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Putting Literacy and Math Together Through a Story

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PROFESSIONAL PROJECT

Professional Project

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College of Education, Western Oregon University

ED 605: Project Implementation

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**WE, THE UNDERSIGNED MEMBERS OF THE GRADUATE FACULTY OF
WESTERN OREGON UNIVERSITY HAVE EXAMINED THE ENCLOSED**

- Thesis
- Professional Project

Titled:
Putting Literacy and Math Together Through a Story

Graduate Student: Kayla Fleshman

Candidate for the degree of: MSED: Curriculum and Instruction

*and hereby certify that in our opinion it is worthy of acceptance as partial fulfillment
of the requirements of this master's degree.*

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Chapter 1: Introduction

The Context of the Project

As a student, one of the subjects that I had a difficult time with was mathematics. To me, it seemed as though math was uninteresting and would never be something that I would use outside of school. It also was confusing; every answer that I would arrive at felt arbitrary and like someone who was much smarter than I had somehow made up the equations. In elementary school, some very basic concepts were easy for me to understand. However, as I got into upper grades and math continued to increase in difficulty level, I grew less and less interested or very frustrated. For example, in fourth grade, we were required to start state testing and complete the math Performance Task, or in other words, a math word problem. I was incredibly nervous that I would not do well on this. During the test, I became very frustrated, and started to cry because I did not see how I was supposed to solve the problem or arrive at the correct answer. I felt the same even when it was not a testing environment and continued to be frustrated any time we did any sort of Math. Not only was it intimidating, it felt like if I could not solve the problems, then I was not as smart as everyone else.

In later years, my dislike and frustration with math continued. I tried my best but had decided that I was not good at math and that I would never be as good at math as I was at reading or writing. In middle and high school, I took the math that I needed and that was it. My math teachers taught from a textbook and would often get lost in their own problems as they tried to explain it to us. The only way I got through these classes was with the help of friends who had taught themselves and then taught me. When we were in class, it was hard to stay focused and to understand where my teachers were getting their answers from. There did not appear to be any background to anything, and I wanted to know why it was important and why we even got the

answers we did when we solved a problem. Although some math problems were applicable to real life, a lot were not.

Finally, when I got to college, I was happy to learn that I would not have to take much math. I only had some basic level math classes in addition to a few Education math classes. In the Education math classes, they were more fun and new ways of teaching math had developed since I had taken it in elementary school. I was, at last, able to learn the background behind math, and why it should be taught in a certain way. It felt amazing to have everything click, and to know that there are many ways to do a math problem. We were able to explore problems and solutions, as well as see how our classmates figured out their problems. Manipulatives or games were often used to help increase understanding. I learned how to teach math effectively, rather than teach like how my teachers taught me when I was in elementary school. These classes helped me appreciate math, and it has now become one of my favorite subjects to teach. I can understand when my students struggle, and always try to think of ways that they can do the problem better. I also continue to learn, as I have to re-teach myself new ways that our curriculum uses to teach math or when I learn from a student a new way to do something.

While thinking about the negative feelings I had towards math, and wanting to support my students, I wanted to create a “Choose Your Own Adventure” book that takes my students through their own journey of practicing a variety of math problems. I currently teach fifth grade; many of my students are at a K-3 grade level, and they struggle with math. I love to write, and I notice that many of my students feel the same way about math that I did: they are anxious when they do it, they think it is boring, and they think that they are not smart enough to do the math problems that we are learning how to do every day. My students love to read, so I wanted to create a fun way they could practice math concepts in the context of a story. My Choose Your

Own Adventure story is short, but gives my students the practice that they need to improve their Math skills. I planned to write anywhere from 15-25 pages, so that my students could stay focused on the story but possibly read it over a few days. At this length, it gives them more options and possibilities to practice but is not so long that they feel like they cannot read it. As is common with a Choose Your Own Adventure book, the students have to jump around the book, making decisions about which page they would like to go to next. In order to move forward, there is a Math problem that they need to solve. Depending on the answer they get, that line of the story either ends, or continues if they get the correct answer. Overall, I think that my project is a great way to integrate Math and Reading together.

Why This Project Is Important To Me

I wanted my students to have fun while they are doing math. I did not want them to feel like I did, where I did not really appreciate or like it until I got into college and started to teach it. It is very important to start encouraging our students at an early age that they can do Math, and that they should be confident in their math skills. Many students become caught up in the fact that because they do not understand something right away, that means that they will never be good at Math. They begin to tell themselves this, and eventually Math becomes something that they strongly dislike or even hate (Dowker, et. al, 2019). A “Choose Your Own Adventure” book is a great way for my students to combine math and reading, and to have fun while they are doing it. It also helps them build endurance with doing math, as they may not get the correct answer the first time but can work and continue learning to find it the next time. Also, if my students can have fun while they do Math, they might be able to remember the Math concepts a little easier. They will continue working on developing their skills, without it feeling like they are “doing” Math in the normal way that they would think of.

In addition to helping my own students, this project was important to me because I am passionate about writing, and I want to use those skills to make a subject that is usually tough for many students more interesting. After using it with my own students, I planned to ask my fifth-grade team if they would like to have some of their students try using it as well. Although there are many books out there that have students explore math concepts in a fun way, I wanted to do something like this because I have seen how much the fifth-grade students really do enjoy “Choose Your Own Adventure” books. In a way, my project helps fill this gap within my own school, and hopefully gets these students more interested in math.

In general, with this project, the hope was that it would have a positive impact on the students directly in my school by encouraging them that math can be a fun subject. After reading this book, my students should hopefully see that even if they are not good at a math concept right away, it does not mean that they are not good at math. It also does not mean that it cannot be figured out or that they will never understand how to reach the correct answer. This project can and hopefully will be used as a tool of encouragement for all students, whether they are struggling in math or whether they love it.

Connecting to Current Research

In the educational world today, there is a lot of research surrounding the topic of using Literature to teach math and other STEM topics. Many researchers argue that math does entail using one’s imagination, and that our kids should be encouraged to use their creativity to solve math problems. For example, Furner (2018) states

Today it is critical to excite young people about mathematics in our high-tech STEM world we live in. Math teachers today need to embolden students to be confident in their ability to solve problems, to think and use their imaginations, to understand mathematical concepts, to be creative, and to see math as a human endeavor (p. 1).

The author goes on to describe that many trade books have been published that help children with exploring math concepts in a fun way. One of the most famous book series is written by Cindy Neuschwander, called *Sir Cumference*. In this book series, Sir Cumference goes on many different adventures throughout his kingdom, using math to help others and solve problems. A few benefits in using Literature, especially fun books such as *Sir Cumference* are that math ideas are taught in the context of the story; it advances mathematical thinking; it thwarts math anxiety; and it provides for a variety of responses (Furner, 2018). In summary, when teachers use trade books like these, they are able to encourage their students to overcome their math anxiety as they have discussions around the book and work on how to solve the math problems that are woven throughout the book. It adds a layer of fun to teaching math, and helps students use their imagination as they are pulled into the story. In one way, because students must use their imagination, it makes the math problem feel more real and connects it to real-life. Using Literature can be a “non-threatening” way to teach students who are struggling with math or become very frustrated when they are doing math.

In addition to helping children use their imagination and creativity to solve math problems, literature can help students investigate, analyze, and discuss certain aspects of math. For example, a story with a math moral can help students make this connection between reading and math (Friedman, 1997). As students read the stories and search for the math moral or really the math concept, they can engage in problem solving and practice using the skills that are similarly needed when solving word problems. It is also important to have students discuss what they discovered as they read the story, so that they practice supporting their answers, like proofs in math (Friedman, 1997). After reading math stories with a math moral, students can also write

their own stories that contain their own math moral. When students do this, it will make the math concepts more meaningful.

Finally, using literature in math can give math a more human perspective as students see people using math to solve real problems, and gives students the opportunity to connect the abstract language of math to the real world (Bintz, et al., 2011). As students read my short Choose Your Own Adventure story, they can see that math can be connected to stories, and real-life challenges. They can work through the problems woven throughout the story, which then creates discussion around what they had to do to reach a certain part of the story. The more that I can encourage my students to discuss how they solved the problems and what they did as they read it, the more it will in turn help them with using mathematical language. In addition, the students can explain how they worked out a problem and the choices they made just like they would when they solve word problems for math.

How the Project Aligns with Professional Standards in Education

The first way in which my project aligns with the goals and learning outcomes of the Curriculum and Instruction M.S.Ed program is that in this project, I am applying learning theories and research in education in a variety of contexts. For example, I present and use current research that supports the foundation of my project. This research shows how important it is to teach students math using Literature, and that integrating math and Reading can be very beneficial. In addition, I am willing to apply these learning theories to my own classroom as I implement my project for my students and other students at my school.

One more way that I am aligning my project with the goals and learning outcomes of the Curriculum and Instruction M.S.Ed program is that I analyzed data and evidence to support

learning and engaged in change. Although I did not collect official “data”, I still analyzed and paid attention to how my students used my story, and if they liked it. I planned to ask my students and other teachers for feedback and adjust as needed. This is engaging in change; I also planned on adjusting my instruction to incorporate my story so that my students had time to interact with it. Everything depended on my students and if I needed to make the story shorter, longer, or change how I incorporated the math parts of the story. This shows me how successful my project was, and if I was able to help students become more interested in math. To ensure that I had some data, I had discussions with each of my students to see what they thought of my story, and any feedback that they wanted to give me. The specific questions I planned to ask students were: On a scale of one to five, five being the most difficult, how difficult was it to read the story and complete the math problems?; and On a scale of one to five, five being that you loved it, one being you strongly disliked it, did you like reading the book? In addition, I also planned to ask my students these questions anonymously, and have a space at the bottom of the paper for them to give more feedback, such as anything else they would like me to know about their opinion of this book.

The last learning outcome and goal from the Curriculum and Instruction M.S. Ed program that I aligned my project with was demonstrating professional growth, dispositions, and leadership appropriate to my field in education. As a teacher, it is important to continuously grow in our instructional practices, and to continue learning ourselves. Learning theories and research are constantly evolving, which means needing to adapt to changes in policies and teaching practices. It is best practice to support all teaching strategies with research, and to know how to defend why you are doing something the way you are doing it. All teachers are different, so there are many ways to give our students the education they deserve. With that, as I completed

my project, I grew in my profession as an educator because I attempted to try something new and incorporated reading into math in a different way. I also developed leadership appropriate to my field in Education because I created my own story that other teachers in my school can use to integrate into their math instruction as well.

Furthermore, one of the learning outcomes that my school has adopted this year is to have clear student success criteria identified, and to help students be involved with their education and the success criteria that we have laid out. As I incorporated my project into my classroom, I changed the success criteria posted, and added in reading the story as part of their practice for math. I also described to students how reading a story like this can help them have a little more fun in math and hopefully make it feel like they are not “practicing” math intentionally. So, my project also helped me meet the learning goals and outcomes that my school laid out for the year.

Implementation of the Project

The first way I planned to implement my project was to implement it into my own classroom and instructional time. My plan was to do this as soon as the project was finished, in late April or May. During math, I typically teach my students a whole group lesson, and then we have math groups where half the class works online on a learning program called iReady, while the rest of the class is on the carpet with me working on whiteboards. I added a third group to this and had some of my students read the book while the others did iReady or worked at the carpet with me. In addition to having my students read the book, I also asked my other fifth grade team members if they wanted to share it with their students.

As I gave it to my students, I first explained how to read the book – showing them that it is just like a normal “Choose Your Own Adventure” book – and that they must solve the

problems in order to know which page to move on to next. They were able to see that if they chose the wrong answer, the story would end at the page it tells them to go to, and they would have to go back and make a different decision. When my students read the book, I paid attention to their reactions, in addition to if they were just skipping around or skimming through the book rather than actually reading it. I planned to go through the first few pages with them, doing the problems as practice with them so that they could see how it works and what they needed to do. For some of my students, it was beneficial to do an interactive read-aloud so that they could do the problems as a small group or class at first (Jacob & Jacob, 2018).

I knew that my project was successful from the feedback that my students gave me, as well as feedback that I got from other teachers in my school who decided to use it. If they say that it worked well, and it got their students reading but also doing math, then my project was successful. As well as positive feedback, I would know if my book needs to be improved by the feedback they gave me also. For example, they might say that the problems were too hard, or maybe the students were not that into solving problems while reading a "Choose Your Own Adventure" story. No matter what, I hoped that my project would at least help some students become more interested in math by reading my story.

Chapter 2: Literature Review

Introduction

In many Elementary level classrooms today, math is a subject that persistently intimidates students. Some parents and teachers even strongly dislike it, which can impact how their children and students feel about math (Frenzel, et al., 2010). For students, it can be boring, and they may not be able to see how math really connects to the real-world or why they would need to learn it. Many students struggle with wrapping their minds around the concepts and feel as though they will never understand math; they may assume that they will never be good at it and therefore they should not continue to attempt to learn it. However, within school subjects, mathematics plays a fundamental role for its application in other school subjects (Gaspard, et al., 2015). Students who believe they excel in one subject may believe that they will not excel in math, because they do not have the skills needed to do well in math. These beliefs and the values that students have about math can influence their achievement in this subject in younger grades and continue as they get older (Fadda, et al., 2020).

As a fifth-grade teacher, I have seen how my students struggle with math, and I empathize with them as I felt the same about math when I was their age. I wanted to figure out a creative and innovative way that will help them engage more in math thinking, but that is also fun for them to do at the same time. During math time, I have an hour to work with my students, in which we use a curriculum called iReady. For the first twenty minutes of class, I teach a lesson from this curriculum, and the students follow along in their workbooks. This is done as a whole group. After the lesson, half of my class goes on their Chromebooks, and completes their online iReady lessons. The other half of my class grabs whiteboards and sits down on the carpet. During this carpet time, I have my students practice different concepts that we are working on.

At first, I give them a problem, and will walk them through it. If we have been working on something for quite a while, I will have them start solving on their own. As students need help, I walk around and support them in solving the problem. When it has been about twenty minutes, I have the groups switch so that all the students have the opportunity to do their iReady lessons.

Although the iReady curriculum supports students in their individual learning, it is the only source I have for helping students who are multiple grades behind fifth grade. iReady gives students lessons at their level, depending on where they tested during a diagnostic assessment that they take several times throughout the year. In our math, as well as outside of our math time, I try my best to have students do as much iReady as possible. The curriculum has a goal of doing sixty minutes of online iReady a week, and many of my students go well over that threshold. This means that they continuously become bored or get burnt out from doing so many lessons. Therefore, for my professional project, I wanted to find an activity that my students could do during our math time that still allows them to practice effectively.

The activity that I decided would benefit my students the most was a Choose Your Own Adventure style book. Many of my students love to read, and the short story has math problems throughout so that students can solve a math problem as they choose which page to turn to next. During our math time, I had a third of my students on iReady, a third of my students at the carpet working with me, and a third of my students reading this short Choose Your Own Adventure story. After about ten to fifteen minutes, I had my students rotate in a station-like structure so that every student had the chance to do each of the three activities. While my students read this book, they had a scratch piece of paper that they could use to solve the problems, or a whiteboard. The goal was to help them have fun while they were still practicing the math skills that we were working on, in addition to skills from prior grade levels.

In this review, I will discuss current research surrounding how Literature can be integrated with math to help students better understand math concepts. The three topics that I decided to focus my research on were: approaches to teaching math with literature; math anxiety; and promoting engagement in math in primary schools. I chose these three topics because they are the foundation and ideas behind why I wanted to create a Choose Your Adventure book for math, and why I believe Literature can be used in a beneficial way for students as they navigate the math classroom. With that, the audience that I intend this review for are educators who work at the primary and middle school levels who would like to know more about using Literature during their math time to develop their students' math learning in a more meaningful way. This Literature review should also be read by those in the field of Educational Research that would like to know what current and past research has discussed about math Anxiety, engagement in math, and how each of these can correlate to achievement in math. In addition, my Literature Review will provide the theories behind using Literature and math together, and back-up my reasoning for proposing this change to math instructional time.

Definitions

This Literature Review has three important terms that need to be discussed to understand the full context of the research. These terms are **Math Anxiety, Literature, and Engagement**. First, the term **Math anxiety**, refers to the fear of, or apprehension about math and is something that can affect working memory (Ashcraft & Kirk, 2001). Anxiety itself is defined as “an emotion characterized by feelings of tension, worried thoughts, and physical changes like increased blood pressure” (American Psychological Association, 2013, p. 1). Math anxiety is one type of anxiety that manifests when people are exposed to numerical stimuli or when they must perform calculations (Passolunghi, et al., 2020).

The second term is **Literature**. In this review, Literature is defined as stories, children's books, or other types of reading material that can be read aloud to students or that students can read. Literature is not textbooks, or worksheet activities that could be used to teach (Bintz, et al., 2011). Literature are stories that can be used by teachers to help children "analyze, discuss, and investigate important mathematical principles" (Friedman, 1997, p. 1).

The third term is **Engagement**. In this review, Engagement is defined as the behavior of students during math class that shows that they are cognitively interested in what is being taught (Leon, et al., 2017). When students are actively engaged, they are involved in class or partner discussions, or asking questions.

Methodology for Literature Review

For this Literature Review, I researched using the database at Western Oregon University's Hamersley Library. At first, I wanted to generally research if the subject of Literacy itself could be integrated into the subject of math, and vice versa. There were a few research studies on this topic, however I mainly found textbooks that were used in teacher preparation programs. As I looked through these resources, I noticed that much of the research these authors were citing had to do with children's Literature, and how it could be used to teach math. This led me to narrow down my search to using Literature to teach math, and approaches to doing so. When I typed in these words, I received many more hits, especially in the area of peer-reviewed articles and research studies. Additionally, after receiving feedback on my introduction, I decided to try researching math anxiety, as many of my students seem to display math anxiety, or because they generally "dislike" math, they do not do well in it. I also wondered how math anxiety would affect achievement in math, and if math anxiety could actually be displayed in younger children. Many of these math anxiety research studies examined gender roles, and how

girls tend to shy away from math compared to boys. This led me to engagement and interest in math, and if students can be more engaged if they have more of an intrinsic motivation to learn math. I also continued to research if children's Literature could possibly affect student engagement and wanted to know if using it would have a positive effect on students with math anxiety, or students who believe they are not good at math because they are a girl or do not have a "natural" interest in math.

Review of Literature

Approaches to Teaching Math with Literature

In the past twenty to thirty years, much research has been conducted on whether Literacy and mathematics can be integrated, and if it would be beneficial for students if they were taught together. The National Council of Teachers of Mathematics recommends that students should do more Reading, Writing, and discussing of ideas in the math classroom (NCTM, 2000). Although it seems like Reading and Writing have nothing to do with math, studies have shown that Reading and math use the same cognitive processes; therefore, early math achievement may lead to later Reading achievement, and vice versa (Bailey, et al., 2020). The following studies examine the possible reciprocal effects of Reading and math, and how Literature can be integrated with math to help students understand math concepts more fully. They were conducted in a range of grade levels, mainly in primary schools, with a few of the studies grouping fifth grade as a middle grade level.

With the possibility of using Literature to teach math, the question arises of what Literature should be used. There are many options for stories that students can read, however, some may not be as high quality as others. In a research study by Hunsader (2004), the author

investigated children's literature, and what books should be considered qualified to help teach students math concepts. They specifically looked at trade books and evaluated each book using a rubric that Hunsader created. Hunsader focused on the idea that "children's Literature gives visual learners a better tool to understand math concepts" (Hunsader, 2004, p. 619). This rubric was adapted from previous studies done by Schiro (1997) and Hellwig (2000). They found that the books needed to activate prior and background knowledge, so that students could not only understand the story, but also recognize what mathematics concepts the story was trying to convey. In addition, many books recommended by publishers did not meet the criteria of the rubric. The criteria that Hunsader (2004) listed, firmly stated that the mathematics content needed to be accurate, and the story needed to be "good" from a literature and math perspective. Similarly in the study by Bintz (2011), they discussed that the literature needed to meet current math and literature standards. Hunsader (2004) and Bintz (2011) both said that literature should be used as a tool meant to develop students' understanding of mathematical concepts. The results of each determined that Literature could help students increase their knowledge and math skills if it is used properly and of high quality. The books should also be entertaining, and something that students will enjoy (Bintz, 2011). Through classroom observations, they noticed that if the class enjoyed the book more, they continued to have discussions surrounding the content of the book and how it related to the math concepts that they were learning.

Each of the studies focused mainly on third or fourth graders; one further research question that could be explored is the possibility of using chapter books with math themes for older Elementary grade levels, rather than picture books. Other research studies would need to be conducted to see if children would respond similarly to chapter books as they did to picture books. However, the children's Literature industry is lacking in this area, and often has very

famous picture books – such as the *Sir Cumference* series by Cindy Neuschwander – which may not be as popular with older kids. Hunsader (2004) had criteria listed that seemed subjective and would need to be further evaluated. For example, one criterion that was listed stated that the story be “good” from a math perspective, as well as a Literature perspective. This leaves an open-ended question of what “good” means, and leaves room for interpretation. Bintz (2011) did a better job of laying out what a successful lesson using children’s literature in math would look like, in addition to giving many book suggestions.

Padula (2004) also researches and discusses what makes a children’s book “quality”. One of the aspects that she thought makes for a successful children’s book is that it not only helps students with math concepts but also with Literature aspects. For example, books that are “rich with relational terms” (p. 9) such as “around”; “about”; “more”; or “fewer” help students learn the language of math. Reading stories with math themes help students with preparing for reading math story problems, which are common in older grades. Padula (2004) discovered that math concepts that are more difficult, such as Volume or Measurement, are easier for students to understand when used in the context of a story. It is also possible to recreate a physical representation of the situation in the story in real-life, so that students can visually understand what is happening and understand these more difficult concepts. Similarly, in Bintz (2011), they discovered that using stories to teach the concept of measurement helped the students have a better understanding; the teacher in this study observed that her students understood measurement better after reading a story than when she would teach it with a textbook, or with a ruler. Having the students read the story first then led them to have the foundational understanding they needed to start using a ruler to measure things. Padula (2004) does a great job comparing trade books and giving suggestions for how you could use these books to teach math.

She analyzes each book and discusses what parts of the book students might have a harder time understanding.

Friedman (1997) suggests that trade books with a math “moral” are best for students when integrating math and Literature. A story with a math moral is like a fable, which contains a general lesson or theme about life. However, a math moral is a “general principle of mathematics”, such as, “dividing a given set of objects equally into more subsets, will cause each subset to contain fewer objects” (p. 1). Friedman (1997) discusses that stories with a math moral help students investigate broad mathematical concepts and gets them to practice generalization and abstraction. She analyzes several different trade books that contain a math moral, and discusses having students role-play the stories, and having students do a scavenger hunt activity to look for the math moral of the story. Trade books like these integrate well with Literature because they have students also learning about the Literature standard of finding a theme, or moral in a story. It is also interactive, and students may enjoy this type of trade book and style of lesson. Friedman (1997) lists several of these books, and how a teacher could use them in a lesson that teaches both math and literature standards.

Similarly, Furner (2018) discusses that math should be seen as a human endeavor; if teachers are able to be creative while they are teaching math, then students can relate it to their real lives. Furner (2018) suggests an activity called a “Math Snoop” where students look for the math concept within a story, which is similar to how Friedman (1997) said students should do a scavenger hunt for a math moral. Both showed that trade books with underlying math morals or themes can be effective in teaching students math concepts. Each author did a great job analyzing the trade books and laying out what lessons with these books would be like.

Friedman (1997) and Furner (2018) write about several ways to use trade books to teach Literature and found that students loved using them to understand the math concepts that they were learning. However, each did not give much context to the grade levels that they were aiming for using these books with. Further research might need to examine if activities like this would work for older elementary grades or middle grades. In addition, one research question that could be investigated further is if students with Learning Disabilities would also do well with finding math morals, or if this concept would be too abstract. Furner (2018) did analyze if lessons like this would be helpful to English Language Learners; he discovered that they could be used with identifying different types of words and understanding their use, which is helpful for students who are English Language Learners. Friedman (1997) did not discuss any extension activities for students who are English Language Learners, or for students who may be at a lower grade level than the rest of the class in math. Furner (2018) also discussed the effect of using children's Literature to guide students in discussions that center around emotional development. As the teacher or the student reads through the story, the teacher can guide students in discussion around math concepts and vocabulary, in addition to any morals in a story that students need to understand in order to develop their emotional awareness.

In the study by Yang and Jiang (2019), they evaluated what Literacy skills have been emphasized for K-5 learners to learn Science and math concepts. They targeted the Elementary grades, but also wanted to research if Literacy instruction lays the foundation for later learning of content in other subjects in Middle and High School. Furthermore, they wanted to find out the best practices for teaching Science and math with literacy. They systematically reviewed articles about math and Science instruction from 2006 to 2016. The results of the study were that reading comprehension, vocabulary, and writing were three important parts of math and Science content

instruction. In addition, they discovered that incorporating texts into Science and math was recommended to learn content subjects; reading aloud these texts especially helped students develop their knowledge of the content. Integrating Literacy skills into math and Science instruction also gave students a foundation for learning in these content areas in Middle and High school. Similarly Green, Gallagher and Hart (2018) conducted a study with fifty preschool aged children with disabilities and found that interactive read alouds during math instruction helped these students improve their understanding of math concepts that they had not previously understood with other interventions. Although this study focused only on students with disabilities and used literature to teach math outside of the core math time, it still was effective in showing how much integrating literature into math can help students. Researchers read one book every two weeks to a small group of children with IEPs; these children did not have severe vision or motor disabilities but rather developmental delays. Fuchs (2008) also studied math interventions for children with Learning Disabilities and used a specific curriculum to test whether students improved their math skills. This was called “Pirate Math”, where the researchers taught students how to do story problems in the context of a pirate story. These third-grade students benefited from learning math concepts in the context of a story that they thought was very interesting. The next time that they were tested, these students improved significantly.

Yang and Jiang (2019) overall said that further research would need to be conducted to strengthen the connection between theory and practice of using Literacy to teach math and Science, that would require educators and researchers to work together. They did not research if students with Learning Disabilities did or did not have the same foundation of Literacy skills that would help them be successful in other content areas in the future or not. Additionally, Fuchs (2008) discussed that research should also be conducted on mathematics curriculum, and that

additional attention should be paid to interventions for math as they tend to decrease as students get into older grades. Although both Fuchs (2008) and Green, Gallagher and Hart (2018) assessed students with Learning Disabilities, I wonder if any of these students were English Language Learners, and if this would have made a difference in the data and success that they had in the experiment.

Math Anxiety

Math can be one of the most difficult subjects for students because of the phenomenon of math anxiety. Math anxiety itself can make it so students cannot perform mathematical functions such as calculations or can lead to students basically shutting down when they try to complete math problems. However, using literature may provide a way around barriers to understanding and engagement that children who suffer from math anxiety may have (Hunsader, 2004). The following studies have the key themes of lessening math anxiety with the possibility of using literature, and the ways in which math Anxiety truly affects achievement in math. When math ideas are taught in the context of the story it advances mathematical thinking; it thwarts math anxiety; and it provides for a variety of responses (Furner, 2018).

Udil, et al. (2017) studied several middle grade students, and focused on analyzing metacognitive processes of students that have been identified as having math anxiety while they solve math problems. They came up with four steps of the metacognitive process that students go through when they solve math problems and evaluated on how students did during these steps. They were how the students understood the problem; how they made a plan to solve it; how they carried out the plan; and finally, how they looked back to check their work after finishing the problem. The researchers interviewed them as they tried to solve the problem, so that they could see what they were thinking as they went about their process. It was revealed that their math

anxiety did have negative effects on their cognitive processes and their ability to effectively solve the problem. In addition, despite the fact that they had the knowledge and have been taught the mathematical concepts, they essentially couldn't think when they were attempting to complete the math problem. Udil, et al. (2017) determined that teachers need to be aware of math anxiety, and ways that they can be creative in their teaching of math lessons to include using media or models for students. Similarly, Foley, et al. (2017) discusses that math anxiety should be treated with emotional control and self-regulation. Additionally, teachers should use creative ways to teach math, such as through Literature, as negative teacher and parent attitudes toward math can increase a child's math anxiety. Foley, et al. (2017) suggest that bedtime math could be very helpful in decreasing the math anxiety that a student has. Bedtime math is where parents read to their children a math problem like a story, or a story with math themes. Then, the parent can ask questions related to the math concept, and it helps children associate math in a positive way with bedtime stories. Overall, Foley, et al. (2017) found that teacher and parent attitudes really affect how children see math and could increase their math anxiety further if they have negative attitudes.

Both Udil, et al. (2017) and Foley, et al. (2017) conducted studies that showed students with math anxiety are unable to complete math problems successfully because of the negative impacts that it has on their Metacognitive processes. Although Udil, et al. (2017) designed specific questions to analyze students' performance, I do wonder how accurate these student responses were. If the students knew that they were being tested for a reason, I wonder how honest they were with their responses, and how prompted they may have felt with the questions. In addition, I wonder if any of these students with math anxiety also had learning disabilities or were English Language Learners (ELLs). If this was the case, then further research could be

conducted to see if there are more students who have math anxiety that are students with Learning Disabilities or English Language Learners, or if it does not matter. In addition, Foley, et al. (2017) mentions the use of Literature, but really does not evaluate the type of Literature that could be used to help students decrease their math anxiety. Bedtime stories could mean any number of stories, so further research could be conducted on what books parents may want to use with their children.

In the study by Barroso, et al. (2021) researchers examined the negative correlation between math anxiety and math achievement. They tested grades one through nine and had a very wide variety of subjects and even included students that were identified as having low math anxiety for comparison. The students tested were from countries all over the world and examined possible causes of math anxiety, such as impact from teachers; the grade that they were in; difficulty of math concepts. In addition, they included students with low math ability, and even evaluated the stereotype of women tending to have math anxiety more often than men. Overall, they saw a significant increase in math anxiety as students got older, especially on standardized tests; this was because there was more pressure to perform well, with more weight on the students' grade. Women also did not have math anxiety more often than men, although people often think this. Similarly, in the study by Herts and Beilock (2017), they analyzed a variety of studies on math anxiety and math achievement, and the negative relation that math anxiety had on math performance. Specifically, they wanted to understand the cognitive function behind math anxiety, and why students may have it. They noted that "children of high math-anxious parents make smaller gains in math throughout the course of the school year than did the children of low math-anxious parents" (Herts & Beilock, p. 217, 2017). Teachers that were also math-

anxious had a negative effect on their students' view of math. Working memory was determined to also be affected by math anxiety.

Barroso, et al. (2021) and Herts and Beilock (2017) analyzed many of the possible causes of math anxiety. Although they both had a wide variety of subjects/studies that they covered, both stated that there is still much to be researched in the area of how math anxiety truly affects working memory and state or trait anxiety. In addition, each had a hard time analyzing whether math anxiety occurs more often in situations with more pressure, and if these students would do better if pressure was not put on them – such as not taking a test but still completing a problem. While Herts and Beilock (2017) learned that adults with math anxiety could cause children to have math anxiety further research could be conducted to see exactly how this happened, and if it is possible to avoid it. Barroso, et al. (2021) also did a better job of having a wider test subject sample; because the subjects were from all over the world, it showed that math anxiety is not only very present in the United States, but also in other countries and cultures. One question I am left wondering is if math anxiety directly correlates to pressure, and if cultures that do not put as much emphasis on testing performance have lower amounts of math anxiety.

Passoguilini and Pellizzoni (2020) focused mainly on alleviating math anxiety, as there are not many studies out there that have researched this. They tested fourth graders and evaluated two different types of training methods that could teach students how to cope with their math anxiety. The first training that was studied was the use of relaxation, positive feeling, and desensitization. The group that received this training had a significant increase in their math performance in comparison to those that had no training at all. In the second training, they used playful activities, such as books, comic strips, and other stories to help students work through their math anxiety. These also helped students to decrease their math anxiety, and therefore

increase their performance in math. The math abilities were evaluated beforehand, which helped to control which groups students were put in and conducted a pre- and post-test evaluation. However, I was left wondering what kind of playful activities they used, and if the students responded to one more than the other. The comic books that were used seemed to interest students, but I wondered what other books and stories they used to help the students overcome their math anxiety. Although the students were grouped based on their math abilities, I wanted to know the demographics of each of these groups, and if they were diverse or not.

Finally, Maloney and Beilock (2012) discuss that for people who have math anxiety, it can be triggering to enter a math classroom or opening a math textbook. Whenever numerical information is presented to them, they do worse even though they may be able to reason perfectly well normally. Although many studies suggest that math anxiety really increases when students get into older grades, Maloney and Beilock (2012) show that it is possible to have math Anxiety as early as first-grade. Furthermore, “both social influences and cognitive predispositions play a role in the onset of math anxiety in early elementary school” (Maloney & Beilock, p. 2, 2012). They discovered that a way to decrease math anxiety is to have students think positively about a testing situation; it is important to try to give students interventions early on as people with math anxiety continue to have counting problems into adulthood as well problems with other foundational math skills. In the study by Ashcraft (2001), they also agree that individuals with high math Anxiety demonstrate a lower ability to do simple math problems later on and showed that these students enrolled in college classes less than their peers without math anxiety. In addition, individuals with higher math anxiety demonstrated smaller working memories. The results of the study, which evaluated twenty-four participants, demonstrated that math anxiety heavily influences a person’s working memory when they are trying to solve a

math problem, leading to lower performance in math. Vukovic, et al. (2013) also addressed the idea that working memory is affected by math anxiety and tested one-hundred thirteen students throughout their second and third grade years of school. They found that math anxiety should be a factor that is considered when looking at how children perform on math tests and performance tasks.

Ashcraft (2001) did a great job of evaluating students over a long period of time; however, the students were mainly Caucasian. I also wanted to know more about where the study took place, and if any students were evaluated who had Learning Disabilities. Although Maloney and Beilock (2012) and Vukovic, et al. (2013) showed that math anxiety should be considered when teachers are looking at students' performance scores in math, I wondered about how teachers could adjust rubrics for grading to factor this in. I also wondered if these studies had evaluated the effect of using children's Literature to teach math and decrease math anxiety, if the students would have increased their performance, similar to other studies.

Promoting Engagement and Interest in Math in Primary Schools

In addition to the research that pointed to anxiety as a barrier to learning in mathematics, other research has also noted negative impacts of boredom and disengagement with learning in the math classroom (Hunsader, 2004). Concepts can be hard to grasp, and students can easily become discouraged when they do not understand something. Literature, therefore, can be used to increase student engagement and interest in math. When students enjoyed the Literature that was read to them, they understood the math concepts better (Hunsader, 2004). In the study by Bintz (2011), students were actively engaged in math lessons when they discussed and connected what they had read to mathematics concepts that they were currently learning. The following studies examine how to promote engagement and interest in math in primary schools and show

how math could become something that is interesting to students especially when Literature is used to teach it.

Gaspard, et al. (2015), Fadda, et al. (2020), and Leon and Núñez (2017) conduct studies with late elementary level students that follow these students all the way up into high school. All three start with the question of what makes students be more engaged during mathematics instruction, what quality instruction that gets students interested would contain. Leon and Núñez, et al. (2015) acknowledges that as students get older, their engagement in mathematics classes steadily declines. They focused much of their research on why there is this decline, and what could be done to stop this from happening in the future. After interviewing and working with over five hundred forty-eight students, three themes emerged: for math classes to be interesting, teachers need to be teaching for relevance; encourage participation; and give positive feedback while acknowledging possible negative feelings students might have towards math. Many students felt like their math teachers did not understand why they felt intimidated by math, and they wanted their thoughts and fears to be heard. Fadda, et al. (2020) also discussed how there has been a decline of students going into STEM jobs after they finish high school; they also interviewed and worked with over five hundred students and found that students only wanted to be enrolled in Math if it had relevance to their real life; utility for graduating high school; and if it would help them get a job. Gaspard, et al. (2015) also noted that utility seems to be of importance to motivate students. Girls often were less intrinsically motivated because of the stereotype that they would be “better” at other subjects such as English.

In the studies conducted by Leon and Núñez, et al. (2015) and Fadda, et al. (2020), the role of gender stereotypes was not discussed like they were in Gaspard, et al. (2015). I wondered about the students they interviewed, and if these gender stereotypes played a role like they did in

Gaspard, et al. (2015). In addition, I wondered if it would be possible to have students become intrinsically motivated, and what in our math curriculum or the way our school system is set up today could we change to make this happen. Further research could be dedicated to understanding this aspect, and if being intrinsically motivated is the only thing that helps students be engaged during math.

Jennings, et al. (1992) focused on engaging students in mathematics through the use of Literature. In the study, they tested sixty-one Kindergarten students from two schools in North Arkansas. The research question that they focused on was if they could use Children's Literature to increase these students' math test scores. All students were white, except for three, which is not a diverse group of students in terms of race. I wondered if the group of students had been more diverse, if the outcome of the study would have been different, and possibly made the study more valid. For the control group, these students used the traditional math curriculum, and the students not in the control group were read aloud different children's books throughout the study. The students were given pre-and post-tests, and the results of the study showed that students who were in the group that used children's Literature improved in three areas: achievement, interest, and vocabulary usage. Sometimes the students were even so interested in the book that was being read that they asked for stories to be re-read. The study indicated overall that Literature could be used to engage and interest students in math learning.

Attard (2013, 2011), and Frenzel, et al. (2010) all examined student perspectives of math, and what would make math interesting to more students. Attard (2013, 2011) both assessed students in Australia, while Frenzel, et al. (2010) assessed students in Germany. Their main research question was how teachers could better engage students in their math lessons, and they all assessed students from fifth to eighth grade. Lessons that had clear expectations, that were

creative, and fun were what students relayed as the most engaging (Attard, 2011). Students liked it when their teachers instilled confidence in them, responded to their individual needs, and when they would stop and explain concepts more in-depth when students did not understand rather than pushing on (Attard, 2013). Parent interest was also a factor, as family values heavily influenced whether students were engaged and interested in math (Frenzel, et al., 2010). From all three research studies, they noticed a downward trend in interest in math as students get older.

Frenzel, et al. (2010) had a much larger group of students that they surveyed, but they surveyed mostly females. Although they were aiming to see if gender stereotypes played a role, I wondered if their study would be altered at all if there were more males that were represented in the story. In addition, because all three studies were conducted in other countries, I wondered if a study in the United States would yield different results. The studies were also from about ten years ago, so it could be possible that a current study would have a different outcome than these other studies. A further study should also be conducted to see how family values affect interest and engagement in math; many previous studies mention it but did not go into more detail about this possibility. One thing that should be researched further is if the gender stereotypes of males being better at math and females being better at English or other subjects is still relevant today and if they would be true.

Conclusion

After reviewing current literature and research on the topic of integrating math and literature, the general conclusion is that students can benefit from this approach. For students with math Anxiety, studies show that Literature and other positive techniques can help them overcome this so that they can achieve at the same rate as their peers. In addition, students were more interested in math concepts when they were a part of a story. Students could make deeper

connections and have more conversations involving math concepts when children's Literature was read to them. As students become more engaged in the math they are learning, they can have a better understanding which will hopefully help them later in life. Therefore, in terms of my own project, research supports using my Choose Your Own Adventure book with math themes to enhance my math instruction. I could use it for all my students during our math core, but I could also use it during an intervention time like several studies suggested. This could be especially helpful for my students with IEPs, that need that extra time of small group or one-on-one math instruction. Overall, this review shows how Literature can truly change math instruction for the future.

Chapter 3: Methods

This year, I am teaching in the Salem-Keizer School District, at Keizer Elementary. I teach fifth-grade. The district overall serves 38,809 students, with the majority of students being Hispanic/Latino (45%) or white (42%). In addition, there are 34% of students who are English Language Learners, and 18% of students who have disabilities. In my school, we have around 546 students, with the majority of students being Hispanic or Latino (51%) or White (37%). We have 30 % of students that are English Learners, and 16% percent of students have disabilities.

In my own fifth-grade classroom, I have 23 students. Of those 23, six students qualify for Special Education services, and six are English Learners. Of those six students, four of them have transitioned out of the English Learner program, and are currently being monitored. Several times throughout the year, we take two district diagnostic tests that show teachers where our students are in math and reading. The platforms that we use for these tests are EasyCBM, and iReady. EasyCBM assesses reading, and gives the students three different tests, in three different areas. The first area is reading comprehension; the students read a passage and answer several questions. This scored out of 20 points, and students have to get 18 points or above to score low risk. The next area is vocabulary; the students are asked to interpret the meaning of grade-level words. This part of the test is also scored out of 20 points, where the students do have to get 18 points or above to receive the score of low risk. The final category is reading fluency. During this part of the test, students read a passage for one minute, and are scored on how many words they read accurately in one minute. To be scored at low risk, students need to get 140 words per minute and above for fifth-grade. The goal is for all students to be at low risk; there are two other categories that they can fall into, which are some risk, and high risk. Typically, if students are at high risk, they receive intervention.

For iReady, this is a curriculum company that also provides a diagnostic test, personalized online lessons, and teaching resources for math. On this diagnostic test, students are tested in four different areas: Numbers and Operations; Algebra and Algebraic thinking; Measurement and Data; and Geometry. Depending on how they test, they are placed in Kindergarten through eighth grade for each category. Within each grade level, there are also early, middle, and late categories. After the students take the diagnostic, they are placed at a grade level and in early, middle, or late for each one of the four areas mentioned above. The goal is to get them on grade level, which they can do by doing their personalized lessons online. These lessons help them master content and skills for each grade level in each of the four areas. Once they hit grade level in one area, it will have them start working on another area. If they are on grade level in all areas, it will have them continue to work, so that those students can receive possibly above grade level instruction. This system is a great way to see where students are at, and to give them personalized instruction tailored to meet their needs. However, one drawback of this curriculum and having students constantly doing personalized lessons is that my students become bored or get burnt out. My story will hopefully allow my students a way to practice math while taking a small break from iReady.

After taking the Fall EasyCBM diagnostic (See Figure 1), these were the statistics: seven students placed high risk overall; six placed in some risk overall; and ten students were low risk overall. The students that were placed in low risk were placed into a small group, in which they received intervention for the area that they needed to improve the most. On the mid-year diagnostic, I had many students improve, but some students had their scores go down or they stayed the same. The statistics for this test were: six students placed in high risk overall; eleven placed in some risk; and six students placed in low risk. Although the students placed in high risk

once again received intervention for the areas they needed to work on, it became clear that for the rest of the class, I needed to re-examine my reading instruction and possibly come up with something that my students could do to practice these reading skills.

PRF		VOCAB		PROF RDG		Risk	Suggested Progress Monitoring	PROF RDG Lexile
80th	183	48th	16	83rd	18	Low		1210L
6th	79	27th	14	56th	16	Some		1065L

Figure 1. Example EasyCBM Diagnostic Score

In addition to the EasyCBM, at the beginning of the year, my students tested on the iReady math diagnostic. On this first test, I had only one student placed in fifth-grade; ten students placed in fourth-grade; two students placed in third-grade; five students placed in second grade; four students placed in first grade; and one student placed in Kindergarten. All of my students besides one were below grade-level, and I had a variety of grade-levels that I needed to teach to, so that my students could improve. Each day, I have my students do their iReady lessons, so that they could continue to work on those skills and content that they need to in order to be caught up to grade-level. For our mid-year diagnostic, I had a few students improve, while others did not, or stayed at the same level. The statistics for that diagnostic test were: four

students placed in fifth-grade; seven students placed at fourth-grade; six students placed in third-grade; three students placed in second grade; and three students placed in first grade.

Figure 2. Example of iReady Diagnostic Test Results

After this diagnostic test (See Figure 2), I decided to examine how my math instruction was going for my students, and what I could do to improve this. During our math instruction, I typically do a whole group lesson using the iReady curriculum for about twenty minutes. Then, I have my class transition into doing their iReady lessons, while I work with a small group of students. I have the students grouped with other students that need to work on similar things, so that we can practice fifth-grade content, in addition to content that they still need to work on. We usually use whiteboards, and I have students practice a few different problems before sending

Overall Placement	NO	ALG	MS	GEO	Typical Growth	Stretch Growth®	Date
Mid 5	Mid 5	Mid 5	Mid 5	Mid 5	18	29	01/11/22
Early 5	Mid 5	Early 5	Early 5	Early 5	18	31	01/11/22

them back to their desks to do iReady. These small groups usually take about twenty minutes. The rest of my math time is used for students to do iReady, and if they need any assistance on their iReady lessons, I help them with those. Although many of my students like iReady, it can get boring, and I wanted to think of another way that I could get my students engaged and practicing math. Many of my students love to read, and get bored very quickly with their iReady lessons. I also knew that it was possible for me to add another “group” rotation to my small

group time, where I could have the students working on something while the other students are with me or working on their iReady lessons.

So, for my professional project, I decided to develop a Choose Your Own Adventure Story that has math woven into it. My plan for this project was to provide a variety of different math problems for my students to solve, that are in the context of a story. After developing this, I would then have my students read it during our math small group time, where I could have four to five students working with me, and then half of the other students working on iReady lessons while the other half of the students would read this story. I felt it important to include reading in this project because although my students love to read, I have many students who need to work on their reading skills as well. This story would allow me to integrate reading and math together, and hopefully engage my students in practicing math and reading in a fun way.

First, I looked over my students' EasyCBM scores, and my students' diagnostic iReady scores. I knew that I wanted my project to be a Choose Your Own Adventure story, but I wanted to make sure that my students were able to read it. This meant deciding if I was going to do an illustrated children's book, or if I was going to make it a chapter book. Based on my students' reading levels, I decided that what would work best was to make it a Chapter book so that they were challenged, but to include a few illustrations at the beginning of each section. Also, I wanted to make sure to only have each section be one to two pages so that my students could stay engaged as they were reading. Many of my students are at this level, where they can read small chapter books, so I also decided that this would be a short story; overall, the length of my story would only need to be around twenty pages. Furthermore, I needed to ensure that the words used were at their grade and reading level, so that they could understand what they were reading.

I wanted to include vocabulary words that they would know, but also that would challenge them too.

As I was thinking about the math that I would like to include in the story, I decided to include problems that were at a third to fifth-grade level. I chose to do this because most of my students are not at a fifth-grade level, but still receive fifth-grade instruction and need more practice with fifth-concepts. However, I chose to include lower grades because the majority of my students are doing third or fourth-grade concepts for their iReady lessons. These were some of the fifth-grade standards that we had been working on, and that my students still needed practice with:

CCSS.MATH.CONTENT.5.NBT.B.5: Fluently multiply multi-digit whole numbers using the standard algorithm;

CCSS.MATH.CONTENT.5.NF.B.6: Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem;

CCSS.MATH.CONTENT.5.NF.B.7.C: Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions;

CCSS.MATH.CONTENT.5.OA.A.1: Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

These were the fourth-grade math standards I wanted to include:

CCSS.MATH.CONTENT.4.OA.B.4: Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors;

CCSS.MATH.CONTENT.4.NBT.B.4: Fluently add and subtract multi-digit whole numbers using the standard algorithm;

CCSS.MATH.CONTENT.4.MD.A.2: Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals;

CCSS.MATH.CONTENT.4.MD.A.3: Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

Finally, the third-grade standards that I wanted to include were:

CCSS.MATH.CONTENT.3.OA.A.1: Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each;

CCSS.MATH.CONTENT.3.OA.A.3: Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities;

CCSS.MATH.CONTENT.3.OA.D.8: Solve two-step word problems using the four operations.

When I thought about how to write the story, I wanted to structure it like a typical Choose Your Own Adventure book. This meant that I needed to have a few different pathways for students to choose. I decided that almost every page would have a problem that the students need to solve; each answer they could choose from would lead them to another page. However, I wanted to make it clear that if they chose the wrong answer, that that was the wrong path and the story ended. A few different pathways would lead to the same page. If the students got the correct answer, then the story would continue on. Once they chose an incorrect answer, then the page they turn to ends the story, and tells them to turn back to page one to try again. This signals to them that they got something wrong. As my students worked through the story, I planned on having them write down the answers that they got, and show their work. I left space on this paper so that the students could do their work, and if they got the incorrect answer, they could have enough space to try again (See Figure 3). The reason I did this is because I wanted to see their thinking, and see that they noticed they got the wrong answer, and that they tried again once they got to that page. Overall, having the story structured like this still added that layer of fun that “A Choose Your Own Adventure” story has, but also ensured that they practiced and understood the math concepts that they were working on as they read.

Name:
Page 1 Answer:

Page 2 Answer:

Page 3: Answer:

Page 4 Answer:

Figure 3.: Example Answer Page (Not actual size)

The timeframe I planned for the implementation of this project was over the span of three weeks. Initially, I first had my students read with me. Before reading, I conducted a few vocabulary pre-reading strategies because I have many English Learners. This not only helped these students with understanding grade-level vocabulary, but all of my students. One strategy that I used was having a poster up with each vocabulary word (from a list that I decided), with a picture. The students looked at each picture, and talked with a partner about what they thought each word meant. Then, we discussed what each word meant, and I wrote the definition the students came up with on the poster. This was hung up in the room so that the students could see the vocabulary words if they needed to remember what that word meant. Also, because the story does have a lot of different places and time periods, I had another poster with pictures of specific “times” and places from the story, and as a class we discussed what the students knew about each time and place. I added more to the poster as we discussed, and I explained more in depth what each place is like. As a whole class, I had them grab an answer sheet, and partner. I read each page, and gave them a few minutes to decide with their partner what they would like to answer. After they decided, they moved to the side of the classroom that corresponded with the page they

wanted to move onto next. Over one week, I only read about the first ten pages. If some of my students chose the “wrong” answer/page, I read that first, and asked them to explain why they chose that answer. Then, I explained how they should’ve arrived at the correct answer and continued reading from that page. Even though the students that got the incorrect answer arrived to an ending of the story, I had them jump in with the other students and continued having them participate with us.

To finish out the rest of the story, I had my students do this as part of our small group time. I had my small group with me, and half of the rest of the class was doing iReady lessons while the other half worked in pairs to keep reading the story. I had them read it out loud, so that they were also practicing reading fluency skills, and their comprehension skills. This took around two weeks for the students to complete the story. Each day, I had them be with the same partners; I had students with a set partner, so that they were with someone they could work together with well. Each partner was also at a different reading level, so that one could help the other if needed. During these two weeks, when my small group was working on a problem independently, I checked in with the group reading the story to see if they were staying on task or if they needed help with understanding how to read it.

Finally, at the end of these three weeks, I compiled my students’ answer sheets together, and I looked at the work my students did. I saw what problems we needed to look over once more, and I went over these during our math whole group instruction time. In addition to how the students did the problems, I also asked for their opinion of the problems, and their opinion about the book in general. Overall, I wanted to know if they thought the book was interesting, and if they would read a book like this again. I also wanted to know what things I could improve in the book if they could think of anything, and if they felt like the math problems were too easy or too

hard to understand in the context of the story. When I got the students' opinions, I did this as a class discussion, and wrote down what they thought on the whiteboard. Then, if I had them rate the difficulty level on a scale of one to five, five being the hardest. In addition, I had them rate how much they liked the book on a scale of one to five, with five being that they really liked it, and one being they did not like it at all. I had them do this on a piece of paper so that it was anonymous.

With the data and feedback from my students, I started to improve my story by fixing the math or making it more engaging if they thought it was boring to read. Any problem that they brought to my attention was fixed, and I polished my story so that I had a final copy that I felt was ready. Once I edited what I needed to, I planned to submit this story to a publisher. I had already researched and chosen a publisher that I would like to submit this too: Olympia Publishers. In addition, I had already written the proposal and summary that they require when submitting a manuscript. Overall, I hoped that my story helped my students practice their math skills and that it made our math instruction time more fun and engaging.

Chapter 4: The Project

Journey Around the World with Math

A Choose Your Adventure Story
By Kayla Fleshman



Money Problems



You walk through a meadow, feeling the soft, green grass beneath your feet. The dew from the early morning fog is wet on your skin. When you look up, you see the bright sun shining down. It feels like a perfect day. Around you, dark green fir trees line the outer edge of the meadow. You can't remember how you got here, but you have the feeling that you're supposed to be here, that this is the right place. Trying to wrack your brain, it feels almost painful trying to reach for any memories. Nothing surfaces, and you decide to look around.

Daisies are scattered everywhere, sprouting up stubbornly in the grass and patches of other multi-colored wildflowers. You listen, and hear birds tweeting sweetly, their songs filling the silence.

Is there anyone else around? Where am I? You think to yourself.

Suddenly, three horses dash into the meadow, their hooves pounding loudly on the ground and their riders pulling back on the reins. One horse rears high in the air, and your heart stops as their legs land just to the right of you. You fall backwards, shielding your face.

"Get up!" The first rider calls out. "You are trespassing on the King's land. Pay us 100 gold coins or you must come with us to appear before the king."

Looking down, you realize that you have a leather satchel slung over your shoulder. Quickly, you reach in hoping to find the money required. You take out a small coin purse, and dump the contents onto the ground. There are many different types of coins, and worry courses through you as you try to understand this foreign type of money.

"Hurry it up!" One rider says forcefully, his voice thick with an accent you have never heard before.

Among the coins, you notice that the gold ones have a picture of a man dressed in battle armor. The other ones are silver, and have on them what you assume to be a queen, as the woman minted on the coin wears a crown. You set aside the silver ones, knowing that you will not need these. Now you just need to figure out which gold coins to give the men.

You have ten small ones, that are worth 1. The medium sized ones are worth 5, and you have ten of these as well. Finally, the biggest ones are worth 10, and you have five of these.

If you think you have enough gold coins to at least equal 100 to give to the men, [turn to page 5.](#)

If you think you do not have enough to give the men, [turn to page 3.](#)

Back to Real-Life



“What did you get for problem number four?” You blink, and look around. You are in a classroom, your teacher staring expectantly at you. “Look down at your book, at problem number four.”

The Math textbook is old but sturdy, the pages dog-eared. All the other kids in your class are staring at you, and your friend leans over to whisper, “You fell asleep. The answer is 22.” You feel groggy, but don’t remember falling asleep. You do remember the men on horses asking for money, and everything that happened after that. It seemed like such a vivid dream, like it was really happening. Was it really not real?

“Twenty-two,” you reply, and the teacher smiles, compliments you knowing the answer, and continues to talk.

Math class drags on, until finally you hear the shrill ring of the bell. Everyone floods the hallways, chatting excitedly. You move to your next class, Social Studies, and know that it won’t be as enjoyable as actually *being* in another place.

Something just feels wrong about where you are. What if you are actually still dreaming? Could this be a dream inside a dream? You shake your head, and take a seat at the same desk you’ve sat in since the beginning of the school year.

However, rather than your regular history teacher, you have a sub. They look very familiar, like someone you have recently met. It is a young woman, and she introduces herself as Ms. Salazar. She has long, shiny black hair, and as she tells everyone that you will be learning about ancient Rome, you feel a sense of *deja vu*.

She shows everyone a few pictures of places in Rome that she has visited, including the Sistine Chapel, the Coliseum, and other famous landmarks. The one of her standing in front of the Coliseum was taken on a sunny day, her smile as bright as the sun shining on the white rock walls.

An image of you standing outside in that very spot, with a camera held up to your face flashes through your mind. Similarly to the picture, you remember the sun reflecting through the lense, and worrying that the picture wouldn’t turn out. You push the image aside, go about your day, and know that you will forever wonder about what actually happened that day.

The story ends here. Go back to [page 1](#) and try again. Choose a different journey to reach a better ending!

The King and His Knights



One of the riders, who is a tall, burly man, grabs you forcefully by the elbow. “You’re coming with us to see the King,” he says, and proceeds to bind your hands. He then attaches that rope to the hook on his saddle. He kicks the horse once, and as it starts walking, you realize that you will be dragged along with it.

The other two riders follow closely behind you, ensuring that you don’t try to get away. The horse tugs you with it, and you run to keep up. Feeling sweat drip down your forehead already, you feel relieved when you come to a stop and see a dirt road with many horses and people. No one glances toward you and the men. You assume that because these men seem like bounty hunters, no one would want to mess with them.

What will happen when you go before the King? You worry. Will he throw you in jail, or be kind enough to allow you to give him whatever you have? Your stomach is knots as you jog behind the horse sullenly. Looming in the distance sits a majestic castle. Thick, green, foliage surrounds it, making it appear even more beautiful as the trees slowly sway in the wind.

At the wrought-iron castle gate, a guard lets your group through. The courtyard is huge, with cobblestones that the horses’ hooves click on as they walk. The rider of the horse you are attached to dismounts, and unties the rope from the hook. Your hands are still bound; the rope rubs your skin uncomfortably. Two heavy wooden doors open to reveal a throne room with a shiny black and white marble floor. The King sits on his throne, having a conversation with several people that stand before him.

You are led down a long, red carpet, and shoved down to the ground just before the steps of the King’s throne. “Kneel before the King!” The man shouts who brought you in. You kneel, not daring to raise your eyes to meet the King’s steele-like stare.

“Why did you bring this person here before me today?” Booms the King.

“They were caught trespassing on your land, and couldn’t pay the fine,” the man replies confidently. You dare to look up, and see the King looking thoughtful. Hope flashes through you, and you wonder what he will say.

“If you can help me solve this problem, I will let you go free. If you cannot, you will be put in the dungeon and dealt with later,” the King replies, and you nod, showing that you understand. Your heart leaps with fear. If you can’t help him you will have to sit in a dungeon for the foreseeable future.

He gestures around him, and says, “I have two farmers here who cannot agree on the amount of land that they each deserve. The total amount of land that they are trying to split in

half is 146 acres. One says that each should receive 73 acres each, and one says that they should receive 80 acres each. Which farmer is correct?"

You take a deep breath to try and calm yourself. Willing yourself to speak, you ask, "Do you have something I can write with?"

An advisor steps forward, handing you a piece of parchment paper and an ink pen. You start to work out the Math problem, and hope that you get the right answer.

If you think that 73 acres is the answer, [turn to page 7.](#)

If you think that 80 acres is the answer, [turn to page 2.](#)

Bread for Answers



One of the riders quickly gets off of his horse, and takes the money angrily from your hand. “Get out of this area, or you will owe us 200 more gold coins, which by the looks of it, is something you don’t have.”

You nod, and stumble away. This once peaceful meadow seems scary and unfamiliar. *Where am I?* You think to yourself. As you run out of the meadow, you see a dirt road with carriages and horses. Dust splashes up into the air as horses fly down the road at high speeds. Coughing, you can taste the grittiness of the dust in your mouth.

There is a market across the street, with vendors calling out loudly what they are selling. Your stomach grumbles, reminding you with a hungry pang that you haven’t eaten anything in a long time. How long you do not know; you still cannot remember exactly how you got to this place. You look both ways before darting across the dirt road, and see a group of kids gathered around one small booth.

They are begging the vendor for bread, which has just been baked and is sitting out to cool on a wooden shelf. The smell from the fresh bread wafts through the air, making your stomach grumble yet again. There are seven kids that you count; none of them seem to have any money to buy the loaves of bread. They are skinny, their faces hollow and skin sagging; they have not eaten for possibly many days. The vendor is a tall man, who stares down at the kids with disgust. You know immediately that you want to purchase the bread so that the kids can have something to eat.

Before you can jump in to buy the bread, you feel a light tap on your shoulder. You flip around to see one of the children from the group, who has scraggly blonde hair that looks like it hasn’t been brushed for a long time. They are almost as tall as you, but probably a few years younger. “If you buy us this bread, I can answer all your questions. I know who you are, and why you’re here.”

Curiosity and the need to know what is going on surges through you like a tidal wave. The baker has four loaves of bread, and if you include yourself, you need to divide up the bread equally between the eight of you. Would four loaves of bread be enough?

“How much for each loaf?” You ask the man. He looks at you as if he knows you are out of place, and not from this world.

“I’ll give you all four for one 10 piece,” he replies. You know you have enough, but still aren’t sure if that is enough bread for everyone to share. Is it possible to divide four loaves up equally between eight people?

If you think you can divide up 4 loaves of bread equally, turn to [page 6](#).

If you think you cannot divide up 4 loaves of bread equally, turn to [page 2](#).



You quickly give the man the money for the four loaves of bread, and are able to split each loaf in half so that everyone has the same amount. The kids eat it happily, and thank you with bright smiles. The bread is delicious, with a savory buttery taste that makes you grateful that for some reason you had money in your pocket. Satisfied, you turn to the kid that said they had answers for you.

“What can you tell me?” You ask quietly. The kid finishes chewing the bread before replying.

“We must not talk here. Someone is always listening.” They glance around, and then pull you towards an alleyway in between two shops. “You are from another time, and the only way that you can return home is by finding the three red rubies. Once you find these, you must take them to the author, the one who created this world. Be careful; there are those that do not want you to find these and make it back home.” They say this with a grave voice, and you understand how serious this is.

“Why am I here? How did I get here?” You ask, still feeling unsure if this could be real.

“That I do not know. All I know is that I must take you to the door that will lead you to one of the first rubies. Come with me.” At the end of the alleyway, there are two doors. One is an old, rickety wooden door, and one is painted a bright blue color. The kid stops you just before them, and tells you, “You must solve the puzzle, and choose one door.”

You look around, but do not see a puzzle on the ground, or anywhere else for that matter. However, you do notice two cobblestones labeled with two different numbers. You kneel down, brushing the dust away so that you can more clearly see. Above those two cobblestones, there is another one with an inscription that reads: *10 cobblestones line this alleyway on the sides, and 8 cobblestones make up the width. Solve for the total number of cobblestones, and your path will be revealed to you.*

You survey the alleyway, and know that your answer will be the one of the numbers on the two cobblestones. One says 80, and the other says 36.

The kid stands there watching you with wonder, and you know they won't be of any help. You could count all of the cobblestones in the alleyway to get the total, but you know that there has to be a shorter way to solve the problem. What could it be?

If you think that the answer is 80, turn to [page 10](#).

If you think that the answer is 36, turn to [page 9](#).

The Wrong Combination



As you turn it to the number 8, you don't hear a click, or anything happening. It must be the wrong pattern. It suddenly makes sense now! If you add 2 to 2, you get 4. So if you add 2 to 4, you would end up with 6.

You thought that the pattern was 2 multiplied by 2 is 4, so that must mean 4 multiplied by 2 would be the answer of 8. Sighing, you look over your shoulder for any sign that the man found you. You hear nothing, and see nothing, and continue on.

Turn to [page 13](#) to find out what happens when you turn to the number 6.

A Weird Encounter



You decide on the number, and head down to 12th street. It was easy enough to find, and surprisingly only a few blocks away since you were on 8th street. On the left, there is an elegant two-story building. She said it was the first on the left, and even though she said it should be a house, you wonder if she really meant an apartment. You head up the thick steps, and catch the door just as someone walks out.

When you go inside, you see a row of doors, and decide to try the first one on the left. A younger man opens it, and starts to talk in French. You try to explain in English that you are looking for the artist, but he does not understand. A woman comes up behind him.

“Hi there, my name is Ashley Salazar. I speak English. There is no one called the artist here,” she replies. “Maybe try a different apartment, or a different street?” She glances at the box in your hand. “Actually, would you like to come in for a cup of tea?”

It is suspicious that she is suddenly interested, and you want to be polite, but aren’t sure what to do. “No thank you,” you say, and turn around. You will just have to try another street.

Suddenly she grabs your arm, and yanks you into the room. “Not so fast,” she says, “You already have one ruby, but you chose wrong. Try again.” When she pushes you into the kitchen, you feel yourself falling into the darkness once more.

Turn back to [page 2](#).

At Home Again



You press down hard on the cobblestone labeled with the number 36. It reveals a small metal key for either the blue door, or the old wooden one.

The blue door looks more promising, so you attempt to put the key in the lock. It will not turn, and can barely fit. This must mean it is meant for the old wooden door. Taking a deep breath, you unlock the door, hearing a click as the lock unlatches.

Your heart beats fast as you turn toward the kid, thank them, and give them a wave goodbye. You slowly open the door, and see nothing on the other side but darkness. One step more, you will be plunged into the unknown. Figuring you have nothing to lose, you step forward, and the door closes behind you.

You open your eyes, and see the white popcorn ceiling of your bedroom. Yawning, you sit up, and take in your surroundings. Your bedroom looks the same, and nothing seems to be out of place. It must be the weekend, because your clock says 9am and you are still sleeping. You frown, and try to remember the strangest dream that you were having.

Your hands still feel dry, as if they are caked with the dust you brushed away to read the numbers on the cobblestones. If you had chosen the other answer, what would have been on the other side of the door?

Thinking hard, you try to figure out what your mistake was. You rip a piece of paper out of your notebook that is sitting on your bedside table, and a pen. The crisp paper crunches as you write on it, drawing a rectangle that represents the alleyway. You label the sides with the number 10, and the width with the number 8. You got the answer 36 by adding together all the sides. However, you realize now that didn't get you the correct answer, and only gave you the outer edge of the alleyway. You needed to actually multiply 10 and 8 together, to get the total number of cobblestones on the inside of the alleyway, or, the area.

You smack your forehead and sigh, wondering what was on the other side of that door.

The story ends here, go back to [page 1](#) to try a different path!

A Place by the Mediterranean



As you kneel down on the ground, you feel the hard, brown cobblestones digging into your knees. Confident that you finally have the right answer, you press down hard on the cobblestone labeled with the number 80. That has to be the total number of cobblestones, since you multiplied 10 and 8 together to find the total area.

The cobblestone pops up, and reveals a gold key with a circular end and ornate swirls. You walk towards the blue door, and insert the key. It unlocks swiftly, and you give the key back to the kid so they can put it back under the cobblestone. "I wish you luck," they say, and you thank them before heading through the door. You cannot see anything until you are all the way through, and the door closes behind you. The darkness surrounds you as you keep walking.

Suddenly, you feel yourself sink into the ground, and the darkness transforms into a new scene: Soft light brown sand, and the bluest ocean you have ever seen in your entire life. The waves lap onto the beach softly, and you feel relaxed. What a beautiful place, you think to yourself.

Behind you, there are white stucco buildings, with blue roofs that almost match the color of the ocean. An older lady walks over, her sleek, jet-black hair pulled back into a high ponytail braid. "Welcome to Greece. The ocean is beautiful, no?" You nod, wondering what she will have to say, or if she is just some random person. You still can't believe that this is real, and it feels like you are in a story, or a videogame. A little bit of worry creeps up, and you push it back down as you realize that you will just have to continue on so that you can get home. Might as well enjoy the journey and all the random places you seem to be going to.

"Can you tell me where I can find the rubies that I need to collect?" You ask boldly. The lady smiles brightly.

"Of course. In order to find the ruby that you seek, you must go up to that hill-" she points to the right- "and jump into the water. There is a cave you can swim into, and that is where you will find it." She then turns on her heel, and continues to walk down the beach towards the hill.

"Why can't I just swim to it from here?" You ask. It doesn't seem like too far of a swim; it would definitely be easier than climbing up a hill and jumping off the side of a cliff.

"If you choose to do that, there is an invisible wall that will not allow you past a certain point. Going up the hill and jumping off the side is the best way to get around that wall," she replies matter-of-factly. Shrugging, you follow her off the beach, and start to climb up the concrete stairs. It seems as though the entire city is built into the side of a few different hills.

She leads you past people's houses, and past the center of town. There is a market, a very old church, and a few random buildings. People are milling about; they stare at you as you continue to make your way through the town.

Out of the corner of your eye, you see a man stare at you with a hard look. You think back to what the kid said, and how there are people that don't want you to find the rubies. What if he is one of those people? You continue to throw looks over your shoulder, and see him start to follow you.

"We need to hurry up," you say urgently. The woman shakes her head.

"I can go no further. Hurry to the top, I will distract him." You thank her, and break out into a run. It takes you almost five minutes to finally reach the top of the hill. There is a slight breeze, which you are thankful for, as you are now sweating and exhausted from running up the hill. The water will be a welcome relief. You peek over the edge of the hill, take a few steps back, and take one last deep breath before running off the side.

You make a huge splash as you hit the surface, and feel the water enclose over you. It is surprisingly warm. You swim to the surface, and look around to make sure the man is not at the top of the hill looking for you. Under different circumstances, this would be a great place to swim. The waves propel you forward towards the cliffside, and you swim around to the left where you see the water flooding into a cave.

The water is colder in the cave because it is hidden away from the sun. You climb out onto the rocky part of the cave where the waves do not reach. Glancing around, you do not immediately see the small metal box on the ground until your foot bumps into it.

You pick it up, and wonder if it could possibly be this easy to find the ruby. Then you see a small paper slipped into a clear waterproof casing on top of the box. *Find the pattern to open the box* is the only thing written on it. You roll your eyes. You didn't realize you would have to be doing so much Math to get through this. Wishing you had your phone and the internet, you take a look at the number lock on the box. Two numbers are set already, and will not allow you to roll it to any other numbers. The third number is the only thing you have to find, and it is only 1 through 9. The first two numbers are 2, and 4. You think about patterns, and counting up from 2. Would the next number be 6, or 8?

If you want to try the number 6, turn to [page 13](#).

If you want to try the number 8, turn to [page 7](#).

The Coliseum



You decide to choose the answer 12, and wonder if that is correct. What will happen if it's not? The woman who spoke for everyone tells someone to get Myra, and they bring out a huge orange and black striped tiger. Your heart practically stops. She sees you glancing at her, and says, "Just in case you try to get any ideas."

Another person comes up, and ties your arms behind your back. You get the feeling that even if this tree does somehow reveal the third ruby, you aren't going to be able to take it to the author yourself. You decide to find out more. "What's your name?"

She gives you a cutting look. "Not that it is your business, but Ashley Salazar. I have been looking for the rubies for quite some time. I didn't know I needed you to fill in the last piece of the puzzle. If we find them, you and I will both take the rubies to the author. I might need you again." Her face has disdain written all over it. You feel disposable, and know that if you were of no use to her, she wouldn't have helped you get through the jungle at all. The group leads you to a tree with the number 12 carved into the side, deep into the wood. Two ruby-shaped holes are to the right of the number, and Ashley pops open your box. She places each ruby, and they slide smoothly in.

The tree starts to shake, until it splits slightly, revealing a small gap in the tree. There sits the third ruby, shining brightly. Ashley grabs it, just as the tree sinks quickly into the ground, before disappearing. The dirt then begins to fall away, and you suddenly see stairs leading down into the dark, cold, ground. "This is where we go on without the others," she says, and grabs your elbow. You yank yourself away.

"No. Untie me, or I am not going with you," you say, and surprise even yourself with how firm you are. She shrugs.

"Fine. But don't think you're going to get away easily." You nod as someone else quickly unties the rope. You both walk slowly down the stairs, and you have a feeling that they actually lead to another place. That seems to be a common theme in this "story" or "game" or whatever this is.

The darkness slowly peels away, and you and Ashley are standing in front of the coliseum, in Rome. It seems to be late afternoon, since the sunlight is soft, and somehow dimmer. What are you doing here? Is this where you can find the author? Ashley seems to know what to do, and pulls a camera out of her bag, which is something you didn't realize she had. "Here, take a picture," she says, and shoves it into your hands. You aren't sure how this would help. When you put your eye to the lens, you see yet another math equation. Ashley knew she would need you. $4 \times 7 - 2$. Why so much Math? It is getting ridiculous. You read it loud, with your answer, and wonder what will happen next.

If you think the answer is 26, [turn to page 19](#). If you think the answer is 20, turn to [page 2](#).

The Eiffel Tower



You turn the combination lock to the number 6, and hear a slight click. The box pops open, and inside, you see a small, glittering red ruby. Suddenly, you hear a splash of water, and see the man from before climbing out of the water.

“Stop!” He yells. Adrenaline rushes through your veins as you dash toward the back of the cave, hoping that it goes deeper. It’s not the smartest thing to do, but you have no other options. Maybe there is another place to swim out. The cave gets darker, and you continue running hoping you don’t slam into a hard cave wall.

However, instead of seeing the darkness of the cave, all of a sudden you hear the honking horns of cars, and see the lights of a city. You are also aware that you are very high up, and you feel a strong breeze pushing against you. As you look up, you realize you are now somehow at the top of the Eiffel Tower. Paris! You think excitedly. It is a place that you have always wanted to visit, but knew that you wouldn’t be able to for a long time. The man who was chasing seems to have disappeared.

Relaxing, you take in the sights of Paris. Right now, the sun is going down, and late evening rays drench the city in orange and pink hues. Happy that you have one ruby, you wonder what your next move is. Should you wander into Paris, and see if anyone approaches you, just as they have the last few times? Although it is nighttime, you do not feel yourself getting tired and know that is a side effect of the game or story that you are in. Nothing is real, you remind yourself.

You are hungry once more and decide to descend the stairs and go to a cafe. There is a small one down the street, and as you enter the sweet smell of coffee wafts through the air. After ordering, you look for a place to sit. A younger woman waves you over, and taking a chance, you sit down in front of her.

“My name is Lana. I am your guide to Paris. I see you have one ruby,” she says, eyeing the box.

“Yeah, so where can I find the next one?” You ask, cutting straight to the chase.

“To know that, you’ll need to speak to the artist. He lives on the street that is no more than 20, and is a multiple of 2, 4, and 8. His apartment is the first on the left. If you find the street, you find him.” She gets up, says goodbye, and heads out of the cafe. So much for being a guide, you think to yourself.

After finishing your coffee and of course, a croissant, you exit the cafe as well. The riddle puzzles you, and you try to remember what a multiple is... You decide the number must be bigger than 2, 4, and 8.

If you think the number is 16, turn to [page 16](#).

If you think the number is 12, turn to [page 8](#).

The Park



The artist frowns. “That would be the color gray. Whatever, let’s go with it.” He continues painting. You tilt your head to the side. It begins to look like a park, with the leaves of the trees turned orange as if it is fall. The gray part that he just painted is actually a sidewalk that runs through the park. Something about the park feels familiar, but you cannot place it.

“What is this place?” You ask with wonder.

“It is your world. I am sorry, but this is the end of your journey here. You must go back.” You shake your head, not wanting to return. If you could just choose the other answer, and have him paint that part, you can continue on.

However, you see the artist, stand up. Without a word, and before you can say anything else, he shoves you towards the painting.

Somehow, you fall *through* it, and land with a thud on the very concrete you were just staring at.

You look around. Someone must have seen that! Nothing appears out of place, and you realize you are at the park near your house. You sigh, and pick yourself up off the ground. The box you had with the ruby has disappeared, and you question whether or not everything that just happened was really real. There is nothing left for you to do but go home.

The story ends here, go back to [page 1](#) to try a different path!

The Soccer Field



Ashley sighs, and you hope that the answer is actually one. She wraps her black hair around her fingers like twine nervously. When you say the answer out loud, you hear a whoosh and feel air rush past you. You then feel yourself falling, and scream as you are plunged into darkness.

You thud onto solid ground again. Birds are singing in the air around you, and Ashley is gone. Underneath you, green grass is wet with morning dew. You recognize where you are, and realize that you are at your school, sitting on the soccer field. A book is beside you, and you don't remember exactly how you got here.

After getting so far in the story, you feel like you should know how to get back "into" it. *I need to start over!* You think, and stand up. Nothing around you seems disturbed, and there are no people around. The book looks old and worn out, the pages dusty and yellowed. You flip back to the beginning, and decide to see if you can start over once more.

Go back to [page one](#) to start the adventure over!

The Artist



It takes you twenty minutes to walk to 16th street. It is lined with cherry-blossom trees, and just like the woman mentioned, right as you turn onto the street you see a huge house on the left. You are amazed to see many large houses; it seems as though Paris would only have apartment buildings considering it is a very big city. These houses are all very fancy, and it makes you wonder once more who this “artist” person is.

You go up the concrete steps of the first house on the left, and knock sharply on the door. Hopefully they answer. A man dressed in a black and white suit opens the door, who you assume is a butler. “The artist is expecting you, he is right this way.” You raise your eyebrows in surprise, but quickly step inside the house. Everything is elegant, with even the railing of the stairs painted with gold. The butler leads you to a room full of easels and other art supplies. A white sheet covers the floor to protect it from random paint splatters.

An older man, with white hair strewn about his face, greets you excitedly. “I have been waiting so long for you! How wonderful it is that you have found the first ruby. Now you can find the second! You just have to help me with something first.” He frowns, looking at the easel that he is currently painting. It is only a half finished painting, and so far, you cannot actually tell what it is supposed to be. You also notice that the container holding the paint has numbers above each little spot holding each color.

“What do you need help with?” You ask politely. The old man seems nice, and maybe a little scatter-brained.

“Well, I have been trying to finish this painting, but I cannot figure out the rest of it. I need help with knowing what two colors to paint next. I just have an equation, but cannot figure out the answer.”

Of course, more Math. Shrugging, you say, “I’ll try.” He hands you a small piece of paper that is slightly crumpled. One equation is easy: $50 + 50$ you know equals 100. The second one though, is $100 - 45$. That will be harder to figure out. “I know that the first one is 100.” You look at the paint holder. “Which seems to be the color blue. The other one though, I will need some time to figure out.” He thanks you fervently, and starts to paint blue where it needs to go. Oddly enough, he knows exactly where to paint it, even though he apparently doesn’t know what it is supposed to be. Must be why he’s the “artist”.

If you think the answer is 60, turn to [page 14](#).

If you think the answer is 55, turn to [page 17](#).

The Jungle



Since you chose the number 55, the paint color is green. As the artist quickly paints, you start to make out what it is actually a picture of. It looks like a scene from the Amazon rainforest. There are many green plants, and huge trees that seem to stretch on forever towards the bright blue sky.

"There we go! Look how beautiful this place is. In you go," the artist says, and you look at him like he is crazy.

"I can't fit through a painting! How am I supposed to go into it?" You take a few steps back, now unsure about this entire thing. The artist takes your elbow gently, and leads you towards the painting.

"Don't worry, everything will be fine," he says reassuringly. Without warning, he pushes you into the painting, and you feel yourself falling. You land on the luscious, green grass of the forest you just saw. You are still carrying the box, and when you pop it open, there are now two rubies inside. Apparently the artist slipped it inside after you got the correct answer. Now you have just one ruby left to find. How on earth are you supposed to find anything in this forest?

Am I supposed to just walk around and hope I see something or someone? What about all the animals? You don't know much about the rainforest, but you know that it can be very harsh, and not easy to survive in. Hopefully you don't get lost wandering around. You decide to walk along, and after a few minutes of walking, you see a small village, with houses made out of wood. A small group of people come out to greet you, wearing clothes that make them look like explorers.

A woman, with dark black hair, greets you. She has an accent, and she tells you that she is an explorer from Italy. The rest of the team tells you that they have been out here, searching for the last red ruby for a few years. So far, they have found nothing. "You are the key to everything," she says. She shows you a few artifacts that they have found, including a small tablet from an indigenous tribe hundreds of years ago. You look at the tablet, and see a language you do not know inscribed there. Suddenly, the words seem to shake, and then rearrange to show a message you can read: *Go to the place that is $5 \times 2 + 6$.*

The group is waiting expectantly for you to tell them what it says, since they clearly cannot read it. You think about your answer. Do you add or multiply first?

If you think the answer is 16 turn to [page 12](#).

If you think the answer is 40 turn to [page 18](#).

Making a Getaway



You tell the group that the answer is 40, and they all leap with excitement. They high-five each other. Before you can ask what the answer will do for them, or where this place is, the woman who spoke for everyone earlier says, “Just to be safe, you’re going to hand over the box with the other rubies. You can’t give the author only two,” she says. Sighing, you know that handing over the box is the only option you have.

The air around you suddenly feels constricting; it is humid and it makes your lungs feel like you are breathing in water. How will you get home if you don’t find the author and give them all the rubies? You hand it over hesitantly.

One of the other people leads a huge orange and black striped tiger out from behind a building. It is on a leash, but it still looks scary and intimidating. Another person puts your hands behind your back, and drags you along with them. The lady with black hair says, “Just to make sure that you behave, just know that Myra will be coming with us to keep an eye on you.” She gestures toward the tiger, and you nod as you stare with fear into its fierce green eyes.

They walk you through the forest, and to a tree that is as wide as a car, and as tall as a building. On the side of the tree, it has the number 40 carved into the side. Two ruby-shaped holes are located next to the number 40, and the lady inserts each ruby. They slide in easily, and light up once placed. The tree starts to shake, and you aren’t sure what is supposed to happen next? Does it have the ruby inside it? It shouldn’t they try to cut it down?

Right before your eyes, the number 40 turns into these words: *Wrong answer, try again.* The group turns to you, and you know that you should have multiplied first. “We have been tricked! Release Myra!” They yell. Without thinking, you kick the person holding your arms behind your back, and they fall to the ground clutching their stomach. You take off running, and know that if you don’t run fast enough, the tiger will get you. Can you really outrun a tiger? Sweat pours down your face as you dash through the forest, running faster than you have ever run in your life.

As you are running, you feel like you are running through air. Wait! You are! You are suspended in the air before face planting on the ground. Gasping for breath, you look around. You are no longer in the rainforest being chased by a tiger, you are at home in your backyard and your pet cat stares at you. No one is around and you laugh as you lay back down in the soft grass. Thank goodness you didn’t get eaten by a tiger. Happy to be alive, you are grateful you are somehow back home, even if you don’t know how.

The story ends here, go back to [page 1](#) to try a different path!

The Author



As soon as you say the answer out loud, the camera flashes without you pressing the button. Still looking through the lens, you see behind Ashley a golden pathway leading towards the inside of the coliseum. Ashley doesn't seem to see it, and you wonder if you should say anything. A few people are milling about, looking around, and none of them seem to see the golden path either.

You move forward and start to follow it. It lines the worn down cobblestones like butter, spread smoothly. Ashley calls to you, and you remember that you don't have the rubies, she does. "Let's go, I think the author is this way," you shout over to her, and break into a jog. The pathway leads straight into the center of the coliseum. It reminds you strangely of a baseball field without any grass; the dirt is pushed evenly everywhere, and you can imagine thousands of people gathering here to sit in the stands. The dirt is soft, but has no footprints anywhere around. *If I'm not supposed to walk out here, oh well*, you think.

A piece of parchment lays on the ground, old and crinkled. It's dry on your fingertips as you open it, and read the words inscribed. Ashley just arrived beside you, and she looks over your shoulder. "What's it say?" She asks.

"It says: *One final problem before I reveal myself to you. It took me 2.5 years to write this story. 1.5 years to build. How many years did it take me? Solve this to truly show your worth.*"

Another Math problem? You just want to go home. Ashley starts to draw in the dirt with her finger, solving the problem. You have come this far, what will happen if you get it wrong?

If you think the answer is 4 years, go forward to [page 20](#).

If you think the answer is 1, go back to [page 15](#).

Rubies for a Way Home



Ashley and you have agreed that the answer is 4, because you added both of the numbers together to get the total number of years that the author spent. How did they make it so people could enter the story physically? Or is this some type of video game, and this is the last level?

You hear clapping, and whirl around. "Very good. I have been watching the both of you, and I am surprised that Ashley finally figured out she needed you. Hand over the rubies, and you both will get to go home." The person talking is a man, with gray specks in his hair, who looks as though he is in his early to late forties. Ashley looks hesitantly at the person you assume is the author. What if it is not the author though?

"Come on Ashley, just give him the rubies," you say. She hands over the box to the man, and he smiles.

"I knew you both could do it! I hope you have enjoyed this adventure. Time for you both to leave though, so other readers can experience this. Tell your friends!"

You feel as though he is advertising, and think that it's a little silly that he would think you knew how to get people "into" the story. How did you even get here?

Before you can say anything else, he snaps his fingers. You blink, and feel like you are moving at 100 miles per hour. It makes you feel slightly nauseous.

When you open your eyes, you are sitting on a blanket in your frontyard. A book is open on your lap, and you remember deciding to read outside because of how nice it was. The sun shines down on you warmly. Could you really have been "inside" the story you were just reading. The page you are on has exactly what just happened with the author written down.

Even though you had no idea what was happening, it certainly was an adventure. Now you can go through life, writing the next parts of your story.

Chapter 5: Reflection

After completing my project, there are many things that I learned, and that I can reflect on to better improve my practice and the story that I wrote. The specific theory this project was connected to was the idea that literature and math can be integrated, and when effective, that this will benefit students, as well as reduce math anxiety. While creating this story was meant to engage my students in math, it was also meant to formulate how children's literature can be used to teach math. In doing this project, I believe that I grew professionally, and related my work to the M.S. Ed learning outcome and goal of demonstrating professional growth, dispositions, and leadership appropriate to my field in education. I attempted to incorporate and create a new form of children's literature into my mathematics instruction time. In addition, I also met the learning outcomes that my school has adopted for this year; my students were able to be involved in their education by giving their feedback and opinions on this story, and clear success criteria was given to the students before this project was implemented. They knew the learning goals and the purpose of this project, and were asked to think about how this project affected their learning personally.

During the first part of the implementation, I decided to read the first ten pages of the story with my students as a whole class. Before reading, I went over key vocabulary and places that the students would see in the first ten pages. This poster of vocabulary was hung up in my classroom, at the front whiteboard, where every student could see it. When I felt my students had a good understanding of the vocabulary, I paired each student up, and gave each pair an answer sheet. I had them stand in the middle of the classroom, in a line, so that they could move to either end of the classroom when they decided what page to move to next.

During this time, a few things that I noticed were: even though I gave the students time to solve the problem, some students just followed everybody else, and answered what everyone else answered; some students decided to guess and did not try the problems; and it was difficult for some students to understand and identify the specific thing they needed to solve to get an answer. As I started noticing that students needed more help understanding the context of the math problems and identifying what was important in the problems, I decided to take it slower, and really point out the parts that they should be paying attention to. In addition, I also did a few problems with the students, so that they could have an example and work with me through a problem. When some students chose the wrong answer, I would read that page so that they could see that it led to an ending, and then I would ask one or two students what they think they may have done wrong when trying to solve the problem. This helped the students to examine their answer sheets and think about how they may have misinterpreted things. Then, I explained the problem to the entire class, so they could see how to solve it and what the answer is.

After a week of reading the story as a whole group, I started to implement it into my small group time during math instruction. During this section, I had about five students with me, for our normal small group time. The rest of the class was divided in half: half were doing their iReady lessons, and half were reading the story. When the students read the story on their own, I let them do it with a partner, or as a small group. At first, I wanted the students to do it on their own, but after the first day, I noticed that some students were not able to read it on their own, or able to solve the problems on their own. So, I changed it so that students could work in partners or small groups depending on what they preferred. These students are grouped purposefully so that there is a wide range of levels in each group; that way some students may be able to lead the

other students as they read. This change really helped my students stay on task, and helped them get through the rest of the story.

For this project, my main goal was to improve my math instruction, improve my students' skills in math and reading, and to reduce math anxiety. I wanted to engage and interest my students more in math, as they tend to get very bored or burnt out when completing their iReady lessons constantly. In Chapter 2, I discussed a variety of literature that supported integrating mathematics and reading, and how this can better engage students in both subjects and increase their achievement (Bailey, et al., 2020). I wanted my math instruction to be more engaging and more fun for students, as math engagement decreases as students get older (Fadda, et al., 2020). Since many of my students have math anxiety, I wanted to create a fun way for them to practice their math skills that did not seem like they were doing math. As suggested in many studies from Chapter 2, literature can have a positive effect on students' math anxiety (Furner, 2018); I saw this as I was implementing my project. Although many of my students may not have been able to do certain problems because they are not at that math level yet, this story seemed to engage them and they seemed to have fun reading it. They liked the idea that the story was like a game, and in order to reach the end, they had to make it through each "level". Although my story was not designed as having levels, I loved that they thought of each part like this. In the future, I may consider changing the title of each part to be called a "level", so that it incorporates what students often love: video games.

When I had my students give me feedback, many of them were able to give great feedback that I can use to improve my story. Out of 23 students, I had around three students who rated the difficulty level of the math in the story as very easy. This makes sense however, because they are my students who are almost in sixth grade math, or are already doing lessons at

that level. Fifteen of my students put exactly in the middle of the scale, showing me that the math was not too hard, or not too easy. These students are anywhere from high second grade math, to fourth grade. Finally, I had five students who said that the math was too hard, and that they could not do the problems, even with a partner. There were around five of these students, and they are the ones who are at a Kindergarten to lower second grade level in math. Although these statistics did not surprise me, it led me to believe that some changes would need to be made to my story in the future. I would love to write in a few different levels to my story, so that it benefits and supports a wide range of students. In addition to having the students rate the difficulty, I also had them rate how much they liked the book. If they chose the number five, that meant that they really loved the book. Three is in the middle of the road, and shows that they thought it was alright, but it wasn't something they thought was amazing. One is the lowest they could score, which meant that they did not like the book at all. When the students rated this, out of 23 students there were three that said that they did not like the book at all. Four scored it as a three, and thought that it was alright. Finally, sixteen students rated it as a five. Although many of the students loved it, I wanted to know more about what I could do to make it more interesting. So, the students were also able to write their opinion, and give me their feedback on the book. For this portion, many of my students said that they thought the book was interesting, but they wanted easier problems so that they could complete the story on their own. Some students said that they thought the book was not interesting, and it would make it more interesting if the "endings" were different when you choose the wrong choice. For example, one of the boys in my class said that it would be better if the endings were scarier, where they don't just return home. They said that would help them want to continue reading. One idea that I would like to

implement in the future is possibly having my students rewrite my story with different endings, as a creative writing assignment that also integrates math.

When I received feedback from my students, I wanted to use this to improve my story. One of the things that I would like to do in the future is to have another version written, that has easier problems; I could also make a harder version, so that my students who were bored with these problems have more of a challenge. If I am able to have several versions for my students to read, then I think that would help them with being able to complete the problems and still have a productive learning experience. In addition, another thing I would like to do is make a recording of me reading the book, so that my readers that need someone to read to them can still actively participate in this activity. Many of my students need this support, so I think that this would help a lot if it was in an “audio-book” format. Another way that I would also like to improve my book is by making it bilingual. The reason I would like to do this is because I think it would help my EL students connect with the content and the book more easily. In the future, I may change the story so that maybe every other “chapter” is in Spanish, or I could blend in Spanish words throughout the story itself. I like the idea of blending in Spanish words and phrases, because this can really help my bilingual students strengthen their vocabulary in English and Spanish for math. One way that I also improved my story after I implemented it, is that I made it more accessible for my students that may need the story read out loud or as an ebook. I hyperlinked each page number, so that if they were reading it online, they can just click the page number and it will take it to the next page they are supposed to turn to. This also helps so that if the story is being read to the student by the computer, they can easily click to the next page.

As far as implementing the story into my classroom, I think that I would like to change how I did this. One thing I would like to do differently is giving my students not only an answer

sheet, but maybe also a guide/written down directions or pictures that show the students what to do when they are doing it during their small group time. I would like to do this because some of my students had a harder time remembering what they needed to do even though we did it as a whole class. In addition, I think that when I implement it as a whole class, I would like to make it more like a game. For example, although I had the students in teams and had it be interactive where they had to make decisions by walking to one side of the classroom or the other, I want to make it more like a videogame. I could decorate my room, to make it themed to this story, including having a part of the room look like where they are going to be traveling to. Furthermore, rather than having a poster at the very beginning for every vocabulary word, I could explain each place and time period and the vocabulary associated with it, when they travel there. One other thing that I also wished I did with this project was implementing it over a longer period of time. It would have been very helpful to see the actual effect of implementing children's literature into math, and if this truly had any effect on their achievement. As this was not a research project, I had the students give me feedback, but did not collect hard data on the effectiveness of using this story. This would be one thing I would change, and would encourage other educators to research to see if children's literature can affect their own students' results.

Finally, this project overall was fun to complete, and made my math instruction time a little bit more engaging. It was great to see my students so interested in doing math, and I think that it was perfect for my students. The goals that I had formulated for the project were met, and I think that I would continue to incorporate this story into my math instruction time in the future. This project demonstrated that children's literature can be integrated into math instruction, and I want to encourage my colleagues and other educators to use it when they teach math.

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