. The teacher calls on a student to tell her the answer and the

student responds with the correct answer of an hour and a half. The teacher moves on to the next problem and asks Tina how much time has passed between 3:30 and 8:00. Tina responds by saying “I don’t know” and the teacher says, “Just give it a try.” Tina gives a frustrated sigh and says, “a half hour.” “Nice try, but let’s ask a friend to help us out,” and the teacher calls on another student. Tina slumps down in her chair and the frustrated look on her face returns. The teacher completes a few more problems with the class to model the process to figure out the answer. “Complete problems 5 through 10 independently,” she concludes.

As a pre-service teacher in the classroom, I am intrigued by the worried look on Tina’s face. She seems at a loss for how to go about figuring out the problem. I walk over and crouch down beside her desk. “Is everything okay?” I ask Tina. “I don’t understand,” she replies, “I don’t like telling time because it is hard and I just don’t get it,” remarks Tina.

As I think to myself, what could she possibly not understand, Tina says “I don’t get it! This is too hard and why does it matter anyway?” I direct Tina to at least try the problems and I offer to help if she gets stuck. She begins writing down numbers, adding and subtracting time, until she comes up with an answer that she thinks is correct. I continue to circulate around the room, noticing that more than a few students are really struggling with the concept.

“Stop, look, listen,” directs the teacher. “Please put away your Math books and take out your writing journals.” She begins to move on with her lessons as planned but I wonder if there is a more engaging way to help Tina and the other students understand the concept at hand with out just trying to re-explain. How can students like Tina



understand difficult concepts and connect with them to make things more meaningful in everyday life?

### Story of the Question

In my own education I enjoyed Math class but always had trouble connecting the concepts learned in class to how they would be used in everyday life. Through my training as a pre-service teacher I have had very few classes about teaching mathematics so most of what I have learned has come from previous knowledge and observations in the classroom.

My position on this research came about through my pre-service teaching observations, as illustrated in the above vignette. This third grade classroom led me to the “aha” moment that there are students who just do not make those connections in math as to why certain topics are important.

Later, the same week of Tina’s troubling math day, I observed the third grade teacher conducting a lesson about rural, urban, and suburban communities. She began the lesson by reading the children’s book Click, Clack, Moo: Cows That Type by Doreen Cronin. The students talked about what you would find in a rural community using the book that the teacher read. Beside the humorous and engaging story line the students were able to discuss the things found on a farm and in a rural community and make personal connections to the book. I thought what a great way to start a discussion in Social Studies without reading from a text book or having students try to imagine what the rural community looks like.

Students really began to understand what a rural community may look like and were able to discuss any connections to the topic. Why can’t the same methods be used

to discuss Math topics? Would students be able to hear the math language and vocabulary used in everyday situations and use this to make the connection to what they are learning? What about students who are English Language Learners and have difficulty with math? Could children's literature help those students improve their math skills and help them make connections with math concepts? As I ponder these questions I began to observe more closely the relationship between Math and Literature in the classroom.

#### Purpose Statement

There are students in every school in the country who struggle to learn math concepts and research conducted to help these students would be very beneficial. In response to this need, this study looks at integrating children's literature into the teaching of mathematics in the elementary classroom. And although using children's literature to develop math concepts is "not a new idea" and much research has been completed (Moyer, 2000), there is a need for more classroom case studies. Moyer suggests that there is a natural connection between children's literature and opportunities for the development of mathematical ideas; however, many teachers fail to utilize this connection in the classroom (2000). I hope that the present study helps teachers understand the possibilities of literature to more fully understand mathematical concepts.

Students today are being challenged "to think about mathematics very differently from the school mathematics which they experienced" (Mink and Fraser, 2002). The expectations that students are given to learn and acquire math skills have become more demanding in order to become successful. In the world today, "it is becoming more and more important that all citizens be confident in their ability to do mathematics" (Furner,

Yahya, and Duffy, 2005). The shift in student learning from rote memorization to student's being expected to "apply, adapt, and extend" their knowledge has developed a need for a change in the approach to teaching (Mink and Fraser, 2002). New standards for the teaching of Mathematics have been adopted by The National Council of Teachers of Mathematics and they have identified "equity" as their first principle for school mathematics (Furner, Yahya, and Duffy, 2005). The NCTM has stated, "equity requires accommodating differences to help everyone learn mathematics" (Furner, Yahya, and Duffy, 2005). If equity is to be attained in the classroom then concepts should be taught in a way that accommodates many ways of learning. One way to help students who have a need to understand why they are learning various topics is to help them make connections to previous knowledge and how it can be applied to everyday life.

Students need to be able to make connections to what they are learning about math to their everyday life or previous experiences in order to internalize its meaning. Children's literature "provides a context through which mathematical concepts, patterns, problem solving, and real-world contexts may be explored" (Moyer, 2000). Further, children's literature can be used to create a context for hands-on opportunities to apply math skills and concepts (Kolstad and Briggs, 1996; Moyer, 2000; Cutler, Gilkerson, Parrott, and Bowne, 2003).

Although the foundations of language and mathematical ideas are developed in the elementary grades (Moyer, 2000), many children have difficulty communicating mathematically. Using children's literature can help these students create a "natural, meaningful path" for communicating and exploring mathematics (Cutler, Gilkerson, Parrott, and Bowne, 2003). Students who are struggling to understand the importance of

math concepts need to be able to make connections to their everyday life and practice communicating mathematically. Marilyn Burns says “teaching math through children’s books motivates children to learn math in exciting new ways; encourages students to think and reason mathematically and builds students’ appreciation for math and literature” (Von Drasek, 2006). The purpose of this research, then, is to integrate children’s literature into the teaching of mathematics so that struggling students are more able to make personal connections with mathematical concepts and enhance their learning.

### Research Question

Children learn mathematics through the use of language and opportunities for the development of mathematical ideas arise naturally from children’s books, yet books are not always used in math instruction. Therefore, the question of this research study becomes “What happens when children’s literature is integrated into the teaching of mathematics?”

Along with examining the use of children’s literature to teach math more questions arise: Does this practice help visual learners and other types of learners? Who might benefit from this practice? Should this practice be used for teaching only some concepts when necessary or should it become a common practice?

### Limitations of the Study

Limitations to the study are found in the lack of appropriate literature to address all math concepts. Although there are many children’s literature texts based on mathematical concepts, finding age appropriate content can be challenging. Consequently, this study looks only at integrating literature into a unit on fractions.

Another limitation is found in that the results are applicable to one specific classroom in one specific school. More studies must be conducted in order to make generalizations about the impact of literature on comprehension of mathematical concepts in the elementary classroom.

### What's Next?

Throughout the remaining chapters the use of children's literature integrated with math instruction will be thoroughly examined and studied. In chapter two, existing literature about incorporating children's books into math instruction is examined and reviewed. The third chapter includes the context of the study and the research design. Chapter four discusses the data sources that are collected and analyzes the data. The final chapter highlights the importance of this study and the implications of the research for other teacher researchers.

## Chapter II:

### Review of the Literature

#### Introduction

In today's schools, many students struggle with the learning of mathematics and it is primarily taught without the integration of other subjects. Chapter two presents a review of the literature regarding the integration of children's literature and mathematics in the elementary classroom. The first section focuses on how children's literature could be used to teach mathematics and what a lesson may look like in the classroom. The second section discusses student benefits of an integrated approach. The chapter concludes with a discussion on how this particular study might add to the current body of research on the integration of children's literature and mathematics in the elementary classroom.

#### What is the integration of children's literature into mathematics?

Even in an integrated curriculum or whole language approach in which a teacher incorporates listening, speaking, reading, and writing across the curriculum," the use of literature in the teaching of mathematics is often neglected (Kolstad, 1996, p. 423). Using children's literature to introduce, teach, and reinforce mathematical concepts is how teachers can implement this approach in an elementary classroom. Integrating

mathematics and children's literature creates "an interweaving of curriculum rather than a compartmentalizing of academic subjects" (Cutler, Gilkerson, Parrott, & Bowne, 2003, p. 22). This path of connecting children's literature and math is natural as mathematical concepts are often linked to the language children use to express these ideas (Moyer, 2000; Cutler, Gilkerson, Parrott, & Bowne, 2003).

### Example Lesson

Ducolon (2000) and Jenner & Anderson (2000) both provide example lessons integrating children's literature and mathematics using the book *Caps For Sale* (Slobodkina, 1987). The book is used as a "springboard for mathematical problem solving" (Ducolon, 2000). The teacher begins by reading the story to the students. In the story, "a peddler walks through neighborhood streets and country roads selling the gray, brown, blue, and red caps that are balanced on his head. When he stops for a rest, several clever monkeys steal his caps and the peddler must find a way to trick the monkeys to retrieve them" (Ducolon, 2000).

The story sparks a discussion concerning patterns using the patterns of the caps on the peddler's head. Students then create their own patterns using the caps, which could be drawn or if the teacher had actual hats they can be manipulated. For other students it may also lead to the discussion of the peddler selling his caps for 50 cents. The teacher then poses the problem to the students: A peddler sells his caps for fifty cents each. In how many ways can we make fifty cents using pennies, nickels, dimes, and quarters? Students construct different ways to make fifty cents through drawing or using plastic coins. The class then discusses strategies the students used that were effective (Ducolon,

2000). The story becomes a way through which students are able to develop mathematical problems, discuss the process of their thinking, and make connections.

### Problem Solving and Critical Thinking Skills

Children's literature provides "real-world opportunities for children to explore mathematics by providing problem-solving contexts with which children are familiar" (Moyer, 2000). In 1989, the National Council of Teachers of Mathematics, NCTM, advocated that "problem solving should be the central focus of the mathematics curriculum" and others agree that problem solving is "a way to see the mathematics involved in daily life" (Leitze, 1997). This is important because children tend to think of math as rote memorization of facts and computation of numbers. Mathematics is also a "way of thinking about problem solutions, which may or may not involve numbers," the same way that the "solution to many of life's problems that call for a mathematical solution may or may not involve numbers" (Leitze, 1997). Children's literature is one way that students can link their understanding of problem solving and knowledge of real life experiences to strengthen their understanding.

### Making Connections

When discussing mathematical thinking, like many other subjects, the role of previous knowledge must be considered. Piaget says "that children cannot see, hear, or remember that which they cannot understand. If the mental structures are not in place to support what is seen or heard, there will be no mental connection, and consequently it will not be remembered" (Wakefield, 1997). The importance of building upon previous knowledge plays a critical role in the learner's ability to construct meaning and connect



new information with what they already know. That is why rote memorization is so difficult for students.

One NCTM Learning Principle, found in the NCTM's *Principles and Standards for School Mathematics*, states "Students must learn with understanding, actively building new knowledge from experience and prior knowledge" (Franz & Pope, 2005). Students need to be able to connect mathematical concepts with meaning and information they already know and using children's literature will enable students to make such connections. For example, in a sixth grade classroom, Deborah Watters (2000) used Bill Martin Jr. and Michael Sampson's book, *Swish!*, to develop activities that would provide students with the opportunity to make connections between mathematics and basketball. Activities ranged from comparing sizes of an NCAA basketball court with the court at the elementary school to discussing and finding field-goal percentages. These experiences gave students the opportunity to "make connections between their existing knowledge and newly presented mathematical concepts" as well as complete activities that have "authentic meaning for students" (Watters, 2000). Another NCTM standard is that programs should enable "all students to- recognize and apply mathematics in contexts outside of the mathematics" and integrating children's literature assists students in making important mathematical connections beyond the math classroom (Franz & Pope, 2005; Watters, 2000).

These types of activities that have spring boarded from children's literature provide meaningful contexts for students. Books provide exploration in a "natural, familiar, and meaningful context" (Kolstad, 1996) in which to use and extend their mathematical knowledge (Jenner & Anderson, (2000). The literature that is read to the

students may increase their interest and gain attention towards the math lesson. If the story is first read to the students and allows them to “enjoy the plot, setting, and characters of a story, the new math skill will be associated with the meaningful contexts” (Kolstad, 1996). Students are enabled to overcome the difficulty of communicating mathematically through the connections that the students are able to make (Moyer, 2000; Ward, 2005). These connections lead to students engaging in “meaningful conversations and investigations” (Ward, 2005).

#### Improving Communication

Many argue that there is a high correlation between achievement in math and the ability to read mathematics (Ward, 2005). Similarly, MacGregor and Price (1999) argue that “language proficiency and mathematics proficiency appear to be linked, such that lower language proficiency tends to translate into poorer mathematics performance” (Ward, 2005). Therefore, there are many students who have difficulty communicating mathematically (Moyer, 2000; Ward, 2005). Mathematics has some of the “most difficult content area material to read as it presents more concepts per word, sentence, and paragraph than any other subject” (Ward, 2005). Many students struggle to understand word meaning because many words are homophones, which mean the words have the same pronunciation but different meanings. Also, many words have meanings in mathematics quite different from their meanings in everyday usage in conversation, like *base*, *product*, and *ruler* (Ward, 2005). The connection between language and mathematics is crucial to develop in the early grades. Communicating mathematically through children’s literature can also lend itself to the different types of learning styles.

#### Learning Styles

Many students have difficulty learning mathematics because of their learning style. Murphy (2000) argues that visual learners and limited proficiency in English students have a difficult time learning mathematics. Children's literature can bring math to life and provide a path for reaching more students. Visual learners will be able to "learn math by explaining math concepts visually" through pictures and illustrations (Murphy, 2000). Also, a visual display of pictures, diagrams, and illustrations in books can be adapted for use in the classroom. Students can use books to make diagrams of information from the story that visually represents ideas. Through visuals created and seen in the books, "abstract ideas become readily understood" by visual learners (Murphy, 2000).

Furthermore, students who have limited proficiency in English may have a difficult time understanding the language and mathematical concepts. If students are able to view illustrations in a children's book they may be able to gain clues to the meaning of new words and concepts (Murphy, 2000). The experience of learning through literature can be a wonderful and positive experience for English Language Learners (ELL) or English as a Second Language (ESL) students. Murphy (2000) also argues that societal barriers inhibit students from succeeding in the "acquisition of mathematics learning." He states there is a need for multicultural math literature because minority students have been increasingly pursuing careers in the math and science field. There should be literature that minority and all students can relate to. Students who are able to relate to literature will become engaged and excited about learning math.

#### Student Attitudes

Von Drasek (2006) found that teaching math through children's books motivates children to learn math in exciting new ways, encourages students to think and reason mathematically and builds student appreciation for math and literature. Similarly, Mink & Fraser (2002) studied Project SMILE, Science and Math Integrated with Literacy Experiences, by evaluating the effect of SMILE on student attitudes toward reading, writing, and mathematics. The project proved successful in terms of promoting positive attitudes toward mathematics, creating positive changes in the classroom environment, and in using children's literature to empower students to learn mathematical concepts (Von Drasek, 2006). Research also shows that "students achieve more when there is a positive classroom environment" (Von Drasek, 2006). Through the use of children's literature unmotivated students may become engaged and excited about math, which results in an improved attitude and motivation for learning math.

### Conclusion

As a review of the literature suggests, incorporating children's literature into the teaching of mathematics results in many benefits to improve student learning. Students will be able to solve problems and think critically as they are enabled to relate situations to everyday life. Students are able to make connections from the stories with their own lives which assists students in constructing meaning and internalizing what they learn. All types of students benefit from the use of literature because of the differentiated instruction that is able to be presented. Unmotivated students find interest in exciting and creative books that will motivate them to engage in the learning of mathematics.

The body of research analyzed suggests many implications of the integration of math and literature. It is hoped that this body of research will provide an opportunity to

determine what happens when children's literature is used to teach mathematics. In the next section, chapter three discusses the context of the study and the research design.

## Chapter III:

### Research Design and Methodology

#### Introduction

Many students in American schools struggle to learn mathematics and fail to connect math to everyday life. This study will look at the teaching of mathematics and the integration of children's literature to see what happens when this approach is used. For this study, I will be using qualitative teacher research. This qualitative approach consists of a "focus" that is "open ended, allowing for important meanings to be discovered" (Maykut & Morehouse, 1994 p. 43). I plan on collecting "open-ended" data through the use of a student response journal, observations of students, student work, and my teacher research journal to assess the integration of children's literature into the teaching of mathematics.

#### Context

##### *School*

Oaklyn Public School is a community public school district that serves students in kindergarten through ninth grade in Oaklyn, New Jersey. Oaklyn is the only district in the United States that still keeps the kindergarten through ninth grade structure. The district consists of two separate schools within one building. Oaklyn Public School also educates

students from the Borough of Hi-Nella in grades Kindergarten through eighth. The student population in grades Kindergarten through ninth grades averages 500 students. Students in tenth through twelfth grades attend Collingswood High School.

### *Participants*

There are four 5<sup>th</sup> grade students and one 4<sup>th</sup> grade student involved in this study. The participants are students in the resource room for Math. All students in the resource room for Math were invited to participate in this study but only those who returned the permission slip signed by a parent or guardian were able to participate. The participants are both male and female, ranging in age from ten to twelve years old.

### Research Design/ Methodology

The design of this research is primarily qualitative teacher research that is presented as a study of one classroom. The design of the research allows me to be involved with participants so that I am able to have a “deeper understanding of experience from the perspectives of the participants” (Maykut and Morehouse, 1994, p. 44).

### *Sources of the Data*

For this study, four data collection instruments are used: student response journals, observations of students, student work, and my teacher research journal. Data is collected during a math instructional unit focusing on fractions and probability. The study begins with the implementation of a student response journal in which students will answer questions about their learning of math. A list of focus questions is given to the students and attached in the front page of their math journals. After each lesson, the students answer one of the focus questions in their journal. The focus questions include:

Did the story help you to understand the lesson? Explain. Did you like the book that was read today? Why or why not? Did you think about the book that was read when you were completing the assignment? What was something you learned today? What helped you to understand it? Did something you learned today make you think about something in your own life? What was it? What part of today's class did you like the most? Why? How did you feel about today's class? Write your own thoughts about today's class. The student responses are then be analyzed to see if there are any patterns or common themes.

The second instrument used is observations of students during the teaching of the integrated math unit. The unit uses a piece of children's literature to introduce a math concept. Then students discuss the book and how it relates to a math concept. The students also write in their journals during the integrated unit and responses are compared to the responses from the first unit. The observations include the amount of participation by each student and observations of the class discussions. The observation also notes any connections made to everyday life as a result of the lesson.

The third instrument used is student work. The student work includes assessment material and work completed throughout the unit. Data is analyzed to see students' understandings of the concepts being taught and if there is any improvement between a pretest and a final test.

The fourth data instrument is the journal kept by the teacher researcher. The teacher researcher records her thoughts, questions, observations, and feelings regarding information gained throughout the research process.

#### *Data Analysis*



The student journals, observations, student work, and teacher researcher journal are analyzed individually and together to draw conclusions based on what happens when children's literature is integrated into math instruction. Information is analyzed to locate similarities and differences in the responses.

#### Looking Ahead

Chapter four discusses the data gathered in the student journals, observations, student artifacts, and relevant information written in the teacher researcher's journal. Chapter five will present the implications of the study and recommendations for further study.

## Chapter IV

### Data Analysis and Findings

#### Introduction

As discussed in previous chapters, this study explores what happens when children’s literature is integrated in a fractions and probability math unit. This chapter is organized by the themes that become evident in the analyzed data: (1) student motivation and interest, (2) connections to everyday life, (3) the level of understanding, (4) and student self confidence. Through these themes, Chapter IV discusses the results of the study.

#### Student Motivation and Interest

“I did like the story because it was fun to learn with food and fractions were fun.”

(Student Journal, See Appendix, #1)

Written in the daily journal of one of the students, this statement was one of the many that spoke to having fun and being excited to learn about fractions. In this study, I was interested to see how the students reacted to the use of children’s literature. At first, I was a little skeptical of the idea of using children’s literature with 5<sup>th</sup> grade students because they may think that it is too babyish for them or they are too old to be read aloud to from a picture book; however, the students reacted with interest and excitement about

the books. The students who participated in this study are all students struggling in math. Through observations before beginning the unit, I saw unmotivated students who infrequently completed homework assignments and were often disruptive during class instruction (Teacher Research Journal, April 7, 2008). During the unit of study using children's literature the students were excited about the lessons, showed interest in the topic, and participated in class activities.

Motivating students and grabbing their attention is a large part of this 5<sup>th</sup> grade resource room. Finding ways to get the students motivated and willing to learn is challenging. Using reads alouds, I hoped to capture student interest and scaffold thinking as well. One of the lessons about fractions is introduced using The Hershey's Milk Chocolate Fractions Book by Jerry Pallotta. An example of a lesson I taught in the unit follows:

The students sit on carpet squares on the floor so they are able to focus on the book. As soon as I show the cover of the book one student blurts out, "Hershey's chocolate, I love chocolate!" They are already excited about the book and I have not even said a word to them. We take a picture walk through the book to predict what the book is going to be about. We brainstorm things we might learn from the book. All of the students participate by sharing their thoughts and predictions. One student predicts, "We are going to find out how to make chocolate, maybe they have a good recipe." Another student offers, "The book is going to be about fractions and maybe candy bars, I like candy bars." While reading, we talk about what a fraction is and the students are interested, asking questions and making observations. When the book is finished the students return to their seats and I pull five Hershey bars from my bag. The students are ecstatic, "Are we

getting chocolate bars?” they yell. “I am so excited!” one of the girls says. The students then practice what they learned from the book with chocolate bars. (Teacher Research Journal, April 15, 2008)

The above vignette is one example of how literature in a math lesson excites and motivates my students.

The students use the literary skill of making predictions when the story is introduced and they become interested and excited about fractions. It is something that the students can relate to and by using the Hershey’s book, students become motivated just by seeing a big chocolate bar on the front cover. The math activities used after reading the story also motivate the students because they relate directly to the book. They use what they know about chocolate bars and fractions to complete the activities.

When reflecting on the lesson, one student says she liked and did not like the lesson because “it made me hungry” (Student Journal, See Appendix, #2). After another lesson one student says, “Today’s class was fun and every days class we are learning something fun and new (I can’t wait until tomorrow)” (Student Journal, See Appendix, #3). The students were interested in fractions and were excited to see what the next book would be. After reading the books, the students would ask, “What book are we going to read next?” (Teacher Research Journal, April 15, 2008). They were always eager to read and learn more.

### Connections to Everyday Life

The students are not only interested and motivated about the books and lessons; they are able to make connections from what they are learning to their everyday life and solve everyday life problems. As a class we read A Very Improbable Story by Edward

Einhorn to discuss probability. The book provides a real world scenario in which they could apply probability. I note in my teacher journal:

In the book, a boy goes into his sock drawer and finds the probability of pulling out a matching pair of socks. One student shares a personal connection with the story and says that if he tried to find a matching pair of socks in his sock drawer it would be a very good probability because his mom matches all of his socks together. Another student says that there would be a very low probability of finding a matching sock in her drawer because her socks always get lost in the laundry and that her drawer looks like the drawer in the book. (Teacher Research Journal, April 11, 2008)

The students are able to take the concept of probability that was discussed in the book and make a connection with their own life.

After the students make a personal connection with the story they are able to use that connection when thinking about other probability problems. The students refer back to the book when completing a worksheet on probability. They think about the messy sock drawer or the many combinations of marbles that the boy in the story tries to make. Through the story the students are able to make connections and use those connections to help them understand the concept.

#### Levels of Understanding

Throughout the unit students have the opportunity to think about fractions and probability in many different ways. The students gain deeper thinking about the concept and what it represents through various problem solving activities that relate to the books. Various assessments are also used to measure student understanding.

The students are given problem solving tasks in which they collaborate and work independently to solve. An example of student thinking follows:

The students are given chocolate bars to break into a fraction given by the teacher. The students are told that they have bought one chocolate bar at the store but they must share it with their friend. How can they divide the chocolate bar so that each person gets the same size piece? Many students are able to figure out that they have to break the chocolate bar in half to get two equal pieces. We write the fraction on the board and continue with more situations about another friend wanting a piece of the chocolate bar and what those fractions would look like. Students are able to conclude that the more people who want a piece of chocolate the smaller the fractions of the whole become. After one of the lessons a student reflects on his learning, saying, "I learned that the smaller the number on the bottom the bigger the group is" (Student Journal, See Appendix, #4). As evidenced, he is beginning to understand how fractions are written, what they look like, and developing a theory about them.

In another lesson, students use apples to work with fraction problems when I introduce improper fractions and mixed numbers. We read *Apple Fractions* by Jerry Pallotta. I ask the students to show what the fraction  $\frac{5}{4}$  looks like using their apple pieces. The students think it is an easy task and conclude that they just cut the apple into 5 pieces and give me 4 of them. Then I ask the students to talk about it and they draw a different conclusion: We learned that when the top and bottom number are the same it means one whole, so  $\frac{5}{4}$  must be one whole and another piece of another apple (Teacher Research Journal, April 11, 2008).

In this example, the students work together to figure out how to show an improper fraction. They are able to use what they learn from reading the book and what we talk about to reach their conclusion. The students were constructing knowledge and the answer was not just dictated to them for memorization, they had to work to figure it out.

The unit is also comprised of various assessments to evaluate their level of understanding. One assessment used to evaluate the students is a pre-test and a post-test. The students' scores for each are shown in the graph below.

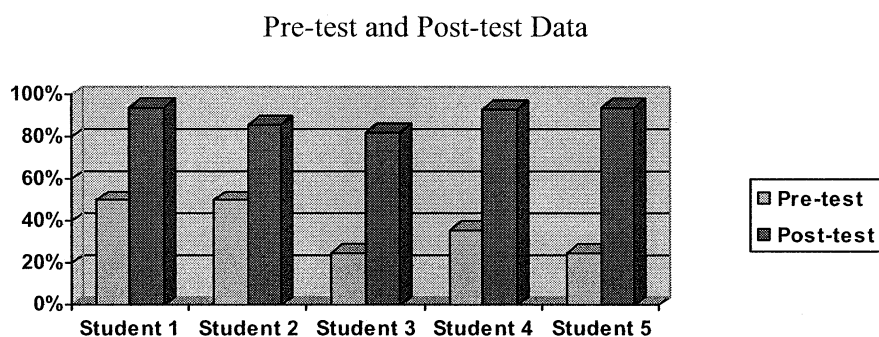


Figure 1

The students' scores all improve dramatically as their understanding of fractions improve. They all show improvement from their understanding at the beginning of the unit to the end of the unit. Their improvement may or may not have been related to the use of literature in the unit but the goal of teaching the unit was for the students to understand the content and be able to use the information they learned. Their assessment scores show improvement and that this goal was met.

Another way that I assess student understanding of the fractions unit is with a self assessment measure. Students evaluate their understanding of math concepts by checking one of three categories: a) I can do this on my own and explain how to do it; b) I can do this on my own; and c) I can do this if I get help or look at an example. The following

chart illustrates the self assessment results for the students who said “I can do this on my own.”

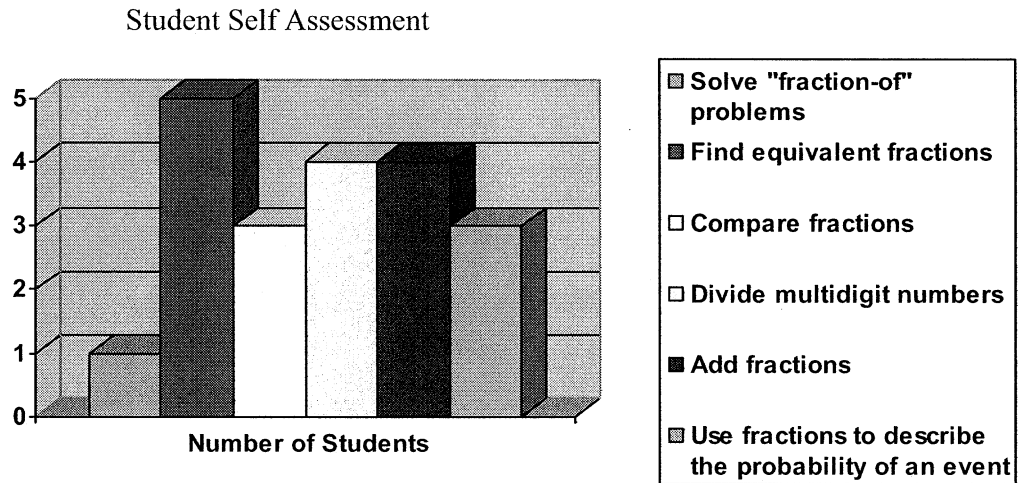


Figure 2

Based on the student responses, most students said they were able to complete many of the categories on their own and if they couldn't do it on their own they said they could do it if they were looking at an example or with help. This self assessment allows students to look at their own understanding of various concepts taught in the unit. They begin to see what they do understand well and where more learning is needed. From the self assessment, I am able to see what the students think they understand and then look at their work to see if they were really able to complete those types of problems on their own. Most of the students accurately represent what they can do on their own and what they need help with. The students are able to not only gain understanding of the concepts that are taught but they are able to articulate what they can do.

Student Self Confidence

“It helped me because I was not good at this stuff”

(Student Journal, See Appendix, #4).



An improvement in the students' self confidence is also found during the unit of study. At the beginning of the unit, students comment that they don't like math, math is hard, and they do not want to try the worksheet (Teacher Research Journal, April 8, 2008). However, as we get into the lessons the students' attitudes change and they begin to become confident in their abilities. After one of the lessons a student responds that he "felt very [excited] to learn [new] things like [equivalent] fractions" (Student Journal, See Appendix A, #5). This student in particular does not usually like to try things he does not know how to do. Other students also reflect at the end of the unit and say that the test was easy for them and they have learned a lot about fractions.

The students are also able to understand the read alouds. Although most of the students are also struggling readers, the books used are easy to understand children's books. Students show their understanding through responses to questions and the ways that they interact with the text in related math activities. The students seem to feel good about themselves and act confident enough to raise their hands and participate in class discussion. The students increasingly ask questions about the books. They become less afraid to give their input; they are not only developing new knowledge, but their questions suggest that they want to know more. One student comments, "We are adding fractions but how do we multiply them? I want to try it" (Teacher Research Journal, April 17, 2008). Here, the students' behavior suggests a growth in confidence about their abilities to read and understand math.

Also attesting to the students' self confidence is the students' grade improvement, shown in the following graph

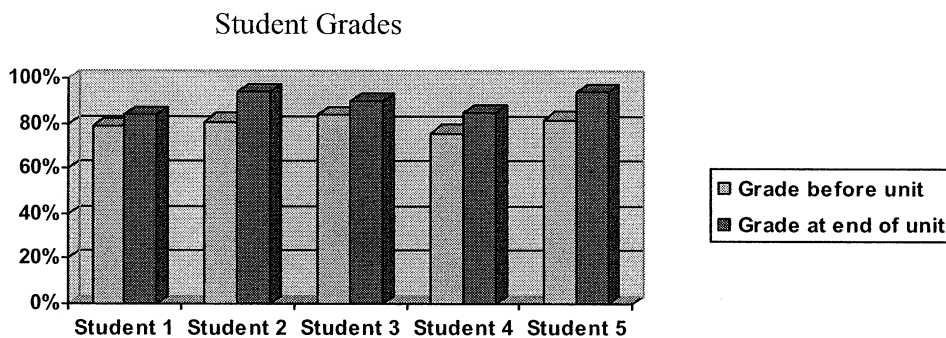


Figure 3

Throughout the unit the students' grades begin to improve and the students are becoming more confident in their ability to understand and try these new math concepts. They feel good about themselves and feel good that they could achieve an A. Most of the students were C students before beginning the unit; yet, during the unit of study the students achieve A's and B's. This shows what the students are capable of. With motivation and encouraging students to feel confident that they can learn and improve, they are able to achieve good grades.

#### General Conclusions

Overall, the study's results suggest that the students enjoy the children's literature read during math lessons. The students are motivated during class and are generally excited about the lessons and the activities during class. With the students motivated and excited a lot of the behavior issues that were previously present in the classroom have disappeared. The students are able to make connections to their everyday lives and build knowledge around those connections. The connections that are made also help the students to remember the information they learned. The students are able to gain deeper thinking about the topics covered in the unit. They are able to see the information in many different ways, through the books, using manipulatives, and working problems out

on paper. The students are also able to problem solve to construct their own knowledge and gain a deeper understanding through completing problems on their own. Throughout the unit, the students' self confidence improved by participating in class discussions and asking questions during the reading of the books. The students have seen improvement in their grades which seems to boost their self confidence and shows that they can achieve A's and B's.

Some of the students have a difficult time with the journal responses. They knew what they thought about the lesson or the book but it was hard to write things down on paper. Some of the students may be able to better articulate what they want to say if they do not have to write it down. Also, some students really like to write in the journals. The journal is a private place where they could write down what they thought and the students only shared their entry if they wanted to. The journal also becomes a good place for me to be able to get a feeling of what the students thought about the lessons so that I can improve upon my own teaching.

## Chapter V

### Conclusions and Implications

#### Introduction

In this chapter, I discuss what I have found in this study and how the results answer my original question: What happens when children's literature is integrated into the teaching of mathematics? I also discuss the limitations of this study and the implications this research has not only in the classroom but also in future studies on the topic of literacy and mathematics.

#### Results

This research supports the conclusion that there are many benefits from integrating children's literature into the teaching of mathematics. Students who are struggling in mathematics may become motivated by the books used during a math lesson. The books may interest the student and hold their interest enough to keep them focused on the lesson. Students who have trouble making the connection to why they need to learn math concepts may be able to make connections to their everyday life. These connections may help students to remember a concept or help them apply the skills they learn to their everyday life. The books help the students to talk about math concepts. When discussing probability, it is difficult to talk about low and high probability without

understanding what it means and how it applies to the student. By using a book about probability to introduce the concept the students are able to think about the topic and connect it with something in their own life. The students are also able to gain a deeper understanding of the concept being taught. By looking at a concept in many different ways the students are more fully able to understand what a concept like fractions and patterns and similarities. The students did not have to memorize how to complete a problem; rather they learned to understand the why and the how about various math concepts. The students also construct knowledge through various problem solving activities that stemmed from the situations in the books. The students could think about a problem and work out a solution through their own understanding.

The students are also able to improve on their own abilities and self confidence. The students are able to participate in class discussions and feel good about what they contributed. As the students' understanding and motivation increased their grades improved, leaving the students with a feeling of success and self confidence.

#### Implications of this Research

In the classroom, teachers can motivate students and capture student interest by using children's literature in a lesson. Not all students may be as motivated as others but by presenting the information in a variety of ways, students of all learning styles may be reached. Also, by creating opportunities for student constructed knowledge, students will feel good about what they have accomplished and what they can contribute to a class discussion.

Children's literature can be used at any age level and grade level. Even students who are struggling in reading and comprehension may benefit from the reading of books

that are on their independent level. These books become a way to help students find a connection with a topic, build background knowledge, motivate them and hold their interest. There are also many other benefits that may come from the use of children's literature and anything that can help a child to understand and learn a concept should be used in the classroom. One piece of children's literature could be used to address both a mathematical topic as well as a literary theme. If a book displays the use of a literary theme of interest it could be highlighted or taught. The same book may also lend to a lesson in other subjects as well. Looking at the book across the curriculum may help the students to make many different connections and help them to understand and learn from the experience.

#### Limitations of this Study

This study is limited in that it was completed using only five participants. The thoughts and reflections of only five students were used. If completed with more students the results may provide more information concerning benefits and drawbacks. Also, there were some students who had difficulty expressing their thoughts on paper about a lesson. Many times a student would write "the lesson was fun" and had a difficult time writing why it was fun or what made it fun. Also, the study used journals and did not allow for many verbal student responses other than what was said during the lessons.

#### Suggestions for Future Research

My research focuses on integrating literature into the teaching of math concepts but future research may focus on teaching math through other subject areas. Math could be taught using Science, Social Studies, or other subjects. Future research may discover other benefits or negative aspects to integrating subjects.

My study also focuses on a unit of study in a resource room setting and future research could look at another grade level to see if the results are similar. Similarly, other classroom settings could be studied. The research could be completed in a general education classroom, inclusion classroom, behavior disabilities classroom, or any variety of classroom settings. Also, future research could be done on students with severe disabilities or students whose first language is not English. Future research could be done to look at what types of learners benefit from the integration of subjects.

### Closing Thoughts

As students learn in many different ways and have many different interests, finding what motivates and interests students may be a difficult task. Using children's literature may be a way to do just that. Students are able to make connections to their everyday life and use those connections to understand mathematical concepts. Students struggling to understand math may be able to connect with a children's story or find meaning when a math concept is introduced in a story. Children's books may motivate a student who has difficulty focusing on a lesson otherwise. Also, providing students with the opportunity to experience different ways of looking at a math concept may aid students with a variety of learning styles. It may also help students to understand and construct their own knowledge and meaning. One goal of integrating children's literature and mathematics is to increase student learning and understanding; it is the role of the teacher to find ways to maximize student learning.

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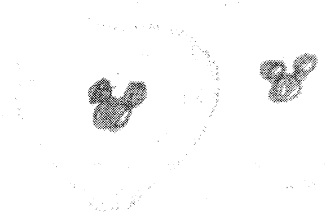
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APPENDIX

Daily Student Journals

#1



Apr. 15/08

Q. # 2

I did like the story  
because it was  
fun to learn w/ th  
Food. and fraction were  
fun.



#2

Kayla

April 15<sup>th</sup> 2008

auishoin number 2<sup>th</sup>

i loved today story  
because it maid me  
hungry and helped  
me with fra Shains  
but i didnt like it  
cause it maid me  
hungry

#3

Day 1 4/16/08 (weds)

Today's class was fun  
and every days class we are  
learning something fun and  
new. (I can't wait until tomorrow).

#4

4/18/08

Q.4

I learned that  
the smaller the number  
on the bottom the  
bigger the gap is.

$$\frac{2}{4}$$

smaller  
7

or

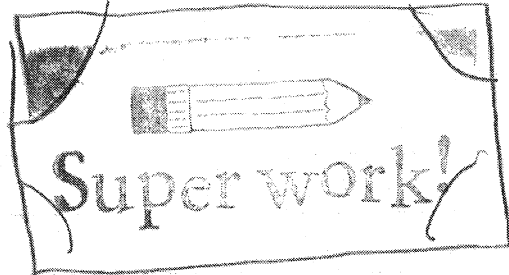
7

?

$$\frac{10}{10}$$

It helped  
me because  
I was not good  
at this stuff.

$$\frac{7}{8} \text{ or } \frac{10}{10} ?$$



Quest 7.

I felt very excited to learn ~~ing~~ ~~new~~ things ~~like~~ ~~equi-~~ lent fractions

