

5-2013

Integrating Literature in an Elementary School Mathematics Classroom.

Samantha Munro
East Tennessee State University

Follow this and additional works at: <https://dc.etsu.edu/honors>



Part of the [Curriculum and Instruction Commons](#)

Recommended Citation

Munro, Samantha, "Integrating Literature in an Elementary School Mathematics Classroom." (2013). *Undergraduate Honors Theses*. Paper 76. <https://dc.etsu.edu/honors/76>

This Honors Thesis - Open Access is brought to you for free and open access by the Student Works at Digital Commons @ East Tennessee State University. It has been accepted for inclusion in Undergraduate Honors Theses by an authorized administrator of Digital Commons @ East Tennessee State University. For more information, please contact digilib@etsu.edu.

Integrating Literature in an Elementary School Mathematics Classroom

Thesis submitted in partial fulfillment of Honors

By

Samantha Munro
The Honors College
Teacher Education Honors Program
East Tennessee State University

May 1, 2013

Dr. Rosalind Gann, Faculty Mentor

Samantha Munro, Thesis Author

Introduction

Historically, students have been required to use a set procedure to produce an expected answer when solving mathematical problems (Young & Marroquin, 2006). This traditional rote learning relies on the use of computational drills, workbooks, and worksheets. Often times, this learning leaves students with negative attitudes towards mathematics as they struggle to remember the mathematical concepts and procedures from day to day (Wilburne & Napoli, 2008). They are also left with the thought that math is dull, unimaginative, and inaccessible because of the work that is done out of textbooks and workbooks (Burns, 2010). In addition, these traditional methods do not help children acquire conceptual understanding, nor do they help children progress from conceptual knowledge to procedural knowledge. They also fail to encourage children to solve problems creatively, think logically, or pursue mathematics learning voluntarily, and with enthusiasm. These traditional methods have led students to believe that mathematics is one of two things: 1) a process of plugging numbers into a problem or a calculator to solve an answer or 2) a set of rules to memorize. In reality, mathematics is just the opposite. It is thinking and reasoning, solving problems, making connections, and being able to communicate ideas mathematically (Tucker, Boogan, & Harper, 2010; Young & Marroquin, 2006); Hellwig, Monroe, & Jacobs, 2000).

In order to achieve these necessary aspects of mathematical learning that traditional methods do not, the National Council for Teachers of Mathematics (NCTM) suggests that students need to be taught mathematics in ways that create meaningful connections, increase their interest and motivation, promote critical thinking, and encourage communication and justification (Young & Marroquin, 2006). Teachers are encouraged to actively engage students in mathematical learning, implementing new instructional strategies that do not rely on textbooks and similar materials (Hellwig, Monroe, & Jacobs, 2000). One suggested way students can be

active participants is through opportunities with concrete materials and manipulatives that will aide them in learning the conceptual knowledge and procedural knowledge taught in the mathematics classroom. (Hong, 1996). The NCTM believes this can be achieved through the integration of literature and mathematics. The study “Integrating Literature in an Elementary School Classroom” was designed to further investigate NCTM’s suggestion through the following three guiding research questions:

1. What effect does teaching mathematics through literature have on students’ mathematical achievement?
2. What effect does teaching mathematics through literature have on students’ attitudes towards mathematics?
3. What effect does teaching mathematics through literature have on students’ awareness of real-world applications of mathematical concepts?

Literature Review

Education is essential in preparing students to meet the needs of the 21st century. The goal of education is that students will grow to become informed, thinking individuals who are able to participate in today's complex society. In order to achieve this goal, all disciplines must join together and acknowledge their interdependence. Likewise, all segments of society, such as parents, educators, legislators, and the business community, must also join together to identify what is truly essential for students to know. These members of society all work together to create reforms in education. One of today's significant reforms is in the area of mathematics education.

History of Mathematics Education

Mathematical opinions on how curriculum should be taught, as well as what is included in the curriculum, have shifted quite rapidly as the field of mathematics has changed and developed. Beginning in the 1940s and continuing through the 1950s, the mathematics curriculum was designed to accommodate a society occupied with shopkeepers, farmers, and factory workers. To meet the needs of society, students were instructed in ways that prepared them for these particular job opportunities.

The 1960s ushered in the Modern Math Era. This era produced the assumption that mathematical understanding could best be developed by precision and rigor. The learning style during this period focused on the traditional approaches of textbooks and workbooks. As the 1970s approached, there was a strong backlash to this learning style. Society gradually saw a transitional period from rote, exact learning of mathematical facts and algorithms to a more process driven, hands-on approach to mathematics, influenced by the research of Jean Piaget and other cognitive theorists. This period during the 1970s was called the Laboratory Math Period because of the extensive use of laboratory materials, manipulative teaching materials, and hands-on activities. The late 1970s also brought about a great amount of change for society. The United

States came to the realization that all citizens, regardless of culture or background, needed equal access to mathematics education if the country was to remain a world leader and/or competitive with the rest of the world.

This realization paved the way into the 1980s, the Era of Realization. There was a realization that the mathematics curriculum and education in the United States was in need of reforms. During this time, criteria were designated for the K-12 mathematics curriculum and there was a focus on how students come to understand mathematics (Braddon, Hall, & Taylor, p. 2). This focus helped lead way to the discovery that children learn and understand things best by being actively involved in the learning process, rather than by filling out set after set of worksheet exercises ((Braddon, Hall, & Taylor, p. xiii).

Following the Era of Realization came the movement towards a development of the mathematics education curriculum and standards. In the 1990s, many states developed their own mathematics standards for the K – 12 curriculums. In the 2000s, there was a shift with the development of the Common Core Standards. These standards were designed so that all students nationwide would be learning the same curriculum based upon the same standards. In addition to the standards, the National Council for Teachers of Mathematics (NCTM) has worked with parents, educator, and other members of society to create a set of goals they feel students need to meet in order to succeed mathematically. The Curriculum and Evaluation Standards for School Mathematics, created by the National Council for Teacher of Mathematics (NCTM) has set forth five general goals for K – 12 students:

- 1) that they learn to value mathematics,
- 2) that they become confident in their ability to do mathematics,
- 3) that they become mathematical problem solvers,
- 4) that they learn to communicate mathematically, and

5) that they learn to reason mathematically (NCTM, 1989).

Integration of Mathematics and Literature

The NCTM recommends that to help children develop and retain the mathematical goals and standards laid out in today's society, teachers need to integrate them into other curriculum areas. They also encourage more reading, writing, and discussing of mathematical concepts. In conjunction with this, the NCTM promotes the importance of integrating children's literature with mathematics instruction, because of the belief that children's literature can help foster all five of the general goals of the NCTM Curriculum and Evaluation Standards (Hong, 1996; Tucker, 2012).

Math is a communication tool that works directly with the skill of reading and allows students to use and understand data in all school subjects, as well as allowing students to interpret the logic and patterns found in those subjects (Braddon, Hall, & Taylor, page 3). Aspects of mathematics and literacy both require the development of many of the same processes. For example, both subjects rely heavily on the following processes: classifying, recognizing patterns, analyzing relationships, organizing thoughts, solving problems, and justifying opinions and perspectives (Burns, 2012). Therefore, reading and mathematics need to go hand in hand to help students become successful learners (Braddon, Hall, & Taylor, page 3).

Finding and using a natural connection between reading and mathematics would be valuable to a classroom environment because it provides opportunities for the students to develop and link the processes in the two content areas (Burns, 2012). The NCTM believes this natural connection is through children's literature surrounding mathematical topics. The NCTM advocates the use of children's literature as a vehicle for communicating mathematical ideas, asserting that this needs more emphasis in the K – 4 curriculums because of its many benefits (Young & Marroquin, 2006; Anderson, Anderson, & Shapiro, 2004). Research has proven that

three of these many benefits are in the aspects of student attitudes towards mathematics, student knowledge of real-world mathematical applications, and student achievement in mathematics.

Attitudes towards mathematics. Unfortunately, many children have negative attitudes towards mathematics. Students do not see a value in learning or using mathematics. To them, it is just counting, numbers, memorization, and computations without meaning (Tucker, 2012). Often times, children develop an anxiety about math because they do not understand it but are required to learn it (Tucker, 2012). As with students, Marilyn Burns (2012) believes that teachers are just the same as students. Teachers cannot teach what they do not understand and they cannot teach what they do not enjoy. For guidance on this issue, Burns looks towards children's literature that has long been a mainstay of classroom instruction. "As teachers, we've all experienced the richness and creativity that children's books bring to reading and language arts instruction, and we've enjoyed the interest and positive reactions from students when we read them aloud." Therefore, Marilyn Burns believes that using literature as an instructional choice in the mathematics class makes sense for a variety of reasons.

First, literature can spark children's interest in learning mathematics. Literature can motivate children by stimulating their imagination in ways that textbook exercises and worksheets often do not. They help dispel the myth that math is dull, unimaginative, and inaccessible. Students for whom math is their first love learn to look at books in new ways. Students who love to read – but for whom math is not "their thing" – are helped to experience the wonder of mathematics in the same way they are already enjoying the wonder of books (Burns, 2012).

Secondly, many mathematical concept books or informational books can provide an interesting, risk-free context for children to explore mathematical concepts. Evidence from research consistently points out that young children learn more effectively in a familiar setting

and in a context that is meaningful for them. The implication from research is that if a meaningful setting related to children's own experiences and background knowledge is given, their motivation to pursue a related learning activity may increase. Therefore, Burns, along with others, believe children's literature is a wonderful vehicle for helping teachers teach math, as well as for helping students learn math (Burns, 2012; Tucker, 2012; Hong, 1996). The storybook can act as a catalyst to motivate students because storybooks mostly deal with situations that can touch on their interests and experiences, providing contexts that engage them. If children are given activities that allow them to use mathematical concepts in the storybook context, they may do mathematical work more often and for longer periods of time, not to mention that they are likely to become more deeply involved in the learning activities. Children may even start to pursue the mathematical activities independently if they can choose what to do and set their own standards for solving problems (Hong, 1996).

Many of these strategies can help to reduce students' anxieties and negative attitudes towards mathematics, helping to increase their self-confidence (Tucker, 2012). The stories allow this to happen because they provide a meaningful context that motivates the students to solve problems embedded within the literature (Ameis, 2002). By integrating mathematics and literature, the word problems can be placed in familiar stories that allow students to address the mathematical functions at hand, rather than struggling with unfamiliar vocabulary, farfetched scenarios, etc. (Braddon, Hall, & Taylor, p. xiii). Harris (1997) quoted Rathmell saying that, "As students pose, discuss, and solve problems, they develop confidence in their ability to make sense of mathematics and to use their reasoning and skills to solve problems. Mathematical activities stimulated by literature inspire students to explore and investigate the concepts. As their thinking strategies and reasoning skills expand, they begin to develop true mathematical power." Malinsky and McJunkin (2008) tied on to this as they noted in their research that

emphasizing children's literature is crucial in the mathematics classroom because it draws students into a story, making them feel at home, as they learn mathematical concepts in a nonthreatening way.

Real-world applications. Math joined with quality children's literacy fosters the realization that mathematics is all around us! A mathematics-literature connection is a natural way for teachers to allow students to see mathematics in everyday society, to give meaning to mathematics, and to make it come alive (Leitze, 1999, p.398),” (Hellwig, Monroe, & Jacobs, 2000). Making the NCTM Standards come alive gives the students a purpose for learning, rather than perceiving mathematics as something useless that has to be learned “just because” (Braddon, Hall, & Taylor, p. xiii). The stories can show students how math is applied in the “real world” in ways that textbooks rarely do (Braddon, Hall, & Taylor, p. xiii). By placing mathematics in the familiar context of children's literature, children are able to make sense of the concepts because it allows them to see mathematics as an integral part of their everyday lives. Not only is the context more interesting and meaningful for the students, but it also provides a familiar context where they are able to explore the mathematical concepts. Often times, the storybooks also show students that real world math problems can be “messy,” as they have multiple solutions and are not static, as the ones frequently seen in textbooks and workbooks (Moyer, 2000).

The NCTM encourages the use of meaningful problem solving contexts for students, such as the aforementioned children's literature because “...when mathematics evolves naturally from problem situations that have meaning to the children and are regularly related to their environment, it becomes relevant and helps children link their knowledge to many kinds of situations.” Through the systematic use of numbers and language, children begin to understand and employ many of these problem-solving strategies into real-world situations. Both literature

and mathematics help us organize and give order to the world around us. The use of language, in both oral and written forms, and the use of numbers to count, compute, and generate statistics, provide information that allows us to make decisions daily. When language skills are embedded in meaningful contexts, they are easier and more enjoyable for students. Likewise, when numbers and their operations are embedded in meaningful real-world contexts, children are given the opportunity to make sense of mathematics and to gain mathematical power (Moyer, 2000).

Math achievement. Mathematical concepts are often tied to the language children use to express ideas. Opportunities for discourse in both reading and mathematics instruction promote children's oral language skills, as well as their ability to think and communicate mathematically. The NCTM emphasizes the important role that communication plays in helping young children construct mathematical knowledge and form links between their informal notions and the abstract symbolism of mathematical ideas (Moyer, 2000). To meet this need for communication, the NCTM recommends that to help children develop and retain mathematical concepts and skills, teachers need to integrate curriculum areas, children's literature being one way. Good children's literature can help children extend their understanding to other contexts and provides an opportunity to explore mathematics concepts further. Investigation of mathematical concepts through literature offers a natural way for students to relate the abstract ideas, language, and symbols of mathematics to a context they understand. As students listen, read, write, and talk about mathematics from these stories, teachers take opportunities to connect math terminology and symbols to the context. Teachers also support communication by asking students to explain their thinking and encouraging them to listen and respond to another's ideas (Tucker, 2012).

Listening to, or reading, a good book provides students with the opportunity to think, reason, problem solve, critique, and communicate all standards aligned with the NCTM

(Ducolon, 2000). As students listen to an interactive piece of literature, they are able to think about it and respond to it. They become engaged in the process of reasoning and explaining as they learn about the mathematical concepts throughout literature (Ameis, 2002). The language in books plays an important role in helping students comprehend and generate ideas, promoting mathematical discussion. The books also help students imagine a concrete situation that would reflect the processes and products of mathematics (Wilburne, Napoli, Keat, Dile, Trout, & Decker, 2007). Helping students imagine these concrete situations is vital to their comprehension. Many children are visual learners and find it difficult to grasp math concepts when they are presented verbally or numerically. Teacher and researchers have found that using math storybooks help students because they present the abstract concept through a story to which children can relate and explain the concept in terms children understand. Most storybooks also have vivid illustrations and even diagrams to help explain the concept. As children begin to understand these abstract concepts, they should be encouraged to create their own visual representations to illustrate and communicate their understanding (Tucker, 2012).

NCTM Standards. Mathematical achievement of the five goals set out by the NCTM can successfully be achieved through the integration of mathematics and literature. The first goal, to value mathematics, is nurtured through stories in which children see others using math for many reasons in their daily lives. Children can transfer these math usages to their own lives. The second goal, to help students build confidence in their own math abilities, is developed by providing opportunities for a non-threatening, relaxed time to explore math concepts through stories. Students can achieve the third goal, to become mathematical problem solvers, by reading stories that contain fun, interesting, or exciting mathematical problems. In addition, they should also be encouraged to create and solve their own mathematical story problems. To achieve the fourth goal, communicating mathematically, students need to read books that illustrate

mathematical concepts through words and pictures, and then follow the actions of the characters by creating their own related projects that communicate the concept. To learn to reason mathematically, the first goal, children might act out parts of a book in order to use deductive reasoning to solve problems or they may use manipulatives to explain their reasoning. (Tucker, 2012).

Methods

This study focused on a classroom of seventeen 3rd grade students at a suburban school in the Johnson City School System, located in Northeast Tennessee. Once IRB approval was received, parental consent packets (Appendix A) were sent home with each student. Students were given one week to return the signed parental consent forms. Any student who did not return a signed parent consent form was given an alternate assignment from the classroom teacher. Fourteen of the seventeen students returned consent forms and were able to participate in the study.

On the day of the study, students were read a child assent (Appendix B). This was a child-friendly version of the parental consent form, informing students of the activity and giving them the opportunity to decide whether or not to participate. Once the child assent was read and all fourteen students agreed to participate, a pre-test assessment (Appendix C) was distributed. The pre-test assessment was composed of six questions, three of which addressed the study's three guiding questions, and three of which assessed the students' multiplication skills and knowledge. Once all fourteen students complete the pre-test assessment, the class engaged in a read-aloud. Together, the class read and discussed "Amanda Bean's Amazing Dream: A Mathematical Story" by Cindy Neuschwander. Following the story, students were to create their own multiplication stories, as displayed throughout the read-aloud book. Students were to create a multiplication story, write a multiplication fact to solve it, and then illustrate their multiplication story. When this activity was completed, a post-test assessment (Appendix D) was distributed. The purpose of the post-test assessment was to document results related to the three guiding research questions by determining how well students progressed from the pre-test assessment and how well they benefited from the educational activity. Upon collection of the post-test assessment, all students were given a bag of jellybeans for their participation.

Results

Pre-Test Assessment (Appendix C)

Question #1: Do you enjoy mathematics?	
YES	10 students
NO	4 students

Question #2: Why is multiplication helpful?	
Quicker than addition	10 students
Bills/Taxes/Shopping	2 students
Arrange items	1 student
Don't know	1 student

Question #3: How can you use multiplication outside of school?	
Study/Practice Multiplication Facts	3 students
Count items	4 students
Get things done quicker	1 student
Large addition problems	1 student
Money/Shopping/Bills	2 students
Don't Know	3 students

Question #4: If Amanda has 4 bags, with 3 cookies in each bag, how many cookies does she have total?	
Correct Answer	14 students
Incorrect Answer	0 students

Question #5: Which has more wheels: 5 tricycles or 7 bicycles?	
Correct Answer	13 students
Incorrect Answer	1 student

Question #6: Write a mathematical equation to represent how many jelly beans Amanda has total.	
Correct Answer	12 students
Incorrect Answer	2 students

Post-Test Assessment (Appendix D)

Question #1: Did you enjoy reading a book to help you learn the math skill of multiplication?	
YES	14 students
NO	0 students

Question #2: How did the book help you learn the math skill of multiplication?	
Used multiplication examples to help emphasize importance of multiplying instead of counting	10 students
Made multiplication fun	3 students
Taught me things I didn't know	1 student

Question #3: How can you use multiplication outside of school?	
Multiply things around you/count things faster	11 students
Money	1 student
Make up problems	1 student

Question #4: Amanda has two rows of chocolate chip cookies, with 4 cookies in each row. Each cookie has 5 chocolate chips. How many chocolate chips are there?	
Correct Answer	11 students
Incorrect Answer	3 students

Question #5: Which has more panes: a window with 5 rows and 4 panes in each row or a window with 3 rows and 6 panes in each row?	
Correct Answer	11 students
Incorrect Answer	3 students

Question #6: Draw an array to illustrate the problem 3×6.	
Correct Answer	14 students
Incorrect Answer	0 students

Discussion

Based on research and conclusions drawn, integrating literature and mathematics is an effective way to help students prosper with the goals and objectives laid out by the National Council for Teacher of Mathematics. The first research question addressed was “What effect does teaching mathematics through literature have on students’ attitudes towards mathematics?” In the beginning many of the students indicated they did not necessarily like mathematics. Of the four students that indicated they do not like mathematics, they provided reasons such as math being too hard or math not being interesting. On the other hand, there were ten students who indicated they do enjoy mathematics. Many of these students reasoned that they enjoy working with numbers or that it is easy for them and they are good at it. By the end of the activity, all fourteen students noted that they enjoyed the integration of literature and mathematics to help them learn the skill of multiplication. Several of the students reasoned that learning this way made math a lot more fun, so they really enjoyed it. Other students indicated that they liked learning this way because they learned how multiplication relates to the real-world. All of these reasoning students gave are consistent with research on integrating mathematics and literature.

The second research question addressed was “What effect does teaching mathematics through literature have on students’ awareness of real-world applications of mathematical concepts?” The majority of students did not know any real-world applications of multiplication, the mathematical conceptual focus for this study. The rest of the students had one of two thoughts for real-world applications of multiplication. The first common response was to count things faster. The other response was to practice their multiplication facts. However, students didn’t really have knowledge of how they could use multiplication in certain scenarios. Throughout the study, it was evident that students had learned real-world applications of multiplication through the integration of mathematics and literature. After reading “Amanda

Bean's Amazing Dream: A Mathematical Story," students were given the opportunity to write and illustrate their own multiplication stories, as encouraged by research. Tucker (2012) suggested that as children begin to understand these abstract concepts, they should be encouraged to create their own visual representations to illustrate and communicate their understanding. When doing this in the classroom, students created wonderful multiplication stories that showed they now had an understanding of real-world applications of multiplication. For example, one story included counting cherries on cupcakes. Several other stories included counting wheels on race cars. Some students even created wonderful stories about how many pieces of cheese mice had. The creativity of these stories showed that students were able to apply the abstract concepts of multiplication. On the post-test assessment, students were able to come to the conclusion that multiplication is important to use in the real-world because it is a faster version of addition and more efficient. They were also able to provide specific examples of when they could use multiplication in the real-world, demonstrating that literature successfully helped them achieve this NCTM Standard.

The third and final research question investigated in this study was "What effect does teaching mathematics through literature have on students' mathematical achievements?" Throughout the integration of mathematics and literature, students were able to demonstrate achievement of all five Curriculum and Evaluation Standards established by the National Council for Teachers of Mathematics. The first standard, value mathematics, was achieved as students demonstrated that they liked mathematics and saw it as useful in various contexts. The second standard, to become confident in their ability to do mathematics, was achieved throughout the lesson. As students created their own multiplication stories, they demonstrated confidence in their abilities to be creative and problem-solve. Their confidence was also demonstrated in their post-test assessment responses. The third standard, to become

mathematical problem solvers, was achieved in conjunction with the second standard. Students created and solved their own multiplication stories, demonstrating valuable problem-solving skills. They also implemented problem solving strategies when solving multiplication problems correctly on the post-test assessment. The creation of multiplication stories also helped students achieve the fourth standard, to communicate mathematically, and the fifth standard, to reason mathematically. The integration of mathematics and literature was a great springboard to help students achieve all five of the NCTM standards, as well as improving their mathematical attitudes, their mathematical real-world knowledge, and their mathematical achievement.

Works Cited

- Ameis, J. A. (2002). Stories: Invite children to solve mathematical problems. *Teaching Children Mathematics*, 8(5), 260 – 264.
- Anderson, A., Anderson, J., & Shapiro, J. (2004). Mathematical Discourse in Shared Storybook Reading. *Journal for Research in Mathematical Education*, 35(1), 5 – 33.
- Braddon, K. L., Hall, N. J., & Taylor, D. B. (1993). *Math Through Children's Literature: Making the NCTM Standards Come Alive*. Greenwood Village: Teacher Ideas Press.
- Brahier, D. J. & Speer, W. R. (1996). A tale of two stories. *Teaching Children Mathematics*, 3(1), 28 – 33.
- Burns, M. (2010). As easy as pi: Picture books are perfect for teaching math. *School Library Journal*, 38 – 41.
- Ducolon, C. K. (2000). Quality literature as a springboard to problem solving. *Teaching Children Mathematics*, 6(7), 442.
- Forbringer, L. L. (2004). The thirteen days of Halloween: Using children's literature to differentiate instruction in the mathematics classroom. *Teaching Children Mathematics*, 11(2), 82 – 90.
- Harris, J. (1997). Problems solving with Franklin the Turtle. *Teaching Children Mathematics*, 4(1), 24.
- Hellwig, S., Monroe, E., & Jacobs, J. S. (2000). Making informed choices: Selecting children's trade books for mathematics instruction. *Teaching Children Mathematics*, 7(3), 138.
- Hong, H. (1996). Effects of mathematics learning through children's literature on math achievement and dispositional outcomes. *Early Childhood Research Quarterly*, 11, 477 – 494.

- Jenner, D. M. (2002). Experiencing and understanding mathematics in the midst of a story. *Teaching Children Mathematics*, 9(3), 167 – 171.
- Malinsky, M. A. & McJunking, M. (2008). Wondrous tales of measurement. *Teaching Children Mathematics*, 14(7), 410 – 413.
- Moyer, P. (2000). A remainder of one: Exploring partitive division. *Teaching Children Mathematics*, 6(8), 517.
- Moyer, P. (2000). Communicating mathematically: Children's literature as a natural connection. *The Reading Teacher*, 54(3), 246 – 256.
- Moyer, P. (2001). Using representations to explore perimeter and area. *Teaching Children Mathematics*, 8(1), 52 – 59.
- Neuschwander, C. (1998). *Amanda Bean's Amazing Dream: A Mathematical Story*. New York: Scholastic Press.
- Tucker, C., Boggan, M., & Harper, S. (2010). Using children's literature to teach mathematics. *Reading Improvement*, 47(3).
- Wilburne, J. & Napoli, M. (2008). Connection mathematics and literature: An analysis of pre-service elementary school teachers' changing beliefs and knowledge. *Issues in the Undergraduate Mathematics of School Teachers: The Journal*, 2, 1 – 10.
- Wilburne, J. M., Napoli, M., Keat, J. B., Dile, K., Trout, M. & Decker, S. (2007). Journeying into mathematics through storybooks: A kindergarten story. *Teaching Children Mathematics*, 14(4), 232 – 237.
- Young, E. & Marroquin, C. L. (2006). Posing problems from children's literature. *Teaching Children Mathematics*, 12(7), 363 – 366.

Appendix A
Parental Consent Packet

Dear Parents/Guardians:

My name is Samantha Munro. I am Senior majoring in Elementary Education at East Tennessee State University, where I am also a member of the Honors College. With this, I am currently working on my Senior Honors Thesis – “Integrating Literature in an Elementary School Mathematics Classroom.” This thesis is considered research.

The purpose of conducting this research activity is to determine if teaching mathematics through literature has an effect on students’ mathematical achievement, an effect on their attitudes towards mathematics, and an effect on their awareness of real-world applications of mathematical concepts. In order to evaluate these effects, I would like to engage your child in a one-hour math lesson during the regular school day. During this time together, we will read “Amanda Bean’s Amazing Dream: A Mathematical Story” by Cindy Neuschwander. Afterwards, students will create their own multiplication stories similar to ones that were introduced throughout the story. Your child will also be given a six question pre-test prior to the lesson and post-test following the lesson to determine their multiplication knowledge, applications of multiplication in the real world, and their attitudes towards mathematics. Students not participating will be given an alternative assignment from the classroom teacher. All information will be kept confidential.

I hope you will consider allowing your child to participate. For he/she to be able to participate please read the enclosed consent form and sign one copy and return it to your child’s classroom teacher as soon as possible using the envelope provided. Keep the other copy for your records.

Thank you for your consideration!

Samantha Munro

EAST TENNESSEE STATE UNIVERSITY
Parent/Guardian Informed Consent Agreement

Please read this consent agreement carefully before you decide to allow your child to participate in the study.

Purpose of the research study: The purpose of conducting this research activity is to determine if teaching mathematics through literature has an effect on students' mathematical achievement, and effect on their attitudes towards mathematics, and an effect on their awareness of real-world applications of mathematical concepts.

What your child will do in the study: In order to evaluate these effects, I would like to engage your students in a one-hour math lesson during the regular school day. During this time, together we will read "Amanda Bean's Amazing Dream: A Mathematical Story" by Cindy Neuschwander and then have the students create multiplication stories that were taught throughout the story. Your child will also be given a six question pre-test and post-test to determine their multiplication knowledge before and after the lesson.

Duration: The study will require about one hour of your child's time.

Risks: There are no anticipated risks in this study.

Benefits: Your child will be more aware of how they can apply mathematics and multiplication to the real-world so they will have more of a desire, reason, and motivation to learn this skill. Most significantly, you child will spend the time practicing multiplication, a valuable mathematics skill.

Confidentiality: This activity is completely anonymous and confidential. In other words, there will be no way to connect your child's name with his/her pre- and post-test assessments and the multiplication stories. The results of this study may be published and/or presented at meetings without naming your child as a participant. Although your rights and privacy will be maintained, the Secretary of the Department of Health and Human Services, ETSU IRB, and personnel particular to this research have access to the study records. Your child's study records will be kept completely confidential according to current legal requirements. Responses will not be revealed unless required by law or as noted above.

Voluntary participation: Your child's participation in the study is completely voluntary. You may refuse to allow your child to participate. Your child can quit at any time. If your child quits or refuses to participate, the benefits or treatment to which he/she is otherwise entitled will not be affected. Students not participating will be given an alternative assignment from the classroom teacher.

Right to withdraw from the study: A student may quit at any time and parents/guardians may remove their child at any time. You have the right to withdraw your child from the study at any time without penalty or loss of benefits.

DOCUMENT VERSION EXPIRES

APR 14 2014

ETSU IRB

APPROVED
By the ETSU IRB

APR 15 2013

By aa
Chair IRB Coordinator

How to withdraw from the study: If you want to withdraw your child from the study, tell the researcher. There is no penalty for withdrawing.

Payment: You will receive no payment for your child’s participation in the study

If you have questions about the study, contact:

If you have any research-related questions or problems contact Samantha Munro at 423-834-0850.

If you have questions about your rights in the study, contact:

You may call the Chairman of the Institutional Review Board at 423/439-6054 for any questions you may have about your rights as a research subject. If you have any questions or concerns about the research and want to talk to someone independent of the research team or you can’t reach the study staff, you may call an IRB Coordinator at 423/439-6055 or 423/439/6002.

Agreement:

I agree to allow my child to participate in the research study described above.

Your Child’s name _____
(Please Print)

Signature: _____ Date: _____

If you agree to allow your child to participate please use the envelope provided to return the signed copy to your child’s teacher and keep the other form for your records.

APPROVED
By the ETSU IRB

DOCUMENT VERSION EXPIRES

APR 15 2013

APR 14 2014

By aa
Chair/IRB Coordinator

ETSU IRB

Appendix B

Child Assent

Good morning boys and girls! I am Ms. Munro. I go to ETSU where I am learning how to be a teacher. You know how Mrs. Henry has you do book reports and other big projects? Well, I have a big school project to do and I could really use your help on it! You can think of my project as your Science Fair Projects. I have a problem and a hypothesis that I need to do an experiment with. So for my project, I want to see if teaching kids like you mathematics through a storybook helps them learn. My hypothesis is that this will make math fun for you and it will help you understand how you can use math outside of school. So to test my hypothesis, I need your help with my experiment.

If you choose to help me, we are going to do a math lesson together during your typical math time with Mrs. Henry. First, I would need each of you to complete these six questions as a pre-test. A pre-test is just a way for me to see how you did before the lesson. Next, we will read this book together, "Amanda Bean's Amazing Dream: A Mathematical Story" by Cindy Neuschwander. After we read the book, we are going to create our own multiplication stories like we will see in the book. Finally, each of you will take a six-question post-test. The purpose of a post-test is to help understand how well this lesson helped you and it will give me the results of my hypothesis. When you do these activities, they will be completely anonymous and confidential. This means that no one will know which work was yours or which was your friends. Your name will not be written on anything and I will not show anyone your work. However, I will use the results and the data I collect from this "experiment" to help me write a paper for my project. So I would greatly appreciate your help as I complete this.

Your participation is voluntary. You do not have to participate if you do not want to. In addition, if you choose to participate but change your mind halfway through, you can stop participating and not be included in my project without a penalty. If you do not want to participate, Mrs. Henry will give you another assignment to work on.

Does anyone have any questions for me before we begin? If you do not want to participate, you may come over to Mrs. Henry at this time to receive an alternate assignment while I begin my project with those of you who wish to participate.

APPROVED
By the ETSU IRB

APR 15 2013

By aa
Chair IRB Coordinator

DOCUMENT VERSION EXPIRES

APR 14 2014

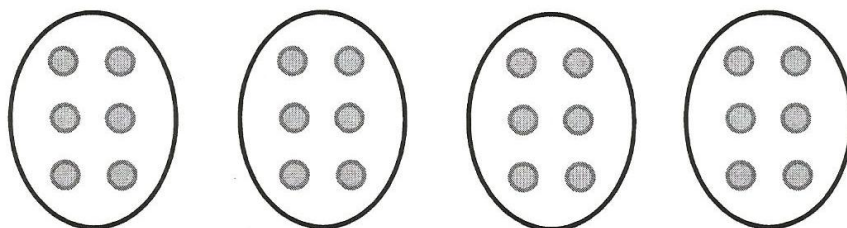
ETSU IRB

Appendix C

Pre-Test Assessment



1. Do you enjoy mathematics? Why or why not?
2. Why is multiplication helpful?
3. How can you use multiplication outside of school?
4. If Amanda has 4 bags, with 3 cookies in each bag, how many cookies does she have total?
5. Which has more wheels: 5 tricycles or 7 bicycles? Show your work.
6. Write a mathematical equation to represent how many jelly beans Amanda Bean has total.



Appendix D**Post-Test Assessment**

1. Did you enjoy reading a book to help you learn the math skill of multiplication? Why or why not?
2. How did the book help you learn the math skill of multiplication?
3. How can you use multiplication outside of school?
4. Amanda has two rows of chocolate chip cookies, with 4 cookies in each row. Each cookie has 5 chocolate chips. How many chocolate chips are there?
5. Which has more panes: a window with 5 rows and 4 panes in each row or a window with 3 rows and 6 panes in each row?
6. Draw an array to illustrate the problem 3×6 .