The Effect of Math Navigator on Sixth Grade Students' State Test Scores

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A Special Project

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The Effect of Math Navigator on Sixth

Grade Students' State Test Scores

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ABSTRACT

The researcher conducted the Special Project to determine if *Math Navigator* was an effective intervention curriculum to use with sixth grade students, including English Language Learners (ELLs). The researcher used data taken from the annual math Measurements of Student Progress (MSP) assessment. The project was conducted using MSP scores from spring 2010 and spring 2011. During the 2010-11 school year, students who were identified as Tier II were instructed using *Math Navigator* for 30 additional minutes each day, outside of their core math curriculum. As a result of the analysis of data, the researcher found that *Navigator* helped support sixth grade students in achieving standard on the MSP, and there was a significant difference in ELL test scores as a result of using the curriculum (significance was found at $p \geq .20$).

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TABLE OF CONTENTS

Page

Page

Page

LIST OF TABLES

CHAPTER 1

Introduction

Background for the Project

According to the Office of Superintendent of Public Instruction (OSPI), mathematics was one of humanity's greatest achievements. In the twenty-first century, the field of mathematics continued to grow rapidly, creating new technologies and jobs. Due to the importance of mathematics in the United States' society, students required an education that went beyond what was needed in the past to maximize their opportunities in the future ("Mathematics," 2012).

Students needed the best math curriculum available because mathematics was part of the core curriculum taught in schools. The study was conducted to determine if a quality math intervention curriculum was taught at Panther Lake Elementary in sixth grade classrooms. Multiple math curriculums were used around the state of Washington, and the United States, and it was important to determine the effects of *Math Navigator* on sixth grade students' state test results.

As sixth grade students moved out of elementary school and into middle school and high school, the requirements on their knowledge of mathematics continued to increase and the mathematics became more difficult. When students exited high school, looking for jobs in multiple areas, their knowledge of mathematics was needed in a variety of ways. Mathematics was an important element to surviving in everyday society.

Statement of the Problem

Sixth grade students at Panther Lake Elementary were not meeting Adequate Yearly Progress (AYP) in mathematics, according to Washington's annual Measurements of Student Progress (MSP) assessment. Likewise, English Language Learners (ELLs) were also not meeting AYP on the annual state test. Thus, students were not making sufficient growth in mathematics every year, in order to help them succeed in the future. As a result of not meeting AYP in math, there was a need for teaching a math intervention curriculum, involving tiered instruction that met the needs of all students who were at different levels in mathematics.

Purpose of the Project

The researcher conducted the project in order to determine if *Math Navigator* was an effective intervention curriculum to use with sixth grade students, as well as with ELL students. The data collected by the researcher provided information to determine if the curriculum helped students succeed on the math MSP.

Delimitations

The Special Project was conducted during the 2009-10 and 2010-11 school years. It included sixth grade students who attended Panther Lake Elementary, and who had taken the math MSP during the spring of 2010 and the spring of 2011. English Language Learners, as well as native English speakers, were part of the study.

The researcher was a teacher at Panther Lake Elementary, which was located in Kent, Washington. Panther Lake Elementary was one of 28 elementary schools in the Kent School District. Each elementary school was given *Math Navigator* as a math intervention curriculum and it was used in grades three through six; however, the researcher focused on sixth grade students only.

The math intervention curriculum used during the project was *Math Navigator*. The materials that were used included: consumable workbooks, teacher manuals (one per module), skill cards, pre- and post-tests from the curriculum, the *Assessment and Reporting Online System* (ARO) website, SMART Notebook software, and the math MSP.

Assumptions

During the project, it was assumed that if a student's fifth grade teacher passed them onto the next grade, they were ready for sixth grade. It was assumed that the sixth grade students from the 2010-11 school year were similar (in regards to maturity, skill level, etc.) to the sixth grade students from the 2009-10 school year as well. It was also assumed that based on the researcher's *Math Navigator* training done with the Kent School District, the researcher was ready to teach the curriculum to sixth grade students. Finally, it was assumed that *Math*

Navigator was an appropriate curriculum to use as an intervention with the age level of the students who were included in the study.

Hypothesis

Sixth grade students, including English Language Learners (ELLs), who were identified as below grade level in math, were instructed using a targeted math intervention curriculum, which resulted in increased scores on the math MSP. This occurred because they were receiving additional instruction that specifically met their needs.

Null Hypothesis

Sixth grade students, including ELLs, who were identified as below grade level in math, were instructed using a targeted math intervention curriculum, which resulted in no significant change to scores on the math MSP. Significance was determined for $p \geq .05, .01, .001$.

Significance of the Project

Positive results of the study meant that Panther Lake Elementary continued to use *Math Navigator* as an appropriate math intervention curriculum to help students, and ELL students, succeed on the annual math MSP. More materials were bought, and additional sixth grade students received instruction using the curriculum, in order to close the gap between Tier I and Tier II students.

Negative results of the study meant that Panther Lake Elementary re-assessed their use of *Math Navigator* and how it was taught to sixth grade students, including ELLs. Discussions occurred, observations were made, and meetings were held to determine if *Math Navigator* would continue to be used as a Tier II math curriculum. Alterations were made to how *Math Navigator* was taught, if the staff/district decided to continue to use it as an intervention.

<u>Procedure</u>

In September 2010, students were placed into three Tiers of Intervention based on their math MSP scores from the previous spring. Students placed in Tier III (who were two or more years below grade level in math) were placed in a classroom that used the *Math Triumphs* curriculum. This curriculum was considered their core curriculum for the school year.

All remaining sixth grade students were given the National Screener VI test provided by the *Math Navigator* curriculum, in order to determine which modules should be taught, based on highest student need. During the 2010-2011 school year, the three modules that were taught by the researcher to Tier II students were Place Value: From Decimals to Billions, Understanding Fractions, and Understanding and Reading Word Problems (*Math Navigator Implementation*, 2009, p.7). The class lists for each module varied, depending on pre-test data, which was analyzed by the sixth grade teachers and the investigator. The investigator developed SMART Notebook slides to accompany each session in the modules, and taught the lessons for 30 minutes per day, twice a day.

Definition of Terms

close the gap. In education, there was an achievement gap between students of same and different ethnicities, and OSPI sought out to close that gap to ensure that all students made sufficient progress each year while in school. Students who were slightly below grade level (Tier II), or two or more years below grade level (Tier III), were instructed with the intention to close the gap and be at grade level as quickly as possible.

everyday society. Society included attending school, working at a job, possibly supporting a family, and conducting a variety of activities that people came across on a daily basis (i.e. building a fence in a backyard, determining the price of a shirt on sale, etc.). Math was important for children and adults to use in this everyday society.

Acronyms

ARO. *Assessment and Reporting Online System.*

AYP. Adequate Yearly Progress.

CPM. *College Preparatory Mathematics.*

EALRs. Essential Academic Learning Requirements.

ELL. English Language Learner.

GW-CEEE. George Washington University Center for Equality and Excellence in Education.

IASA. Improving America's Schools Act.

IDEA. Individuals with Disabilities Education Act.

IDEIA. Individuals with Disabilities Education Improvement Act.

MSP. Measurements of Student Progress.

NCLB. No Child Left Behind.

OSPI. Office of Superintendent of Public Instruction.

RTI. Response-to-Intervention.

SIOP. Sheltered Instruction Observation Protocol.

TI. Tiered Intervention.

ZPD. Zone of Proximal Development.

CHAPTER 2

Review of Selected Literature

Introduction

Sixth grade students, including ELLs, at Panther Lake Elementary were not meeting standard on the annual MSP assessment. The investigator conducted the project to determine if the *Math Navigator* curriculum, which was taught to Tier II students, was an effective curriculum and helped increase state test scores. Districts and schools around the country were using intervention strategies to help students succeed in class and on state assessments, and *Math Navigator* was one such intervention that could be used. The researcher chose to review Tiered Intervention (TI), the background and use of *Math Navigator* in other areas of the country, and specific strategies that were suggested to help ELLs succeed in the classroom.

Tiered Intervention in the Classroom

School districts around the United States saw large numbers of students fall behind grade level in a variety of subjects, including mathematics; and teachers noticed gaps in student learning that prohibited them from acquiring new knowledge. As a result, intervention strategies were needed to ensure that all students met their academic potential. Intervention, also known as TI or Response-to-Intervention (RTI), was implemented in a variety of ways throughout the country in order to help fill in those academic gaps (Berkas & Pattison, 2007).

The Individuals with Disabilities Education Improvement Act (IDEIA) of 2004 required that all students, both with and without disabilities, be provided with proactive, supplemental support as soon as a teacher detected a potential difficulty (Searle, 2010). Similarly, the No Child Left Behind (NCLB) Act of 2001 also stated that support needed to be provided as soon an issue was identified (Berkas & Pattison, 2007). The purpose of the RTI process was to help decrease misidentification of students for special education just because they were English Language Learners (ELLs), African American, or were from disadvantaged socioeconomic circumstances. Prior to the implementation of TI, a disproportionate number of these students were misidentified as disabled (Searle, 2010). Tiered Intervention was introduced to help provide a wider variety of general education options before the words special education were even broached.

The main idea behind using intervention strategies within the general education classroom was to intervene early, and help prevent academic failure by determining whether a student's underachievement was the result of an actual learning difficulty, or other factors that needed to be addressed (Azzam, 2007). Many students had the ability to excel in one area of mathematics, but needed support in another area, and the use of intervention tactics in the classroom could help provide students with strategies that would help them become independent and take responsibility for their own learning ("Intervention," 2011).

Searle (2010) stated it well, noting that RTI should be looked at as a three-legged stool: the first leg being the assessment process, the second leg consisting of a Tiered Intervention menu, and the third leg being a problem-solving process. Each leg of the stool needed to be in place for RTI to be stable and functional. The assessment process involved in RTI needed to provide teachers and students with specific data to help stay on target and make appropriate changes if needed. The assessment tools included universal screening (which helped point out areas of concern), diagnostic assessments (which identified root causes for gaps or misconceptions), and progress monitoring (which provided continuous feedback on if the intervention was working). The second leg typically consisted of a three-tiered pyramid that teachers used to identify where a child was in terms of needing further intervention. Tier I consisted of classroom instructional strategies that helped the majority of students be successful without further assistance or intervention. Tier II involved moderate intensity interventions that supplemented (but did not replace) Tier I instruction (Berkas & Pattison, 2008). These interventions were provided in small groups. Tier III used intense interventions provided in small groups, to also supplement Tier I instruction. The final leg of the RTI stool involved a team that prescribed, monitored, and adjusted intervention plans based on data. The team was in charge of helping teachers and families identify appropriate solutions using the tiered-pyramid.

The *Math Navigator* curriculum (which was the Tier II curriculum used at Panther Lake Elementary) fell under the category of being a protocol RTI model (Searle, 2010). The curriculum prescribed a specific intervention for all students who exhibited similar problems and fell below an established districtwide (or statewide) benchmark. All students were assessed on mathematical concepts connected to their grade level, and students who presented the same areas of difficulty were placed in a small *Math Navigator* group. This group of students was taught a 20-session module by the researcher. The researcher was trained and monitored for fidelity of implementation, to ensure that the intervention was used appropriately and accurately. Tiered Intervention consisted of monitoring student progress using ongoing data collection and assessment, which also occurred while the researcher taught the *Navigator* modules (through checkpoints, and pre- and post-tests) (Azzam, 2007).

"In the gradual journey toward mathematical understanding, students may experience difficulties that require intervention," (Berkas & Pattison, 2008). It was the responsibility of the teachers and schools to ensure that students were able to tackle those difficulties, and become mathematically talented students. Intervention strategies provided a guide to help make that goal possible. Tiered Intervention was introduced to support and fill in students' academic gaps, which ultimately helped students succeed as mathematicians.

Background of *Mathematics Navigator*

When compared to other countries in the twenty-first century, the United States had a deficit in mathematical knowledge. Ultimately, students were falling further and further behind in math, and it was critical for students to accelerate in order to keep pace with the rest of the world ("Math Navigator Research," 2009). As a result of this crisis, *Mathematics Navigator* was a program developed in collaboration with the Shell Centre in England to help support struggling students (*Math Navigator Implementation*, 2009). The curriculum was designed to help address the needs of students who were at grade level, but were having difficulty keeping up with the rest of the class.

The *Math Navigator* curriculum was an intervention program designed to target specific gaps and misconceptions that students needed to correct in order to be successful in math. The curriculum was a highly flexible, research-based program that could be used in elementary, middle, and early high schools ("Math Navigator Research," 2009). The philosophy of the curriculum was not to revisit or repeat initial teaching, but to focus on revising misconceptions or errors in students' mathematical thinking. The purpose was to target and identify misconceptions, build on prior knowledge, target specific math concepts, encourage problem solving, provide a language-rich environment, teach students to be better learners of mathematics, and offer instructional support (Phillips, 2008).

The term misconception meant a misapplication of a rule or procedure, an over or under generalization, and/or an alternative interpretation of a situation (Phillips, 2008). A common misconception that students had was that it was not possible to subtract a larger number from a smaller one. This rule seemed true, but ultimately, was incorrect (if the student thought of negative numbers). Misconceptions were caused in part due to the lack of meaningful discussions in the classroom, and *Navigator* developed an opportunity for students and teachers to hold meaningful discussions that corrected the students' misconceptions. Students who were identified as Tier II or Tier III commonly approached mathematics with a flawed or incomplete knowledge of the concepts, and were the most at risk of not meeting standard. The goal of the *Math Navigator* curriculum was to help repair the misconceptions of these tier-leveled students, and not just reteach the classroom math curriculum. "Research shows that students who are taught by repairing misconceptions retain their learning over time" ("Math Misconceptions," 2012).

The *Navigator* program was designed to work with any school math curriculum, and it was intended to enhance (not replace) the grade level curriculum. It had the ability to be used during school hours, in tutoring, after school, on the weekends, or in summer programs (*Math Navigator Implementation*, 2009). America's Choice developed 18 stand-alone modules, and each module had a logical progression of 20 sessions that were sequenced and consisted of careful, thought-out scaffolding ("Math Navigator Research," 2009). Each session was intended to take 30 to 45 minutes outside the regular math class. Modules were not designated by grade level, so any student who needed the support could be part of a module. Once a student demonstrated mastery of the targeted concepts, they exited the program.

One of *Math Navigator*'s main premises was to develop a language-rich environment. Building mathematical vocabulary in the classroom was very important, but often neglected. For ELLs, it was exceptionally important for students to build their academic language, and words needed to be learned and used in context. The *Navigator* curriculum provided teachers with support to use deliberate strategies for clarifying word meanings and provide opportunities for ELLs to use mathematical vocabulary. While using the *Navigator* curriculum, "students, including ELL students, are encouraged to make their learning visible to the larger group. When learning becomes visible to others, understanding will grow and ideas can be connected" ("Math Navigator Research," 2009). The curriculum also provided instructional support for teachers with ELLs in the classroom. Throughout the sessions, ELL Notes were listed to help guide a teacher's instruction. As an example, in the Place Value: From Decimals to Billions Instructor Edition (2006), it stated in session six, "Make sure your students know the terms 'estimate' and 'estimation.' Consider using a word wall or posters with pictures, symbols, and simple definitions that students can refer to daily." Instructor editions of each module provided multiple suggestions on how to support ELL math students.

The *Math Navigator* assessments included: screeners, which helped identify which modules were needed and which students needed the module; pre- and post-tests, which confirmed a students' need for a module and was the starting point from which progress was measured with the post-test; and progress monitoring and checkpoints. America's Choice worked with its assessment partners the Shell Centre in England and the Australian Council of Educational Research to develop their assessments, and all items were used in various psychometric studies to confirm their reliability and validity (*Math Navigator Implementation*, 2009).

A variety of schools and school districts were using *Math Navigator* as an intervention curriculum to help improve students' understanding of critical mathematical concepts. A Mississippi elementary school showed a 41 percent gain from pre- to post-test on two modules used with students. The modules were provided during summer school ("Math Navigator Results," 2012). Special Education students at an elementary school in Florida made significant gains, and one-third of the students passed the state test (while 75 percent exceeded expectations by making a year's growth of progress). Likewise, 100 percent of general education students at the same elementary school who were taught *Navigator* passed the state test. When teachers and students were interviewed about the program, positive results were found. A student at Tylertown Upper Elementary in Mississippi said, "I like math right now because somebody knows how to do it, and can teach me an easy way to do it" ("What People," 2012). Similarly, a teacher at Chets Creek Elementary in Florida noticed how excited students were after attending *Navigator* class, and that they were able to hold classroom conversations that were not possible six days earlier. Students' enthusiasm for mathematics increased in the regular classroom as a result of their attendance in the *Navigator* class.

The ultimate goal of *Math Navigator* was to help students succeed in mathematics; and it was a curriculum that could be implemented in different ways in different schools. It was up to each school to determine the best method that worked for their school, their schedule, and their students' needs.

Suggested Strategies to Support English Language Learners

American society was becoming increasingly diverse year after year, with at least ten percent of the population speaking a primary language other than English as of 2009 (Kyounghee & Hoover). The rapid growth in the ELL population had heightened awareness of issues for ELLs in states, districts, and schools. As a result of this growth, accommodations needed to be offered for ELLs in the teaching and assessment of math, science, and reading/language arts (Willner, Rivera, & Acosta, 2009). The use of language in mathematics was quite important, and teachers faced new challenges to ensure that mathematical language was explicitly taught, in order for all students to be successful. Mathematics could be described as having its own language, and "one might say that, for an ELL, the mathematics classroom is a domain in which three 'languages' intersect" (Cirillo, Bruna, & Herbel-Eisenmann, 2010) – the three languages were: a student's first language, English as a second language, and the mathematical language.

In 1994, the Improving America's Schools Act (IASA) required that all educators develop aligned standards and assessments that applied to all students, including ELLs. Likewise, the NCLB Act required that states include ELLs in content assessments. The original Individuals with Disabilities Act (IDEA) of 1975 required that accommodations be made to support students with disabilities, and it was extended to include assessment support for ELLs in the mid-1990s (Willner et al., 2009).

A variety of suggested strategies were developed and presented to teachers, to help them support ELL students in their classrooms. The first strategy suggested was to provide small group opportunities and chances for cooperative learning. Students needed to be given opportunities to talk and share in small groups, which could help create productive discussion. Allowing students to turn to a partner and answer a question before sharing out was considered an effective conversational technique because it provided ELLs (and all students) with an opportunity to participate and practice their language skills in a comfortable environment (Echevarria, Vogt, & Short, 2010). Grouping students heterogeneously also promoted language growth of students who were less proficient, and gave ELLs an opportunity to use and hear the English language more amongst their peers (Cirillo et al., 2010).

Another suggested strategy was to incorporate more visuals, realia, and mathematical manipulatives into teaching, and provide more hands-on experiences during math instruction. When appropriate, the use of pictures and drawings was recommended, and incorporating real objects (also known as realia) into teaching could help relate new vocabulary to tangible objects (Cirillo et al., 2010; Kyounghee & Hoover, 2009). Students needed opportunities to see and touch objects, while also hearing the new vocabulary words, so they could make connections and remember the vocabulary for the future. Teachers were encouraged to demonstrate and model new mathematical concepts for ELLs, and provide manipulatives (base-ten blocks, fake money, fractional equivalency cubes, etc.) so that students were not entirely dependent on the language alone.

The researcher's school read and reviewed the Sheltered Instruction Observation Protocol (SIOP) to help incorporate appropriate strategies that supported ELLs in the classroom. According to the SIOP model, there were eight main components included: lesson preparation, building background, comprehensible input, strategies, interaction, practice and application, lesson delivery, and review and assessment. Lesson preparation included the planning process done by the teacher, the development of language and content objectives, the use of supplementary materials (such as manipulatives), and developing and providing meaningful activities. Building background was valued because it was important to make connections with students' previous experiences and prior knowledge to help develop additional academic vocabulary. Comprehensible input focused on adjusting teacher speech, modeling tasks for students, and using multimodal techniques to enhance comprehension. Strategies included using scaffolding techniques and promoting higher-order thinking skills. Interaction involved grouping students appropriately for language and content development. Practice and application focused on the use of meaningful activities and providing practice time so students could work towards becoming more independent. Lesson delivery was based on if the teacher met the desired expectations they set forth for the lesson. And review and assessment included reviewing the objectives, assessing student learning, and providing feedback to students (Echevarria, Vogt, & Short, 2008).

The Russian psychologist, Lev Vygotsky, introduced the idea of the zone of proximal development (ZPD). The ZPD was defined as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Iddings, Risko, & Rampulla, 2009). Vygotsky developed an analogy to assist in understanding the concept of ZPD. A fruit farmer assessed his harvest, and he considered not only the fruit that had already matured, but the fruit that was still maturing; likewise, ZPD was different than the zone of actual development (the zone in which children managed all actions independently) because it included the activities that students could not yet do on their own, but would eventually be able to master as a result of modeling, assistance, and guidance by the teacher or other peers (Zaretskii, 2009). Teachers provided students with engaging activities, and assistance was offered to bring about the next phase of development (or ZPD). These activities were deliberate, supported students' understanding, and helped them work through misconceptions to develop new understanding. Thus, the idea of using scaffolding techniques could be argued to have begun with Vygotsky.

As stated previously, language played a large and important role in learning mathematics. Math had its own symbols, which formed a written language, and was confusing to many, not just ELLs. Mathematical language was learned almost entirely in school, and often not spoken at home; thus, some referred to it as a foreign language if compared to everyday communication (Cirillo et al., 2010). Echevarria, Vogt, and Short (2010) discussed the importance of spending a significant amount of time teaching the vocabulary required for understanding math concepts. They suggested that word walls and posters be hung around classrooms, explaining math processes, commonly used terms, and different mathematical operations. They also encouraged teachers to be clear in their expectations of students, and thorough in their instructions. Teachers should model instructions and provide opportunities for students to gradually become independent. Student talk and teacher talk needed to be balanced in order to promote meaningful language learning experiences for ELLs.

> When you teach students how to participate in classroom conversations … you give them the tools they need to practice with language skills that enable them to back up claims with evidence, be more detailed in their observations, use persuasive language compellingly in arguments, and compare points of view, with the result being academic achievement and school success" (Echevarria et al., 2010).

The ELL Accommodations Research Team at The George Washington University Center for Equality and Excellence in Education (GW-CEEE) also created an ELL Accommodations Database to highlight research and good practices for implementing appropriate assessment accommodations for ELLs. Some accommodations included: providing a picture dictionary to students, providing written directions in their native language, reading directions and test items aloud, simplifying directions, using a tape recorder to record test responses, and much more ("ELL Accommodations," 2012).

The ultimate goal for teachers was to develop independent, successful students. English language learners needed to be given opportunities to become those independent, successful students through a gradual release of responsibility.

Students needed to be provided with increasingly independent experiences through explicit teaching and modeling, guided practice, practice and application, and independent work time (similar to Vygotsky's recommendations involving ZPD). Teachers could meet this goal by using the suggested strategies for all students, including and particularly for ELLs.

Summary

Students in the United States were struggling to keep pace with the rest of the world, particularly concerning the area of mathematics. Intervention strategies were developed to help districts, schools, and teachers find appropriate ways to support students and ELLs. The goal of intervention was to provide students with strategies that would help them become more independent and take responsibility for their learning. Likewise, strategies to support ELL students (such as providing small group and collaborative learning opportunities, using visuals and realia, and making assessment accommodations) were incorporated due to the increase in the ELL population. The purpose of using ELL strategies was similar to intervention – to gradually release responsibility and promote independence. Russian psychologist, Lev Vygotsky, developed the concept of the zone of proximal development, which informed teachers of their ability to help scaffold lessons, and break down complicated tasks into parts and work with each part separately. The *Navigator* curriculum provided a variety of scaffolding strategies which supported Vygotsky's idea to help build and move students through the next phase of development, eventually ensuring that they become independent learners. The *Math Navigator* curriculum was considered a Tier II intervention curriculum that attempted to produce independent, responsible mathematical students. It targeted specific gaps and misconceptions that needed correcting, in order to help students succeed. Additionally, it provided suggestions on how to support ELLs in a language-rich environment. The researcher conducted the study to determine if *Math Navigator* helped sixth grade students, as well as sixth grade ELL students, succeed and pass the math MSP.

CHAPTER 3

Methodology and Treatment of Data

Introduction

The researcher reviewed the math Measurements of Student Progress (MSP) scores of all sixth graders at Panther Lake Elementary. In the spring of 2010, 37.2% of the sixth grade class did not meet standard on the math MSP. Panther Lake Elementary implemented two new curriculums designed around Tiered Intervention (TI) in September 2010. The researcher's colleague taught the Tier III curriculum, *Math Triumphs*; while the researcher taught the Tier II curriculum, *Math Navigator*. The purpose of the project was to find out if sixth grade math MSP scores improved as a result of the new curriculum.

Methodology

The investigator used a modified true experimental design to conduct the project. The control group took the sixth grade math MSP in spring 2010, while the treatment group took the math MSP in spring 2011. The treatment group, that took the MSP in 2011, received 30 minutes of extra instruction (in addition to their core math curriculum) in *Math Navigator*, five times per week. The author's goal was to determine if the 2011 sixth grade students' MSP scores increased as a result of the additional math instruction.

Participants

For the Special Project, data were collected from sixth grade students attending Panther Lake Elementary in Kent, Washington. The researcher used a convenience sampling based on the sixth grade students who were currently enrolled at Panther Lake Elementary. These students were assumed to be ready for sixth grade, based on their classroom teachers passing them (and not holding them back another year) at the end of the previous school year.

According to the Office of Superintendent of Public Instruction (OSPI), Panther Lake Elementary was a school with 73.4% of its population on free or reduced-price meals. English Language Learners (ELLs) made up 34.8% of the 575 student population. The ethnicities of the students at this school consisted of: American Indian or Alaskan Native (0.3%), Asian or Pacific Islander (23.1%), Black (17.9%), Hispanic (23.3%), White (29.0%), and two or more races (6.3%) ("Panther Lake," n.d.).

In spring 2010, there were 78 sixth grade students enrolled at Panther Lake (30 females and 48 males). All sixth grade students were given the math MSP. In spring 2011, 88 sixth grade students were enrolled at Panther Lake (45 females and 43 males). All 88 sixth graders were given the math MSP.

The sixth grade students from the 2010-2011 school year were placed into categories, depending on their math MSP score from the previous year. The three categories were: Tier I, Tier II, and Tier III. The students who were categorized as Tier III were placed in a class where *Math Triumphs* was their core curriculum instead of *College Preparatory Mathematics* (CPM). All of these students had the same math teacher for their core math instruction. Students who were categorized as Tier II students were taught the CPM curriculum by their classroom teacher for 80 minutes, plus an additional 30 minutes every day of *Math Navigator*, which was taught by the researcher. Tier I students were instructed using the CPM curriculum for 80 minutes per day only.

The control group data consisted of all sixth grade student data because Tiers had not been determined until the 2010-11 school year. The treatment group data did not include Tier III student data because they received a different core curriculum than was studied by the Special Project.

The author of this Special Project and instructor of *Math Navigator* for Tier II sixth grade students, had been a teacher for five years, and had a bachelor's degree in Elementary Education. The researcher had taught second and fifth grade; and was the Librarian, Technology Specialist, and ELL (Interventionist) teacher at Panther Lake Elementary.

The researcher was also part of a TI cohort, which met once a month throughout the school year to discuss curriculum, data, and new information. The team consisted of Panther Lake's principal and vice principal; classroom teachers who were teaching *Math Triumphs* to Tier III students; and two ELL teachers/Interventionists (one being the researcher), who were teaching *Math Navigator* to Tier II students.

Instruments

The instrument used to gather data was the math MSP. The MSP was Washington State's exam given to all students in grades three through eight. According to OSPI, the goal of the MSP was to measure student progress, and the math MSP was tested each May, and took one school day to complete ("Measurements," 2012). The MSP measured students' performance against a set of learning standards, not against their peers; and because the test was based on Washington's state learning standards, it remained valid and reliable every year.

The MSP was implemented in response to the state's Education Reform Law of 1993, which required that all students in public schools be tested annually (including students with disabilities and limited English proficiency), based on the state's learning standards – the Essential Academic Learning Requirements (EALRs). The MSP also fulfilled the requirement of the federal No Child Left Behind (NCLB) Act ("Frequently Asked," 2012).

The Office of Superintendent of Public Instruction ensured that the test did not contain any cultural bias by having each question go through an extensive analysis by a Bias and Cultural Fairness Committee of specially trained educators and community members before being added to the test. Each question was also piloted with students in order to determine whether it posed difficulty for students from different backgrounds ("Frequently Asked," 2012).

Tests were scored by trained scorers, who were monitored closely by the Data Recognition Corporation. The scorers were monitored daily to make sure that their scores met the criteria of "accuracy and consistency set by Washington educators" ("Frequently Asked," 2012). Open-ended items were scored based on a list of specific steps in order to ensure that the scoring process provided valid and reliable results.

Design

The researcher used a modified true experimental design. The specific design used was a posttest-only control group design; however it did not involve random sampling. The researcher compared sixth grade spring 2010 math MSP results to spring 2011 math MSP results, to determine if *Math Navigator* helped increase MSP scores.

According to Gay, Mills, and Airasian (2009), the internal sources of invalidity that were controlled in the study were: history, maturation, testing, instrumentation, regression, selection, and selection interactions. The source of history was controlled because the study was conducted using two separate sets of MSP scores. There were no unexpected events that occurred that would have affected the results of the study from spring 2010 to spring 2011. Maturation was not a threat to the validity of this study because each set of MSP scores were taken from sixth grade students in the spring of each school year. It was assumed that both groups of sixth grade students were at the same level of maturity when they took the assessment. Testing was controlled because the students from both groups had the same experience with previous MSP assessments. During both school years, students received instruction to help prepare them for the test. Instrumentation was not a threat because the MSP assessment was considered reliable by the state of Washington. The math MSP assessed students on what they were expected to know in mathematics at the sixth grade level. Regression was not a threat because the researcher used all sixth grade student data, no matter if they were extremely high or extremely low scorers. Similarly, selection was controlled because all sixth grade student data from the spring 2010 math MSP and the spring 2011 math MSP was included in the study. It was assumed that both groups of students were at the same level of maturity and held the same characteristics. Selection-maturation interaction was controlled by collecting data from sixth grade students in both school years. It was assumed that students matured at the same rate in both school years, and both groups were instructed by the same sixth grade teachers in mathematics.

The external sources of invalidity that were controlled in the study, according to Gay et al. (2009), were pretest-treatment interaction and multiple-treatment interference. Pretest-treatment interaction was controlled because there was no pretest given in the study. All students were assumed to have the same experience with the posttest (the MSP assessment). Both groups were taught similar test preparation tips, and were prepared for the assessment, due to taking similar assessments in third, fourth, and fifth grade. Multiple-treatment interference was not a threat because students who were instructed using the *Math Triumphs* curriculum were not included in the analysis. These students received a Tier III curriculum that was not reviewed thoroughly in this study; thus, their math MSP scores from spring 2011 were eliminated from the analysis.

The one source of invalidity that posed a threat to this study was mortality (Gay et al., 2009). However, mortality was not a threat to the study because data was only collected from the students who were present at the time the math MSP was given in both 2010 and 2011. All students who were involved in the treatment group of the study received the full benefit of *Math Navigator*.

Procedure

At the beginning of the 2010-2011 school year, the TI cohort met to determine students' placement within the three Tiers of Intervention. The three Tiers were: Tier I (students considered to be at or above grade level, who scored 400 or more on the math MSP); Tier II (students who were considered to be slightly below grade level, who scored between a 375 and 399 on the MSP); and Tier III (students considered to be two or more years below grade level, who scored lower than a 375 on the MSP). Once students were categorized into Tiers, a class list was generated for the Tier III instructor's *Math Triumphs* class, consisting of 24 sixth grade students. These students were taught using the *Math Triumphs* curriculum for 140 to 165 minutes per day.

In order to develop the *Math Navigator* groups that the researcher taught, the sixth grade classroom teachers administered the National Screener VI test, provided by the *Math Navigator* curriculum. At the beginning of the year, Panther Lake Elementary received 16 modules from the *Math Navigator* curriculum. Out of those 16 modules, the sixth grade modules were: Place Value: From Decimals to Billions, Multiplying Multidigit Whole Numbers, Understanding Division, Understanding Fractions, Understanding and Reading Word Problems, Measurement, Beginning Patterns, and Beginning Data and Probability (*Math Navigator Implementation*, 2009, p.7). Once students completed the screener, the data were analyzed to determine which module should be taught first, due to the highest student need.

Upon looking at the data, the sixth grade teachers and the researcher agreed that the first module needed was Place Value: From Decimals to Billions. The group of teachers generated two class lists, consisting of seven students who would come to the library for the first half hour, and ten students who would come to the library for the second half hour. The researcher read through the *Math Navigator* curriculum, and developed SMART Notebook slides to accompany the instruction for each lesson. Each module in the curriculum consisted of 20 sessions. The author looked over each session, and developed support materials to help teach each session. The Notebook slides consisted of suggested questions the curriculum posed for the teacher to ask students, definitions of vocabulary words, and pictures/visuals to help students make connections between words and mathematical concepts. Appendix D included examples of Notebook slides used with the first module the researcher taught to sixth grade students. The slides helped the researcher scaffold instruction, and gradually release responsibility and learning to each individual student (similar to Vygotsky's theory of the zone of proximal development). The researcher taught the same 30-minute lesson twice each day.

On October 4, 2010, Tier II sixth grade students began coming to the library to be instructed in *Math Navigator* for 30 minutes each day. The first session consisted of a pre-test, which was administered by the investigator (to be reviewed against the post-test in session 20). The Place Value: From Decimals to Billions module lasted until winter break (the middle of December).

Once students and teachers returned from winter break in early January, the sixth grade teachers and the researcher met to determine the next module to be taught to the Tier II students. The module which showed the most need was Understanding Fractions. The teachers developed two class lists, one consisting of 11 students, and one consisting of 10 students. Some of the students who came to the researcher for the first module were assigned to come again for the second module; however, the class lists varied slightly, depending on which students in sixth grade needed the most help with that math concept. The investigator developed SMART Notebook slides to accompany each session; and the second *Math Navigator* module was taught for 30 minutes per day, twice a day. This module ended in the middle of April.

For the last few months of the school year, the teachers met again to determine the final module to be taught. They decided that the Understanding and Reading Word Problems module would be the most appropriate module to teach next. Thirteen students were assigned to the first group, and 13 students were assigned to the second group. The author read through the *Math Navigator* curriculum, developed SMART Notebook slides for each session, and taught the module until school ended in June.

Throughout the 2010-2011 school year, the TI cohort continued to meet every month to analyze data, and discuss curriculum and new information. The researcher also attended a *Math Navigator* district training in January, to help incorporate the *Assessment and Reporting Online System* (ARO) website into tracking and analyzing data of all *Math Navigator* students.

Treatment of the Data

The researcher used a t-test for independent groups, using the *STATPAK* software, available through Macromedia Director (1999). Two sets of math MSP scores were compared to determine if the students that received additional math instruction in *Math Navigator* during the 2010-2011 school year improved their

MSP scores in comparison to the 2010 sixth grade students who had not received the enhanced math curriculum. A second t-test was conducted using just ELL student math MSP scores as well.

<u>Summary</u>

The investigator designed this project with the purpose of determining if sixth grade math MSP scores increased as a result of implementing the *Math Navigator* curriculum for Tier II students. The researcher used the experimental method to compare sixth graders from the 2009-2010 school year to the 2010-2011 school year. Students from the 2010-2011 school year were instructed in their core math curriculum (CPM), with an additional 30 minutes of *Math Navigator* taught by the researcher each day.

CHAPTER 4

Analysis of the Data

Introduction

According to the annual Washington state assessment, known as the MSP, sixth grade students at Panther Lake Elementary were not meeting standard in mathematics. English language learners were also not meeting standard on the state test. Overall, students were not making appropriate growth every year, to help them succeed in the future. The author conducted the Special Project in order to determine if the Tier II math intervention curriculum, *Math Navigator*, was an effective strategy to help students succeed in mathematics. The author analyzed MSP tests scores for a control and treatment group, to determine significance for $p \geq .05, .01, .001$. The author reviewed the data for all sixth grade students, as well as ELLs.

Description of the Environment

The project was conducted during the 2009-10 and 2010-11 school years. It included sixth grade students who attended Panther Lake Elementary, and who had taken the math MSP. It included both native English speakers and ELLs.

The investigator was a teacher at Panther Lake Elementary in the Kent School District. The *Math Navigator* curriculum was an intervention program provided by the school district to all elementary schools. The curriculum was used in grades three through six, although the investigator used sixth grade data for the study. The materials included with the study were: consumable workbooks, teacher manuals for each module, skill cards, pre- and post-tests, the ARO website, SMART Notebook software, and the math MSP results.

The control group consisted of all sixth grade students because Tiers had not been determined until the 2010-11 school year. When data were collected from the treatment group, the researcher did not include MSP scores from Tier III students because they received a different core curriculum than was studied by the Special Project.

Hypothesis

Sixth grade students, including English Language Learners (ELLs), who were identified as below grade level in math, were instructed using a targeted math intervention curriculum, which resulted in increased scores on the math MSP. This occurred because they were receiving additional instruction that specifically met their needs.

Null Hypothesis

Sixth grade students, including ELLs, who were identified as below grade level in math, were instructed using a targeted math intervention curriculum, which resulted in no significant change to scores on the math MSP. Significance was determined for $p \geq .05, .01, .001$.

Results of the Study

The investigator collected math MSP scores for all sixth grade students from spring 2010 and spring 2011 assessments. In Table 1, the control group was known as Pre-Navigator Math 2009-10, and the treatment group was Math Navigator 2010-11. Table 1 displayed the raw scores for each student. It consisted of an abbreviated list of all student MSP scores. The data was made available to the researcher through OSPI in the fall of 2010 and fall of 2011. Appendix A contained a complete list of the data.

Table 1

Math MSP Scores for Sixth Grade Students 2009-10 and 2010-11

Math Navigator 2010-11		Pre-Navigator Math 2009-10	
Student	MSP Score	Student	MSP Score
X1	387	Y1	420
X2	444	Y2	420
X3	456	Y3	387
.	.	.	.
.	.	.	.
.	.	.	.
X63	456	Y76	415
X64	471	Y77	454
X65	471	Y78	462

Note. This was an abbreviated list of sixth grade math MSP scores. Student names were withdrawn from the data and replaced with X and Y. Test scores from students receiving instruction in the Tier III curriculum were not included in the treatment group (Math Navigator 2010-11) data.

The researcher conducted a t-test for independent groups, using the *STATPAK* software, available through Macromedia Director (1999). Sixty-five student scores were used in the control group, and 78 student scores were used in the treatment group. The t-value determined was 2.81, as well as 141 degrees of freedom. Table 2 illustrated the complete *STATPAK* t-test data for all sixth grade students.

Table 2

t-test for Independent Samples – Sixth Grade Student MSP Data

Statistic	Values
No. of Scores in Group X	65
Sum of Scores in Group X	28285.00
Mean of Group X	435.15
Sum of Squared Scores in Group X	12433043.00
SS of Group X	124716.46
No. of Scores in Group Y	78
Sum of Scores in Group Y	32191.00
Mean of Group Y	412.71
Sum of Squared Scores in Group Y	13478831.00
SS of Group Y	193440.22
t-Value	2.81
Degrees of freedom	141

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(\frac{SS_1 + SS_2}{n_1 + n_2 - 2}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{435.15 - 412.71}{\sqrt{\left(\frac{12433043.00 + 13478831.00}{65 + 78 - 2}\right)\left(\frac{1}{65} + \frac{1}{78}\right)}}$$

$$t = 2.81$$

The t-value of 2.81 and 141 degrees of freedom from the t-test for independent samples was used to determine significance for $p \geq .05, .01, .001$. Using Table 3, the author concluded that the hypothesis was supported at both .05 and .01 levels; however, the null hypothesis was accepted at the .001 level. The author determined that the use of *Math Navigator* with sixth grade students benefitted their math MSP scores, and targeted specific misconceptions that needed correcting. Students who were considered below grade level, or Tier II, received instruction that specifically met their needs. The t-value would have had to be 3.36 to show significance for p at the level of .001.

Table 3

Distribution of t of Sixth Grade Student MSP Data

	p		
df	.05	.01	.001
141	1.98	2.61	3.36

The researcher also collected math MSP scores for ELL sixth grade students from spring 2010 and spring 2011. Table 4 displayed the raw scores for each student. There were two more ELL students during the 2009-10 school year; thus, providing more scores for the control group.

Table 4

Math MSP Scores for ELL Students in Sixth Grade, 2009-10 and 2010-11

Math Navigator 2010-11		Pre-Navigator Math 2009-10	
Student	MSP Score	Student	MSP Score
X1	450	Y1	442
X2	424	Y2	313
X3	320	Y3	340
X4	284	Y4	403
X5	395	Y5	379
X6	428	Y6	350
X7	419	Y7	376
X8	456	Y8	355
		Y9	304
		Y10	321

Note. Student names were withdrawn from the data and replaced with X and Y. Test scores from students receiving instruction in the Tier III curriculum were not included in the treatment group (Math Navigator 2010-11) data.

The researcher conducted a second t-test for independent groups, using the *STATPAK* software. Eight student scores were used in the control group, and 10 student scores were used in the treatment group. The t-value determined was 1.56, and 16 degrees of freedom. Table 5 illustrated the complete *STATPAK* t-test data for all ELL sixth grade students.

Table 5

t-test for Independent Samples – Sixth Grade ELL Student MSP Data

Statistic	Values
No. of Scores in Group X	8
Sum of Scores in Group X	3176.0000
Mean of Group X	397.00
Sum of Squared Scores in Group X	1288038.00
SS of Group X	27166.00
No. of Scores in Group Y	10
Sum of Scores in Group Y	3583.0000
Mean of Group Y	358.30
Sum of Squared Scores in Group Y	1300341.00
SS of Group Y	16552.10
t-Value	1.56
Degrees of freedom	16

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(\frac{SS_1 + SS_2}{n_1 + n_2 - 2}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{397.00 - 358.30}{\sqrt{\left(\frac{1288038.00 + 1300341.00}{8 + 10 - 2}\right)\left(\frac{1}{8} + \frac{1}{10}\right)}}$$

$$t = 1.56$$

The t-value of 1.56 and 16 degrees of freedom from the t-test for independent samples was used to determine significance for $p \geq .05, .01, .001$. The investigator reviewed Table 6 and concluded that the null hypothesis was accepted at .05, .01, and .001 because there was no significant difference between the two groups of students. However, after reviewing $p \geq .10$ and .20, the investigator found significance at .20. The investigator determined that the use of *Math Navigator* with ELL sixth grade students was benefitting their MSP scores, and was beginning to target misconceptions that needed correcting. The t-value would have had to be 2.120 to show significance for p at the level of .05.

Table 6

Distribution of t of Sixth Grade ELL Student MSP Data

	p				
df	.20	.10	.05	.01	.001
16	1.337	1.746	2.120	2.921	4.015

Findings

The author of the Special Project found that the null hypothesis was rejected at .05 and .01 for all sixth grade students. The hypothesis was thus supported. Students at Panther Lake Elementary were receiving instruction in a Tier II intervention curriculum that did show significance for student math MSP scores. More students were meeting standard on the annual state assessment as a result of using *Math Navigator*.

The author also found that the null hypothesis was accepted for $p \geq .05$, .01, and .001, when reviewing ELL student MSP scores. The hypothesis was not supported. The author did, however, find significance at $p \geq .20$, meaning that there was a positive increase in math MSP scores of English Language Learners at Panther Lake as a result of using the *Math Navigator* program. At .20, the hypothesis was supported for ELLs. The author determined that the curriculum was benefitting ELLs' mathematical learning, and could continue to support and increase their MSP scores after additional years using the program.

Discussion

The *Math Navigator* curriculum was an intervention program designed to target specific misconceptions or gaps that students needed to correct in order to be successful in math (Phillips, 2008). The results of this study concluded that sixth grade students benefitted from the use of the intervention program. This was consistent with the results found in Chapter 2, where multiple schools around the country saw positive outcomes after using *Navigator*. A Mississippi elementary school showed a 41 percent gain from pre- to post-test on two modules used with students ("Math Navigator Results," 2012). Likewise, a school in Florida made impressive gains, where one-third of their Special Education students passed the state test (and 75 percent exceeded expectations by making a year's growth of progress). The use of the curriculum showed significance in sixth grade math MSP results at Panther Lake Elementary, including ELL scores (at $p \geq .20$).

The program promoted the development of a language-rich environment, which was able to support and help ELLs succeed. Unfortunately, the *Math Navigator* results discussed on their website did not share ELL data, but rather all student data and special education student data. The author determined that the curriculum was supporting ELLs; however, it would be beneficial to continue to use the program in future years. This data could then, additionally, be used to conclude that it was an appropriate intervention curriculum that improved assessment scores for English Language Learners.

<u>Summary</u>

The author developed the Special Project in order to determine if *Math Navigator*, a Tier II math intervention curriculum, was effective in helping sixth grade students succeed in mathematics. Math MSP scores were analyzed to determine significance for $p \geq .05, .01, .001$. Data were reviewed for all sixth grade students, as well as ELLs.

The author found that the null hypothesis was accepted at the .001 level for all sixth grade data. The hypothesis was supported at .05 and .01. From these findings, the author concluded that *Navigator* did benefit sixth grade student MSP results, and helped target specific gaps in their knowledge that needed to be addressed and corrected, in order to help them succeed in mathematics in the future. The author also found that the null hypothesis was accepted at .05, .01, and .001, when reviewing the ELL student data. However, the hypothesis was supported for ELLs, when looking further at $p \geq .20$. It was determined that *Math Navigator* showed significance in helping ELL students succeed on the sixth grade math MSP assessment. The investigator concluded that additional research should be conducted to determine how *Navigator* could consistently benefit English Language Learners in the future.

CHAPTER 5

Summary, Conclusions and Recommendations

Introduction

The Special Project was conducted during the 2009-10 and 2010-11 school years. It took place at Panther Lake Elementary in Kent, Washington. Students were placed into Tiers, or levels, to provide more appropriate mathematical instruction that met their specific needs. Tier II sixth grade students were instructed using the core math curriculum, as well as an additional 30 minutes each day using the intervention curriculum titled *Math Navigator*. The investigator was the instructor for *Navigator*. The investigator reviewed and analyzed data taken from the annual math Measurements of Student Progress (MSP) assessment. Data was collected from the math MSP that sixth grade students took in spring 2010 (the control group, which had not received additional instruction in *Math Navigator*), and spring 2011 (the treatment group). The purpose of the study was to determine if using *Math Navigator* with sixth grade students helped increase math MSP scores. The investigator also analyzed data to determine if there was a significant change in the MSP scores of English Language Learners (ELLs). Significance was determined for $p \geq .05, .01, .001$.

Summary

The Special Project included the traditional five chapter format for a thesis. Chapter 1 discussed how students in the United States were falling further and further behind in mathematics when compared to other students around the world. Mathematics was a field that continually provided new jobs and technologies, and students needed to be proficient in order to succeed in the future. According to the annual MSP, students at Panther Lake Elementary were not meeting Adequate Yearly Progress (AYP) in mathematics. English Language Learners were also not meeting standard. The purpose of the project was to determine if *Math Navigator* was an effective intervention curriculum to use with sixth grade students, including ELL students. The intervention program was delivered during the 2010-11 school year to sixth grade Tier II students, for 30 minutes each day. The researcher used data from two spring math MSP assessments, taken in 2010 and 2011, to determine if there was a significant change in MSP scores as a result of using *Navigator*.

Chapter 2 reviewed literature that the researcher selected for the Special Project. The author researched three main areas for the study: the use of Tiered Intervention (TI) in the classroom, the background information found on the *Navigator* curriculum, and suggested strategies that could support ELL students in the classroom. Tiered Intervention (also known as RTI) was implemented to provide a wider range of general education options to use with students who were not at grade level. The goal of TI was to support and fill in students' academic gaps, which could help them become more independent and succeed in the future. The *Math Navigator* program was developed as an intervention curriculum that could be used for TI. Its purpose was to target specific gaps and misconceptions that students needed to correct in order to be successful in math. The curriculum provided 18 stand-alone modules, each consisting of 20 sessions, to use with small groups of students. Students could participate in one module, but possibly skip another, depending on the individual misconceptions each student possessed. The *Navigator* curriculum included suggestions on how to support ELL students in their instructor manuals for each module. Multiple schools and districts around the country were finding success as a result of using *Math Navigator*. As a result of the population of the United Stated becoming more diverse year after year, accommodations needed to be offered for ELL students. Mathematics was often considered to have its own language, consisting of numbers, letters, equations, etc. Mathematical language was difficult for ELL students to comprehend, and support needed to be provided to help all students understand the concepts taught in class. Suggested strategies to use with ELLs included: providing opportunities for students to work in small groups; using visuals, realia, and manipulatives for more hands-on experiences; building background knowledge; modeling; and scaffolding instruction. The idea of scaffolding instruction to help assist students' learning originated from Russian psychologist Vygotsky's concept of the zone of proximal development. The *Navigator* curriculum supported Vygotsky's idea and the goal was to gradually release responsibility to the student, to ensure that they would be successful in their future work with mathematics.

Chapter 3 noted the methodology and treatment of the data that was collected. The author used a modified true experimental design to conduct the Special Project. The specific design used was a posttest-only control group design; though, it did not involve random sampling. The control group took the math MSP in spring 2010, and the treatment group took the MSP in spring 2011. The treatment group consisted of students who received 30 minutes of additional instruction in *Math Navigator*, in addition to the core math curriculum. The treatment group data did not include Tier III students because they received a different core curriculum than was studied by the project. The researcher was the instructor of the Tier II curriculum. The instrument used to gather data was the math MSP, which was given annually in the state of Washington. One source of invalidity that posed a threat to this study was mortality; but, this was controlled because data was only collected from students who were present at the time the math MSP was given. All students in the treatment group received the full benefit of the intervention program. Using math MSP scores, the researcher used a t-test for independent groups. The purpose of the study was to determine if students who received additional math instruction in *Navigator* improved their MSP scores in comparison to students from 2010's MSP assessment. A second t-test was conducted to determine if the curriculum benefitted ELL students' math MSP scores as well.

Chapter 4 discussed analysis of the data and the results of the study. The author found that the null hypothesis was accepted at .001 of p for all sixth grade students. The hypothesis, however, was supported at .05 and .01. It was determined that the use of *Navigator* with sixth grade students benefitted their MSP scores, and students received instruction that specifically met their needs. The author also found that the null hypothesis was accepted at .05, .01, and .001 for sixth grade ELL students. The hypothesis was supported at .20, showing a difference in math MSP scores for ELLs who had been instructed using the *Math Navigator* curriculum. The Special Project found that the curriculum was benefitting ELL students and targeting misconceptions that needed to be corrected, but the author determined that additional research should be done on how *Navigator* could consistently support ELLs.

Conclusions

After reviewing the results of the study, the investigator concluded that *Math Navigator* was an effective curriculum that supported sixth grade students in meeting standard on the annual MSP test. It provided students with instruction that specifically met their needs, and corrected misconceptions they previously had. And the *Navigator* program did provide some benefit for ELL students. There was no significant difference in MSP scores for ELL students at .05, .01, and .001; but, there was significance at .20. These findings helped the author determine that the curriculum was working to meet the needs of students whose first language was one other than English. Ultimately, the *Math Navigator* curriculum was a helpful intervention for students, including English Language Learners.

Recommendations

The researcher recommends that additional students, grade levels, and classes be studied to help determine the significance of *Math Navigator*. Additionally, ELL student data should be studied throughout an entire school district, to get a better picture of the overall effect it has on ELL test scores. The *Math Navigator* curriculum should be reviewed after additional years of teaching. The researcher conducted the study after the first year of implementation, and additional training and materials might be provided to help support teachers in their instruction of the curriculum. Finally, the researcher recommends that the teachers of *Navigator*, as well as the curriculum developers, include additional ways to help support ELLs. The curriculum should develop additional strategies that are embedded throughout the teaching of each module, because they can benefit all students (not just ELLs). As suggested in Chapter 2, the curriculum should also provide manipulatives that can be used during instruction and practice, so students can relate new vocabulary and concepts to tangible objects (Cirillo et al., 2010; Kyounghee & Hoover, 2009).

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APPENDIX A

Table 1 – Complete List of Data

Math MSP Scores for Sixth Grade Students 2009-10 and 2010-11

Math Navigator 2010-11		Pre-Navigator Math 2009-10	
Student	MSP Score	Student	MSP Score
X1	387	Y1	420
X2	444	Y2	420
X3	456	Y3	387
X4	433	Y4	407
X5	407	Y5	454
X6	351	Y6	442
X7	480	Y7	425
X8	419	Y8	376
X9	419	Y9	375
X10	463	Y10	442
X11	450	Y11	403
X12	491	Y12	379
X13	411	Y13	471
X14	531	Y14	376
X15	415	Y15	313
X16	444	Y16	340
X17	444	Y17	471
X18	351	Y18	442
X19	424	Y19	497
X20	471	Y20	387
X21	463	Y21	482
X22	450	Y22	482
X23	463	Y23	462
X24	456	Y24	359
X25	361	Y25	425
X26	463	Y26	313
X27	424	Y27	447
X28	456	Y28	447
X29	471	Y29	328
X30	463	Y30	403
X31	450	Y31	435

Math Navigator 2010-11		Pre-Navigator Math 2009-10	
Student	MSP Score	Student	MSP Score
X32	433	Y32	395
X33	428	Y33	363
X34	403	Y34	497
X35	433	Y35	363
X36	506	Y36	521
X37	320	Y37	462
X38	471	Y38	407
X39	463	Y39	387
X40	428	Y40	462
X41	284	Y41	379
X42	395	Y42	350
X43	375	Y43	376
X44	444	Y44	328
X45	450	Y45	400
X46	428	Y46	462
X47	387	Y47	391
X48	442	Y48	345
X49	450	Y49	462
X50	471	Y50	403
X51	428	Y51	454
X52	424	Y52	403
X53	491	Y53	471
X54	480	Y54	462
X55	506	Y55	403
X56	463	Y56	447
X57	428	Y57	328
X58	346	Y58	482
X59	419	Y59	442
X60	450	Y60	383
X61	411	Y61	400
X62	419	Y62	355
X63	456	Y63	435
X64	471	Y64	379

Math Navigator 2010-11		Pre-Navigator Math 2009-10	
Student	MSP Score	Student	MSP Score
X65	471	Y65	462
		Y66	482
		Y67	391
		Y68	425
		Y69	415
		Y70	304
		Y71	321
		Y72	420
		Y73	368
		Y74	403
		Y75	462
		Y76	415
		Y77	454
		Y78	462

Note. The data was provided by OSPI in the fall of 2010 and fall of 2011. Students took the math MSP in spring 2010 and spring 2011. Student names were withdrawn from the data and replaced with X and Y. There were 13 more sixth grade students during the 2009-10 school year; thus, providing more scores for the control group. Test scores from students receiving instruction in the Tier III curriculum were not included in the treatment group (Math Navigator 2010-11) data.

APPENDIX B

Measurements of Student Progress
School Roster of Student Performance
GRADE 6

Spring 2010

DISTRICT: KENT SD
SCHOOL: PANTHER LAKE ELEMENT
CDS CODE: 17415-5178

Mathematics — Minimum score 400 to meet standard

"+" meets or exceeds proficient range

	Meets Standard / Score (Level)	Percent of Total Points Earned: Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
	YES 420 (L3)	70+	70+	56+	79+
	YES 420 (L3)	77+	50+	56+	79+
	NO 387 (L2)	57	30	50	50
	YES 407 (L3)	67+	50+	50	71+
	YES 454 (L4)	90+	70+	94+	79+
	YES 442 (L4)	87+	60+	75+	83+
	YES 425 (L3)	77+	60+	75+	71+
	NO 376 (L2)	50	20	25	54
	NO 375 (L2)	43	30	25	50
☆	YES 442 (L4)	83+	70+	75+	83+
	YES 403 (L3)	63+	50+	50	67+

Mathematics — Minimum score 400 to meet standard

"+" meets or exceeds proficient range

	Meets Standard / Score (Level)	Percent of Total Points Earned: Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
	NO 379 (L2)	47	40	31	54
	YES 471 (L4)	93+	80+	94+	88+
	NO 376 (L2)	40	50+	25	54
☆	NO 313 (L1)	10	20	6	17
☆	NO 340 (L1)	23	20	25	21
	YES 471 (L4)	93+	80+	94+	88+
	YES 442 (L4)	83+	70+	94+	71+
	YES 497 (L4)	97+	90+	94+	96+
	NO 387 (L2)	50	50+	38	58
	YES 482 (L4)	97+	80+	94+	92+
	YES 482 (L4)	97+	80+	88+	96+

Mathematics — Minimum score 400 to meet standard

"+" meets or exceeds proficient range

	Meets Standard / Score (Level)	Percent of Total Points Earned: Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
	YES 462 (L4)	90+	80+	75+	96+
	NO 359 (L1)	30	40	19	42
	YES 425 (L3)	83+	40	75+	71+
	NO 313 (L1)	7	30	6	17
	YES 447 (L4)	87+	70+	56+	100+
	YES 447 (L4)	83+	80+	69+	92+
	NO 328 (L1)	17	20	13	21
☆	YES 403 (L3)	63+	50+	69+	54
	YES 435 (L3)	83+	60+	69+	83+
	NO 395 (L2)	53	60+	44	63+
	NO 363 (L1)	30	50+	25	42

☆ = English Language Learner

Mathematics

Minimum score 400 to meet standard

Meets Standard / Score (Level)	Percent of Total Points Earned: Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
YES 497 (L4)	97+	90+	94+	96+
NO 363 (L1)	40	20	25	42
YES 521 (L4)	97+	100+	100+	96+
YES 462 (L4)	90+	80+	81+	92+
YES 407 (L3)	63+	60+	50	71+
NO 387 (L2)	50	50+	31	63+
YES 462 (L4)	87+	90+	94+	83+
NO 379 (L2)	50	30	31	54
NO 350 (L1)	30	20	19	33
NO 376 (L2)	47	30	50	38
NO 328 (L1)	17	20	0	29

Mathematics

Minimum score 400 to meet standard

Meets Standard / Score (Level)	Percent of Total Points Earned: Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
YES 400 (L3)	57	60+	56+	58
YES 462 (L4)	87+	90+	81+	92+
NO 391 (L2)	50	60+	38	63+
NO 345 (L1)	30	10	31	21
YES 462 (L4)	97+	60+	88+	88+
YES 403 (L3)	67+	40	56+	63+
YES 454 (L4)	87+	80+	94+	79+
YES 403 (L3)	63+	50+	56+	63+
YES 471 (L4)	87+	100+	100+	83+
YES 462 (L4)	93+	70+	81+	92+
YES 403 (L3)	60	60+	50	67+

Mathematics

Minimum score 400 to meet standard

Meets Standard / Score (Level)	Percent of Total Points Earned: Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
YES 447 (L4)	87+	70+	75+	88+
NO 328 (L1)	13	30	19	17
YES 482 (L4)	97+	80+	88+	96+
YES 442 (L4)	80+	80+	63+	92+
NO 383 (L2)	57	20	50	46
YES 400 (L3)	67+	30	75+	46
NO 355 (L1)	33	20	25	33
YES 435 (L3)	80+	70+	75+	79+
NO 379 (L2)	47	40	44	46
YES 462 (L4)	93+	70+	88+	88+
YES 482 (L4)	97+	80+	88+	96+

Mathematics Minimum score 400 to meet standard				
	Percent of Total Points Earned			
Meets Standard Score (Level)	Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
NO 391 (L2)	53	50+	25	71+
YES 425 (L3)	70+	80+	50	88+
YES 415 (L3)	67+	70+	56+	75+
NO 304 (L1)	13	0	6	13
NO 321 (L1)	10	30	13	17
YES 420 (L3)	70+	70+	69+	71+
NO 368 (L1)	37	40	13	54
YES 403 (L3)	67+	40	56+	63+
YES 462 (L4)	87+	90+	94+	83+
YES 415 (L3)	73+	50+	63+	71+
YES 454 (L4)	90+	70+	81+	88+

Mathematics Minimum score 400 to meet standard				
	Percent of Total Points Earned			
Meets Standard Score (Level)	Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
YES 462 (L4)	90+	80+	75+	96+

Measurements of Student Progress
School Roster of Student Performance
GRADE 6

Spring 2011

DISTRICT: KENT SD
SCHOOL: PANTHER LAKE ELEMENT
CDS CODE: 17415-5178

Mathematics — Minimum score 400 to meet standard

ELL	Meets Standard / Score (Level)	Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
	"+" meets or exceeds proficient range				
★	NO ~~387 (L2)~~	~~52~~	~~27~~	~~33~~	~~52~~
★	NO ~~351 (L1)~~	~~21~~	~~36~~	~~7~~	~~36~~
	NO ~~375 (L2)~~	~~41~~	~~27~~	~~27~~	~~44~~
	NO 387 (L2)	52	27	20	60
	YES 444 (L4)	83+	64+	73+	80+
★	NO ~~387 (L2)~~	~~48~~	~~36~~	~~40~~	~~48~~
	YES 456 (L4)	86+	73+	80+	84+
	NO ~~383 (L2)~~	~~41~~	~~45+~~	~~40~~	~~44~~
	YES ~~407 (L3)~~	~~59+~~	~~55+~~	~~47+~~	~~64+~~
	YES 433 (L3)	79+	55+	53+	84+
	YES 407 (L3)	62+	45+	40	68+

Mathematics — Minimum score 400 to meet standard

ELL	Meets Standard / Score (Level)	Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
	"+" meets or exceeds proficient range				
	NO 351 (L1)	24	27	7	36
	YES 480 (L4)	90+	91+	80+	96+
	YES 419 (L3)	72+	45+	47+	76+
	YES 419 (L3)	66+	64+	40	80+
★	NO ~~361 (L1)~~	~~24~~	~~45+~~	~~27~~	~~32~~
	YES 463 (L4)	90+	73+	87+	84+
★	YES 450 (L4)	83+	73+	87+	76+
	YES 491 (L4)	97+	82+	93+	92+
	YES 411 (L3)	62+	55+	53+	64+
	YES 531 (L4)	97+	100+	100+	96+
	YES 415 (L3)	76+	27	47+	72+

Mathematics — Minimum score 400 to meet standard

ELL	Meets Standard / Score (Level)	Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
	"+" meets or exceeds proficient range				
	YES 444 (L4)	79+	73+	80+	76+
★	NO ~~356 (L1)~~	~~31~~	~~18~~	~~13~~	~~36~~
	YES ~~403 (L3)~~	~~66+~~	~~27~~	~~67+~~	~~48~~
	YES 444 (L4)	86+	55+	73+	80+
	NO 351 (L1)	24	27	13	32
	YES ~~407 (L3)~~	~~59~~	~~55+~~	~~27~~	~~76+~~
	NO ~~379 (L2)~~	~~38~~	~~45+~~	~~27~~	~~48~~
	YES 424 (L3)	62+	82+	53+	76+
★	YES ~~415 (L3)~~	~~62+~~	~~64+~~	~~60+~~	~~64+~~
	NO ~~387 (L2)~~	~~48~~	~~36~~	~~33~~	~~52~~
	YES 471 (L4)	93+	73+	87+	88+

★ = English Language Learner

~~crossed out~~ = Tier III student; data not included in the Special Project

Mathematics Minimum score 400 to meet standard				
Meets Standard Score (Level)	Percent of Total Points Earned			
	Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
NOT ENROLL				
NO ~~356 (L1)~~	~~21~~	~~45+~~	~~13~~	~~30~~
YES 463 (L4)	93+	64+	80+	88+
YES 450 (L4)	86+	64+	80+	80+
YES 463 (L4)	79+	100+	67+	96+
YES 456 (L4)	86+	73+	73+	88+
NO 361 (L1)	31	27	13	40
YES ~~403 (L3)~~	~~62+~~	~~36~~	~~40~~	~~84+~~
YES ~~411 (L3)~~	~~62+~~	~~55+~~	~~53+~~	~~64+~~
NO ~~391 (L2)~~	~~45~~	~~55+~~	~~53+~~	~~44~~
YES 463 (L4)	83+	91+	73+	92+

Mathematics Minimum score 400 to meet standard				
Meets Standard Score (Level)	Percent of Total Points Earned			
	Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
YES 424 (L3)	69+	64+	53+	76+
YES 456 (L4)	83+	82+	60+	96+
YES 471 (L4)	93+	73+	93+	84+
YES 463 (L4)	86+	82+	87+	84+
YES 450 (L4)	83+	73+	67+	88+
YES 433 (L3)	79+	55+	67+	76+
YES 428 (L3)	79+	45+	60+	76+
YES 403 (L3)	62+	36	33	68+
YES 433 (L3)	72+	73+	60+	80+
YES 506 (L4)	100+	82+	100+	92+
NO 320 (L1)	14	9	7	16

Mathematics Minimum score 400 to meet standard				
Meets Standard Score (Level)	Percent of Total Points Earned			
	Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
NO ~~395 (L2)~~	~~55~~	~~30~~	~~40~~	~~36~~
~~NNEP~~				
YES 471 (L4)	86+	91+	73+	96+
YES 463 (L4)	83+	91+	80+	88+
YES 428 (L3)	69+	73+	40	88+
YES ~~403 (L3)~~	~~62+~~	~~36~~	~~33~~	~~68+~~
NO 284 (L1)	3	9	0	8
NO 395 (L2)	62+	18	53+	48
NO 375 (L2)	38	36	33	40
YES 444 (L4)	83+	64+	67+	84+
YES 450 (L4)	86+	64+	73+	84+

Mathematics

Minimum score 400 to meet standard

Meets Standard / Score (Level)	Percent of Total Points Earned: Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
YES 428 (L3)	72+	64+	47+	84+
NO 387 (L2)	48	36	33	52
YES 442 (L4)	.76+	73+	60+	84+
YES 450 (L4)	76+	91+	87+	76+
YES 471 (L4)	90+	82+	87+	88+
YES 428 (L3)	79+	45+	60+	76+
YES 424 (L3)	69+	64+	53+	76+
YES 491 (L4)	90+	100+	87+	96+
YES 480 (L4)	97+	73+	87+	92+
YES 506 (L4)	97+	91+	100+	92+
YES 463 (L4)	86+	82+	80+	88+

Mathematics

Minimum score 400 to meet standard

Meets Standard / Score (Level)	Percent of Total Points Earned: Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
YES 428 (L3)	79+	45+	53+	80+
NO 346 (L1)	24	18	20	24
YES 419 (L3)	69+	55+	53+	72+
NO ~~370 (L1)~~	~~38~~	~~27~~	~~33~~	~~36~~
NO ~~395 (L2)~~	~~55~~	~~36~~	~~33~~	~~60~~
NO ~~340 (L1)~~	~~24~~	~~9~~	~~13~~	~~24~~
NO ~~375 (L2)~~	~~38~~	~~36~~	~~40~~	~~36~~
YES 450 (L4)	83+	73+	67+	88+
YES 411 (L3)	66+	45+	67+	56
YES 419 (L3)	72+	45+	40	80+
YES 456 (L4)	90+	64+	93+	76+

Mathematics

Minimum score 400 to meet standard

Meets Standard / Score (Level)	Percent of Total Points Earned: Number Sense and Algebraic Sense	Measurement, Geometric Sense, Probability and Statistics	Problem Solving and Reasoning	Procedures and Concepts
"+" meets or exceeds proficient range				
YES 471 (L4)	86+	91+	93+	84+
YES 471 (L4)	90+	82+	80+	92+

APPENDIX D

PLACE VALUE: FROM DECIMALS TO BILLIONS

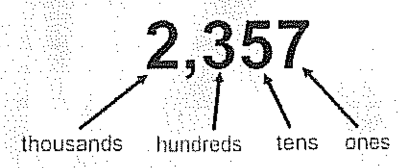
Vocabulary

Expanded Form: A way of writing a number that shows the value of each of its digits

Example: Expanded form for 835:
800 + 30 + 5
8 hundreds + 3 tens + 5 ones
(8 x 100) + (3 x 10) + (5 x 1)

Standard Form: The form of a number written using digits.

Example: 835

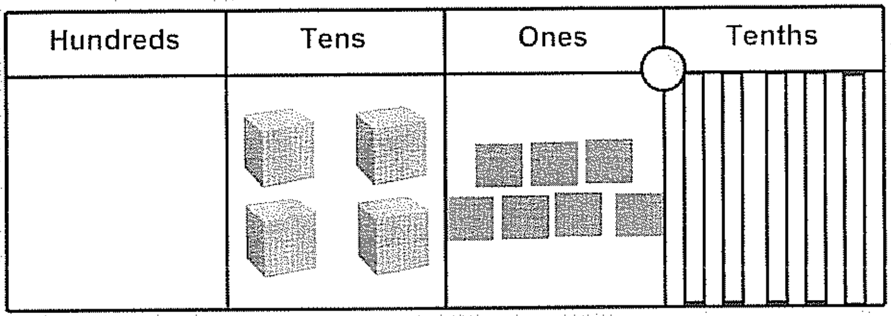


PLACE VALUE: FROM DECIMALS TO BILLIONS

Place Value Mat

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

Place Value Mat



PLACE VALUE: FROM DECIMALS TO BILLIONS

SKILLS PRACTICE - Memory Game

____ 1. The person who is youngest goes first. Flip over two cards.

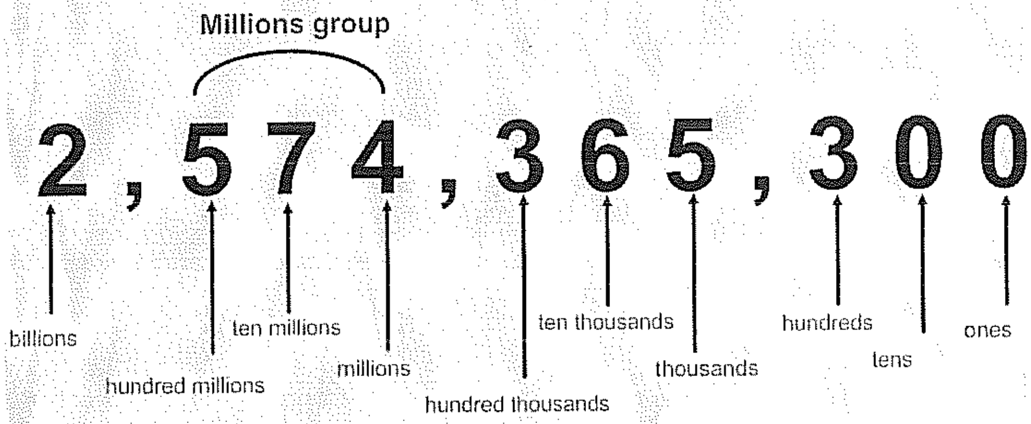
____ 2. If the cards match, write them down in your workbook with that person's name next to it.

____ 3. If they don't match, turn them both back over. It is now the other person's turn.

____ 4. Continue the game until all 8 matches are found.

____ 5. The winner is the person who found the most matches!

PLACE VALUE: FROM DECIMALS TO BILLIONS

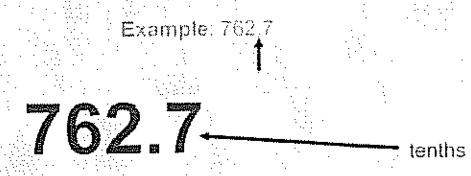


PLACE VALUE: FROM DECIMALS TO BILLIONS

Vocabulary

Estimate: Find *about* how many or *about* how much. A reasonable guess about a measurement or answer.

Decimal point: Separates the whole-number part of the number on the left from the fractional part on the right.



Difference: The result of a subtraction problem.