Effects of Small Group Math Interventions for Math Achievement

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Effects of Small Group Math Interventions for Math Achievement

A Research Proposal Presented to
Presented to
The Graduate Faculty of
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By
Brittany Folk

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Requirements for the Degree of
Master of Science in
Curriculum and Instruction

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Abstract

The purpose of this study was to see the impact of small group math interventions had on students’ math achievement with students who were considered high-risk according to Fastbridge testing. This study was mixed-methods action research, primarily focusing on the quantitative data gathered. The study used pre-test and post-test assessments, weekly small assessments, as well as surveys prior to interventions and after interventions to check students’ anxiety level towards math. There were five students from the 3rd grade class were chosen to participate in this study. All data was collected and analyzed to determine if students grew in their math achievement. The results from this study showed an increase in math achievement in students who were high risk according to their Fastbridge score when doing small group math interventions.
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CHAPTER 1

INTRODUCTION

Introduction

Many students struggle with math and do not receive beneficial interventions to help them increase their scores. Students in many schools receive a lot more reading interventions, and math gets pushed aside more. At the researcher’s school, from 2017—2019, the number of students achieving in math has been lower than those in reading (Minnesota Report Card, 2018). The researcher is currently completing their Masters Degree in Curriculum and Instruction with an emphasis in Literacy. The researcher is aware of and applies literacy interventions within the classroom, however the lack of math interventions in the school warranted the need to complete this study. The lower achieving math scores show the importance and the need for students to be receiving math interventions.

The researcher conducted a study on small group math interventions to help with student achievement with students considered high-risk according to the school’s Fastbridge math testing scores. The students who were deemed to be high-risk based on their Fastbridge math scores were given an additional assessment to see what standards they had not mastered. The additional assessment given helped to guide the small group interventions. If students were high-risk, they achieved a low score on their Fastbridge test. Students who received a low score was because that student answered questions incorrectly. The questions on the test are questions the students should know based on their age and level in school. The students who received the low score needed interventions to try and close the achievement gap in math.

Many students get direct reading intervention with a Title I teacher. The school has Title I services for both math and reading, but a lot fewer students are able to receive the math services
Small Group Math Interventions

due to lack of staff to provide math services. The lack of math intervention has resulted in students achieving higher scores in reading, but unable to close the gap on their math skills, and ultimately staying behind in their math skills. Small group math interventions should help with student achievement with their math skills. The number of students in a small group and how small groups are formed are essential to small groups being beneficial. Many literature sources were reviewed and analyzed to determine how students learn math and math anxiety, math interventions, and how small groups are formed to conduct this study better.

Brief Literature Review

To gain more insight on small group math interventions, the researcher researched small groups and flexible groups, different types of math interventions, and how math anxiety affects how students learn math. The researcher found a plethora of information to help guide their study. The researcher discovered the best way to form small groups, effective math interventions, and why students could be lower in math skills.

Small groups need to be small, but not too small. Small groups need to be seven to eight students, groups should not be too small, and if groups are too large, students could get by without participating (McCrorie, 2010). While doing the literature review research, the researcher learned that size is not as important as how the small group is facilitated. It is more important to ensure the context and the way the teacher facilitates the learning process within the small groups (Enu et al., 2015). When flexible grouping is done it can be teacher-led or student-led. Both ways are very effective in guiding small groups. If groups are teacher-led, groups are formed by ability, interest, or skill level of content (McKeen, 2019). When groups are student-led, the students are guiding the instruction.
Many effective math interventions can be completed in small groups. The researcher focused on interventions to help with math skills that haven’t been learned and fact fluency. The researcher finds it very important for students to know their basic math facts to help them understand the other skills they have not already learned. One intervention the researcher focused on was called Hot Math. This intervention is done in two tiers, and the second tier is done in small groups. The first tier is the whole class promoting problem-solving (Fuchs et al., 2006). The second tier is in small groups focusing on the materials taught as an entire class and re-teaching those materials in small groups (Fuchs et al., 2006). The other math intervention researched was interventions completed in six stages and completed in small groups, or one-on-one. The six interventions are systematic instruction, representation, mathematical language, number line, word problems, and times activities. (Fuchs et al., 2021). Fuchs et al. (2021) explained in great detail how to implement each intervention within the classroom. The final intervention that was researched was called the gradual release of responsibility, commonly known as I do, we do, you do. In the I do stage, the teacher is teaching the focus lesson. In the we do stage, the students are doing the math with the teacher or with classmates, then the final stage of you do, the students are completing math on their own (Fisher & Frey, 2008).

There were two primary fact fluency interventions that the researcher focused on. The first way is Cover, Copy, and Compare. This is a repetitive process that shows improvement with fact fluency (Kitchen et al., 2017). The other intervention for fact fluency is called drill and practice. The drill and practice method with self-management strategies and modeling has shown improvements with fact fluency (Codding et al., 2011). Fuchs et al. (2008), described drill and practice as a very effective intervention for fact fluency. Playing math-related games is also an effective way to help students learn their math facts.
Small Group Math Interventions

For students to learn math skills, there is a lot that goes into learning the new skills. Students need to remember numerical facts and then apply those numerical facts to solve complex problems (Tomasetto, 2021). Math anxiety is something that can hold students back from being able to do their best. This anxiety can come from many different things and is known to affect high school and middle school-aged students more, but it is being found that students younger and younger are having anxiety about math (Maloney & Beilock, 2012). There is a strong correlation between parents or teachers having math anxiety and their students having math anxiety (Szczygiel, 2020). Math interventions are a way to help students feel more confident in their math abilities to relieve some of the anxiety towards math that they are feeling.

**Statement of the Problem**

Students at my school can receive reading interventions easily, but students are not able to get as much math interventions. Schools cannot always have the resources to allow students to receive both reading and math interventions. Since this is a problem in a lot of schools, reading is typically given more attention than math. Teachers need to become creative in fitting in time to allow students to get interventions and extra help in math and in reading. The researcher wanted to be able to incorporate math interventions into her daily classroom activities. The researcher conducted math interventions in small groups during their typical math stations that are completed during their math block.

**Purpose of the Study**

This study aimed to see if students can achieve higher in math by doing small group math interventions. The researcher has noticed the lack of math interventions completed within the school and wanted students to have a fair chance to improve their math skills just as much as they can improve their reading abilities. The researcher incorporated math interventions into her
daily math stations. The researcher wanted to find a way to make sure students can excel in math, just like they can excel in reading in their school. If this study shows growth in their math skills, this will help other teachers to incorporate math interventions into their daily schedule for math.

**Research Question**

The research question was as follows: What impact does small group math interventions have on students’ math achievement with students who are considered high-risk according to Fastbridge testing? This question is to help the researcher determine if math intervention in small groups is beneficial to students who are considered high-risk according to their Fastbridge testing. This research helped determine if math interventions in small groups closed the achievement gap between students.

**Definition of Variables.** Variable A in this study is the independent variable. This was the gradual release of responsibility intervention that was completed in the small groups with the students. This intervention was completed to help with overall math skills.

Variable B in this study is the dependent variable. This was the assessment and survey done prior to starting the interventions and at the end of the interventions, and the assessment the students will complete part way through. This measured the math skills still needing to be learned and then the math skills learned after completing the interventions. The survey told the researcher if the students had math anxiety.

**Significance of the Study**

In this study, the students received math interventions to help with their overall math skills. Most students can receive reading interventions, but not as many students can receive
Small Group Math Interventions

The students cannot get the appropriate math interventions; by doing this study, the students received math interventions that they needed to be more successful in math.

The researcher wanted to complete math interventions within the classroom to give students the best chance possible to achieve in math. The researcher completed interventions in small groups to be able to provide more direct instruction to students. Small groups can be done in many different ways to be beneficial to students. The size and how the small group is facilitated all help the students (Lou et al., 2001). Doing small group math interventions also may relieve math anxiety that some students may feel from being lower achieving with their math skills.

If the researcher finds a successful way to complete math interventions within the daily classroom, then those methods can help all teachers complete math interventions within their classrooms. A lot of schools can give better reading interventions but cannot give math interventions to students at the same level as reading. This study looked at small group math interventions that can be done within the daily classroom.

Research Ethics

Permission and IRB Approval

In order to conduct this study, the researcher will seek MSUM’s Institutional Review Board (IRB) approval to ensure the ethical conduct of research involving human subjects (Mills, 2018). Likewise, authorization to conduct this study will be seek from the school district where the research project will take place (See Appendix B).

Informed Consent

Protection of human subjects participating in research will be assured. Participant minors will be informed of the purpose of the study via the Method of Assent (see Appendix C) that the
researcher will read to participants before the beginning of the study. Participants will be aware that this study is conducted as part of the researcher’s master degree program and will benefit her teaching practice. Informed consent means that the parents of participants have been fully informed of the purpose and procedures of the study for which consent is sought and that parents understood and agreed, in writing, to their child participating in the study (Mills, 2018). Confidentiality will be protected through the use of pseudonyms (e.g., Student 1) without the utilization of any identifying information. The choice to participate or withdraw at any time will be outlined both verbally and in writing.

**Limitations**

The first limitation of this study could be due to COVID. If the researcher’s school were to have to go to distance learning, math interventions would not be able to take place every day, and they will need to be done via zoom or another video platform. Another limitation could be student’s effort on the assessments given; for example, the day of the week may affect how well they do, their behavior or mood that day, or the time of the day the assessment is given. To try and eliminate some of these limitations, the researcher assessed after lunch every time the assessment was given and also always gave the assessments on Fridays, at the end of the week. A third limitation could be the size of the researcher’s class. The school the researcher teaches at is a small district. Their building is a preschool through twelfth grade. Since the school district is small, the number of students in a class can be fewer. If the class is smaller, there is a chance fewer students will be high-risk, leading to less data to collect. The final limitation could be that some students could be receiving double interventions if the school can also provide some math interventions to students. The school, at times, can provide some students with math interventions, but not many students can receive services.
Conclusions

In this chapter, the researcher explicitly outlined what the study is and the purpose of the study. Small groups, types of math interventions, and how math is taught along with math anxiety were all discussed within the brief literature review. The researcher also discussed some limitations that could present themselves as the study was being completed. The next chapter will discuss specific pieces of literature that helped guide the researcher to know what they wanted to conduct their study on.
CHAPTER 2
LITERATURE REVIEW

Introduction

Many students struggle with math and need interventions to help them close the achievement gap. Schools focus strongly on reading interventions and not as much on math interventions. This causes teachers to have to develop their own ways to help students in math to close the achievement gap. The researcher wanted to conduct a study on small group math interventions to see the impact on students’ math achievement.

There was limited research available on the topic researched than the researcher thought there would be. This made the researcher more interested in conducting the study to learn more about conducting small group math interventions. The researcher used keywords such as scaffolding, interventions for math, small group, flexible grouping, math anxiety, and teaching and learning math. These keywords were beneficial for the researcher to find information relating to their topic to learn more about small group math interventions. Many pieces of literature were reviewed and analyzed to gain further knowledge on how students best learn math and math anxiety, math interventions, and small group teaching.

Body of the Review

Context

Many pieces of literature were reviewed and analyzed to find information about how students best learn math, specific math interventions, and how small groups are best utilized. There were six recommended intervention styles to focus on to best fit student interventions in small groups. The six interventions are systematic instruction, representation, mathematical language, number lines, word problems, and timed activities (Fuchs et al., 2021). There are other
math interventions specifically to help students with fact fluency. Other than online strategies, Cover, Copy, and Compare is a repetitive process that shows improvement with math achievement (Kitchens et al., 2017).

The final pieces of literature reviewed and analyzed were looking at small groups specifically having to do with math interventions. McCrorie (2010) said seven to eight students are ideal, if groups become too small, it can become threatening, and if the groups are too large, students can get by without participating (p. 125). All of the literature reviewed and analyzed helped give the researcher further information about how to best conduct small group math interventions with students to help with math achievement, specifically with students who are considered high-risk according to their Fastbridge math test.

**How Students Learn Math**

When students are learning math, they need to remember numerical facts, and then apply the numerical facts to solve more complex problems (Tomasetto, 2021).

Ay Emanet and Kezer (2021) stated,

The learner should proceed by the following instructions of his teacher, who is a guide in the learning process, with his active participation, not without making sense of the knowledge or by memorizing, but by building up new knowledge by using prior knowledge. (p. 241)

It is beneficial to make sure the teacher teaches the students the math knowledge and skills required to be successful with daily life math.

Math anxiety is an increasing problem for students; it is based on their low ability to complete math tasks. Math anxiety was thought to only affect middle and high school-aged students, but it is being found that younger students are having anxiety about math (Maloney &
Beilock, 2012). Parents’ anxiety about math at times causes math anxiety in students (Szczygiel, 2020). Szczygiel (2020) found that there was more of a correlation with the students’ fathers anxiety affecting students own anxiety about math, than the mother’s anxiety about math effecting students. Math interventions can help relieve some of the math anxiety students are experiencing, in all, making them more comfortable with the math materials being taught. Some students may have anxiety about testing, which will cause them to achieve a lower test score. Helping the students become confident in their math skills will help alleviate some of the anxiety associated with math and testing.

Math Interventions

Math interventions should be addressing task engagement through the motivational strategies being utilized (Gersten et al., 2009). There are many interventions to help with multiple different math strategies, some specifically for fact fluency, others just for basic math skills, to more advanced math skills. The researcher looked at their students’ Fastbridge math scores to drive their research for specific math interventions that would benefit their students.

The first intervention looked at was done by Fuchs et al. (2006), called Hot Math. This intervention completed in two tiers. The first tier is whole-class instruction promoting problem-solving, explicit instruction about transfer, and self-regulation strategies (Fuchs et al., 2006). The second tier is Hot Math tutoring. This is done in small groups, suggested having two to four students only, three times a week. Similar material than what was taught in whole-class instruction is also taught in the small groups. Hot math intervention was found to be effective with students (Fuchs et al., 2006).

There are six recommended mathematic interventions to highlight the needs of students in a small group setting or one-on-one setting. The six interventions are systematic instruction,
representation, mathematical language, number lines, word problems, and timed activities (Fuchs et al., 2021). Systematic instruction is implemented to develop an understanding of mathematical skills. The second recommendation is mathematical language, which teaches students how to use language to communicate and understand mathematical concepts (Fuchs et al., 2021). The third recommendation of math interventions is representation, this intervention is choosing concrete and semi-concrete representations to support students in learning concepts and procedures (Fuchs et al., 2021). The fourth recommendation is the use of number lines to build understanding, and to start preparing students for more advanced math. Word problems are the fifth intervention recommendation, in which word problems are used to deepen understand and support the students to be able to apply mathematical ideas (Fuchs et al., 2021). The final recommended math intervention Fuchs et al. (2021), discussed is timed activities. Timed activities should be used regularly to build fluency in math.

There are many math interventions specifically to help students with fact fluency. Other than online strategies, Cover, Copy, and Compare is a repetitive process that shows improvement with math achievement (Kitchens et al., 2017). Another intervention that helps with math fluency is called the drill and practice method. This intervention has shown large growth in student’s math achievement (Fuchs et al., 2008). The drill and practice method for intervention could also be used on other math strategies, not only fact fluency. Playing games is a fun way for students can master basic facts and improve fact fluency. One example of a game that could be played is Go Fish. For this game, they would match numbers to equal ten or any other number. The student matches have to equal a certain number. Games also allow teachers to see students’ progress towards mastery (Bay-Williams & Kling, 2019). Once students have mastered their basic facts, the other math skills they need to learn will also come a little easier for them.
Focusing on both fact fluency and the standards not mastered yet by the students will help them with overall math achievement.

The final math intervention that the researcher researched is called the gradual release of responsibility model, also known as I do, we do, and you do. There are three or four components to this model. The first component is the I do, which is the focus lesson; the teacher is modeling what the lesson’s focus is (Fisher & Frey, 2008). The second component is we do; this is the guided instruction. According to Fisher and Frey (2008), “Guided instruction can be done with the whole class, but our experience suggests that teachers can be much more precise when they guide the learning of small groups of students” (p. 41). The third and fourth components go together and is you do. This consists of collaborative learning that the students do together, and the independent tasks that the students complete alone (Fisher & Frey, 2008).

**Small Groups with Math Interventions**

Small groups need to be small, but not too small. Smaller groups promote better interdependence with students; larger groups provide more diverse opinions and backgrounds (Enu et al., 2015). According to Enu et al. (2015), a small group is not just about the size but the teaching and learning context and how the teacher facilitates the learning process. Doing interventions in small groups rather than one-on-one offers a more time-efficient way to improve math skills for more students. Also, utilizing other support staff with interventions can be helpful to reach more student needs. (Fuchs et al., 2008; Gersten et al., 2009). Small group cooperative learning was found to improve math achievement with students. The size of the group was not as important, but instead how the learning was facilitated in the group (Enu et al., 2015). When students work in groups, they can experience personal growth and confidence (Caulfield & Persell, 2006).
Flexible grouping can be teacher-led or student-led. When it is teacher-led grouping, groups are formed by ability, interest, or level of skill of content (McKeen, 2019). Flexible grouping can allow the teachers or the students to take control of the learning process. According to McKeen (2019), “Flexible grouping allows teachers to focus on students who share similar qualities, in an effort to improve the efficiency and effectiveness of instruction” (p. 48). Looking at the students’ Fastbridge data, putting the groups together by ability level will best fit the students’ needs. All the high-risk students will benefit from being together to gain the best intervention.

Theoretical Framework

The theory that best supports the variable of math interventions is expectancy value theory. Atkinson (1957), defined the expectancy value theory as

The strength of motivation to perform some act is assumed to be a multiplicative function of the strength of the motive, the expectancy (subjective probability) that the act will have as a consequence the attainment of an incentive, and the value of the incentive:

Motivation = f (Motivation * Expectancy * Incentive). (p. 360-361)

If the students are motivated to do well, they likely will achieve more. In this study, the researcher explained to the students what they are trying to achieve to motivate them and make them want to improve their abilities. In some cases, mixing highflyers with the high-risk students can encourage student motivation within the groups. The expectancy value theory will support the math interventions that were done during this study.

Research Question

The research question was as follows: What impact does small group math interventions have on students’ math achievement with students who are considered high-risk according to
Fastbridge testing? This question will help the researcher determine if math intervention in small
groups is beneficial to students who are considered high-risk according to their Fastbridge
testing. This research helped determine if math interventions in small groups closed the
achievement gap between students.

**Conclusions**

This chapter reviewed many pieces of literature to support math interventions done in
small groups to help with student achievement and close the achievement gap. Small groups,
along with flexible grouping, help target strategies needing to be learned by students better.
Many different math interventions that can help close the achievement gap with students. Math
anxiety is something else that has been found to cause problems when teaching math. Math
interventions done in small groups will help with math achievement and decrease math anxiety
in students. The gradual release of responsibility intervention strategy was shown to be beneficial
for students (Fisher & Frey, 2008). This intervention used in small groups helps students close
the achievement gap with math and help alleviate math anxiety within students. The next chapter
will go into detail about how the action research will be conducted.
CHAPTER 3

METHODS

Introduction

The study was conducted to see if math interventions completed in small groups help students with math achievement. Many pieces of literature were reviewed to find the best intervention for the students. Students tend to have anxiety towards math making it more difficult for them to achieve in math. According to Maloney and Beilock (2012), “Math Anxiety is an adverse emotional reaction to math or the prospect of doing math” (p. 404). By completing math interventions in small groups, students will become more comfortable and confident in their math abilities. The intervention completed for the study was the gradual release of responsibility, which is also known as I do, we do, you do. This study is important for other educators to allow other teachers to know how to conduct interventions in the classroom, which can at times be difficult. Doing math interventions in small groups allows the researcher to be able to accommodate their students better.

A pre-test and post-test as well as a survey was given to the students considered high risk. This helped the researcher know which standards are not mastered by the students to guide the intervention. The survey told the researcher how the students felt about math. Smaller assessments were given after each week to see the students’ progress. The post-test was given when the intervention was completed along with the same survey. The post-test and the survey told the researcher the improvements with the student’s math abilities and how the students felt about math after completing the interventions. The instrumentation and interventions used were chosen to best benefit students and increase the student’s math achievement.

Research Question
The research question was as follows: What impact do small group math interventions have on students’ math achievement with students who are considered high-risk according to Fastbridge testing? This question is to help the researcher determine if math intervention in small groups is beneficial to students who are considered high-risk according to their Fastbridge testing. This research helped determine if math interventions in small groups closed the achievement gap between students.

**Research Design**

The research design selected was a mixed-method of quantitative and qualitative action research. Quantitative data was used more heavily than qualitative data. This design was selected to find an effective way to complete math interventions within the daily classroom structure.

Data was collected before, during, and after the interventions to see if improvements were being made. After looking at the math Fastbridge scores, the students for the small groups were selected. A pre-test was administered to guide the small group math interventions. At the end of each week, an assessment was given to see how well the students understood the standards taught. At the end of the four weeks, a post-test was administered to see the progress made by each student. A survey was given before and after the interventions to see if the students’ level of anxiety decreased after receiving math interventions.

**Setting**

This study took place in a small school district. The building has preschool through grade twelve in it. It is located in Southeastern Minnesota. The town population is about 500 people. The town is known for its school, school sports teams, and farming. The school district has about 300 students. The class sizes from the last five years have ranged from 10 to 21 students (Minnesota Report Card, 2018). The racial/ethnicity for the whole school consisted of 75.5%
Small Group Math Interventions

White, 14.7% Hispanic or Latino, 0.3% American Indian or Alaska Native, 2% Asian, about 3% Black or African American, and 4.6% that are two or more races (Minnesota Report Card, 2018). Students that are English Language Learners make up 7.2%. There are 22.2% of students receiving special education services, and 49.7% of students receive free/reduced-price meals (Minnesota Report Card, 2018).

Participants

The researcher had sixteen students in their classroom. Three students were on IEP’s and receive individualized services with the special education teacher. Fifty percent of the students were females, 50% of the students were males. 50% of the students came from homes where parents are either divorced, separated, or not married. All students ranged from eight to nine years old. About 45% receive Free/Reduced Lunch in the class. About 80% of the students were White.

Sampling

The students chosen for this study were all 3rd graders in the same class. After the students completed their Fastbridge math testing, the scores were looked at to determine which scores put them at high-risk. This is a purposive sample because the researcher chose the students. Etikan et al. (2016) stated, “for purposive sampling, a researcher has something in mind and participants that suit the purpose of the study are included” (p. 1). The participants that were chosen were selected based on their Fastbridge score that put them at high-risk. The students were put all together in one group, which consisted of five students.

Instrumentation

The researcher used a pre-test and post-test for their instrumentation (see Appendices D and E). At the end of each week, a short assessment was given to see if the skills worked on that
week were mastered (see Appendices F, G, and H). The researcher also gave the students a survey before starting interventions and after interventions were completed to check students’ anxiety levels and their comfort level of math (see Appendix I). All students took their math Fastbridge test within the first couple of weeks of school starting. The researcher looked at the scores to see which scores were low enough to consider the students as high-risk in math. Those high-risk students were put in a small group together to receive math interventions. The pre-test was given to the high-risk students to see which 2nd grade standards were not mastered. Although the students were 3rd graders, the researcher wanted to focus on their 2nd grade standards that were not mastered since they wouldn’t have learned many 3rd grade skills when the study was conducted.

The researcher looked at 2nd grade standards and the 2nd grade My Math curriculum book to help create the pre-test and post-test. The pre-test and post-test were designed to have the same number of questions and the same type of questions. There were 21 questions on the pre-test and post-test. Multiple choice and short answer questions were included in the pre-test and post-test. The difference between the pre-test and post-test was that the numbers used for the questions changed, so the students couldn’t try to remember the answers they had gotten before. While doing the interventions, the researcher gave smaller assessments at the end of each week to check progress with the skills being worked on for that week. The pre-test and post-test took approximately thirty minutes, but the students were given as much time as they needed to complete. Each assessment at the end of each week took approximately fifteen minutes, but the students were given as much time as they needed to complete the assessment. The survey was given prior to starting the intervention and after the intervention was completed. The survey did not change; it consisted of 11 questions prior to and after the intervention was completed. The
survey took approximately ten minutes to complete, but students were given more time if needed.

Data Collection

A pre-test was given before interventions began. This helped the researcher determine which 2nd grade standards were not mastered. The pre-test guided the interventions. The standards that the students did not master were the standards taught in the small groups. At the end of each week, a short assessment was given to see the progress on the standard being taught that week. At the very end of the assessment a post-test was given to see the progress that the students made. A survey was also given to the students prior to starting the intervention and after the interventions were completed. This gave the researcher data on their anxiety levels of math prior to the intervention and after.

Most of the data collection was done by looking at the pre-test, post-test, weekly shorter assessments, and the survey. The survey was given because some students have anxiety when taking tests. The researcher also observed the students while conducting the interventions. The researcher observed the students to see how well they could complete the math on their own. While looking at the results of the assessments and the survey, the researcher used the survey to know which students had testing anxiety and used observations to determine if standards were mastered by those students.

Data Analysis

After the four-week time period was over, the post-test and survey was administered. The researcher compared the pre-test and post-test to see if there was growth in the students’ scores. The researcher also compared the survey given prior and the survey given after the interventions to see if math anxiety had decreased. The weekly assessments were also looked at to see if the
standards worked on during that week were mastered. All scores were recorded to be able to see the average growth. Finally, through observation, the researcher analyzed the post-test and weekly assessments to see if there were any areas of inconsistency. The survey results were put into a table to see if anxiety towards math had decreased with the students.

**Research Question and System Alignment.**

Table 3.1 shows the research question and how it is aligned with the variables, design, instruments being used, validity and reliability, technique, and the source.

**Table 3.1.**

*Research Question Alignment*

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Variables</th>
<th>Design</th>
<th>Instrument</th>
<th>Validity &amp; Reliability</th>
<th>Technique (e.g., interview)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>What impact does small group math interventions have on students’ math achievement with students who are considered high-risk according to their reports?</td>
<td>IV: Intervention completed during the small groups</td>
<td>Action Research</td>
<td>A pre-test was given before the intervention begins.</td>
<td>To allow for accurate data and to be able to see progress made by students the pre-test and post-test are the same length. The style of the questions remained the same, but numbers were changed. A weekly shorter assessment was given.</td>
<td>Pre-test and Post-test, end of the week assessments, observation, and surveys</td>
<td>3rd grade students. Sample size was five students.</td>
</tr>
</tbody>
</table>
Small Group Math Interventions

was given. A survey was given prior to interventions starting as well as once interventions are completed.

Procedures

This study was completed at the beginning of the school year. The first couple of weeks of school is getting into the routines and getting familiar with the 3rd-grade curriculum. During the classroom’s math block, the math lesson was taught with the whole group and typically took twenty minutes. After the whole group lessons, the students broke up into small groups and completed math rotations. The rotations that were completed were the ‘on your own’ math assignment from the lesson that was taught, play a math game, play a math game on their iPad, and small group with the researcher to get intervention time. Each rotation was approximately fifteen minutes.

Within the first couple of weeks of the school year, the students completed their Fastbridge testing. This test took approximately thirty minutes to complete and was completed on the students’ iPads. This told the researcher which students were high-risk, some-risk, on target, or above target based on the score they received. The researcher looked at the students that were high-risk according to their score in math and put them in a small group together. If there were more than eight students, the group would be split in half and be two separate small
groups, still receiving the same intervention. For this study, the small group consisted of five students. From there, an additional pre-test was given to the students. This assessment tested them on 2nd grade standards to see which standards those students had not mastered. The pre-test took approximately thirty minutes to complete, but the students were given additional time if needed. The researcher looked at all the pre-tests to determine which standard to start within the small group interventions. The standards that were not mastered were what guided the small group instruction. Prior to beginning the small groups, the researcher gave the students a survey to see the students’ level of anxiety. This survey gave the researcher an idea of how the students felt about math.

Once in the small groups, the researcher followed the gradual release of responsibility strategy, also known as, I do, we do, and you, do to guide their teaching of the standards. The first time being in the small group, the researcher taught a standard that was already mastered by the students. This taught the students what is expected while they were in their small group. After that, the researcher taught the standards that were not mastered. The students worked with the researcher for fifteen minutes every day. At the end of each week, a shorter assessment was given to test the standards that were learned during that week. This shorter assessment took approximately fifteen minutes to complete. The students were given more time to complete the shorter assessment if needed. At the end of four weeks, the post-test was given. The post-test took approximately thirty minutes, but the students were given more time if needed. This showed the researcher what the students had learned since starting and completing the interventions. Additional weeks could have been added on if not all standards were mastered or if not all standards were covered in the four weeks.

**Ethical Considerations**
Protecting students was a top priority to the researcher. The small group consisted of five students. The risk of it being a small group may have caused some students to feel pressured to participate. Since the students don’t understand the material being taught, they may have felt anxiety with being with so few students. The researcher wanted to protect the well-being and mental health of the students. The researcher frequently checked in on the students in the small group. To alleviate anxiety in students, the researcher did not force the students to answer questions. The researcher observed to see which students seemed to feel comfortable with the material and which students were struggling. The researcher made sure to check in more often with the students who seemed nervous about being in the small group. Parent permission was granted to allow the students to participate. The students and the parents understood that they could withdraw at any time with no penalties to them.

**Conclusions**

This chapter looked at how the researcher collected and analyzed the data. The data was collected to see if small group math interventions help students with achievement in math. A pre-test, post-test, a survey, and observation were all used to gain data. The data was collected through mixed-method of quantitative and qualitative action research. The procedure was explained in detail of how the researcher conducted their study. The next chapter will include the results of the study.
CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

A study was conducted to see if small group math interventions increased math achievement. Students were picked based on their Fastbridge math scores. Students who scored a low enough score putting them at high risk were chosen for the study. Five students were a part of the study. Data was gathered by completing a pre-test, weekly assessments, a survey, and a post-test. Students at the school where the study was conducted do not receive math interventions like they do for reading interventions. Students who need extra support in reading will get pulled out to receive title services. Since the school is located in a small community there is less staff members available. The school doesn’t have the resources to provide math interventions as easily. The purpose of conducting this study was to be able to help other educators who also need to support students in math in their general education classroom.

Data Collection

The researcher conducted a study using assessments, and observation. Right away in the year the students completed Fastbridge testing. Based on those scores students who scored a low score putting them at high risk in math were chosen to be a part of the study. This consisted of five students. At the beginning of the study a survey and pre-test were given to the students. The pre-test was made up of second grade standards. Then the researcher analyzed the pre-test to see which second grade standards were not mastered by the students to guide the small group instruction.

The small group intervention consisted of four weeks. The small group intervention followed the gradual release of responsibility format. This is where the teacher starts with an ‘I do’ stage and teaches the skill. Then you move to the ‘we do’ stage, where the students and
teacher completed the math problems together. The final stage is ‘you do’, where the students complete math problems on their own (Fisher & Frey, 2008). Each week followed this same format.

Each week focused on new skills. Week one focused on arrays and even and odd numbers. Week two focused on adding and subtracting two-digit numbers with and without regrouping. Week three focused on adding and subtracting three-digit numbers with and without regrouping. Week four focused on patterns and place value. At the end of the week, on Friday, the five students were given a weekly assessment focusing on what was taught during the week. At the end of the fourth week the post-test was given, and the survey was given again.

While conducting the small groups the researcher observed the students. The researcher paid close attention to which students were able to complete the math problems consistently on their own. The test scores were compared to the observations that were made. If students were consistently answering questions correctly on their own, their test scores would be expected to correlate with that.

Results

**RQ 1: What impact does small group math interventions have on students’ math achievement with students who are considered high-risk according to Fastbridge testing?**

Five students were selected to be a part of the small group math intervention study. These students were chosen based on their math Fastbridge testing scores. To be considered ‘high risk’ their score needed to be below a 196. A score considered ‘some risk’ for the Fastbridge test is a score between 196 and 203. An ‘on target’ score for Fastbridge testing is a score between 204-208. Any score above 208 is above target. Student one scored 190. Student two scored 193. Student three scored 193. Student four scored 191 and Student five scored 191. All five testing
scores were considered in the ‘high risk’ range. The Fastbridge test assessed broad math skills that beginning third graders should already be able to do. A pre-test was created for the five students to complete that was on second grade standards. This helped to guide the small group instruction. The questions that the students got wrong told the researcher which second grade standards these five students still have not mastered.

The week one skills that were being taught in the small group were arrays, and even and odd numbers. When given an array, they needed to write a repeated addition sentence. When given a repeated addition sentence, they needed to be able to draw an array. Then they also had to determine if a number was even or odd. Each week was five days long. Two days were spent on arrays and two days were spent on odd and even numbers. From observation, student two, student one, and student five seemed to grasp the concept of both topics being taught. The week one test results showed the same results as the observations that were gathered (see table 4.1).

Table 4.1 shows the results gathered from the pre-test, weekly tests, and post-test for each student. The percentage was how many correct they scored on each test.

**Table 4.1.**

<table>
<thead>
<tr>
<th>Student</th>
<th>Pre-Test</th>
<th>Weekly Test 1</th>
<th>Weekly Test 2</th>
<th>Weekly Test 3</th>
<th>Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>28.57%</td>
<td>78.57%</td>
<td>48.85%</td>
<td>60%</td>
<td>78.57%</td>
</tr>
<tr>
<td>2</td>
<td>71.42%</td>
<td>92.85%</td>
<td>85.71%</td>
<td>90%</td>
<td>78.57%</td>
</tr>
<tr>
<td>3</td>
<td>64.28%</td>
<td>42.85%</td>
<td>92.85%</td>
<td>70%</td>
<td>100%</td>
</tr>
<tr>
<td>4</td>
<td>35.71%</td>
<td>64.28%</td>
<td>71.42%</td>
<td>20%</td>
<td>57.14%</td>
</tr>
<tr>
<td>5</td>
<td>42.85%</td>
<td>85.71%</td>
<td>71.42%</td>
<td>70%</td>
<td>57.14%</td>
</tr>
<tr>
<td>Average</td>
<td>48.56%</td>
<td>72.85%</td>
<td>74.05%</td>
<td>62%</td>
<td>74.28%</td>
</tr>
</tbody>
</table>
The week two skills taught were adding and subtracting two-digit numbers. Two days were spent on addition, and two days were spent on subtraction with the final day being the week two test. Through observation, all students were able to add and subtract with regrouping correctly except student one. This student was able to add two-digit numbers, but when subtracting would forget to regroup so would get an incorrect answer. The observations that were gathered showed the same results as the week two test (see table 4.1).

The week three skill was adding and subtracting three-digit numbers. Week three had the same results through observation. Student one did great with addition but when subtracting would often forget to regroup. Student four did great with both adding and subtracting while in the small group, but when it came to Friday, doing the weekly test the student rushed through the test and forgot to regroup on subtracting which resulted in this student getting most of the subtraction questions incorrect. This is shown in the weekly test three results (see table 4.1).

The final week, week four, place value and patterns were taught. The students seemed to have the most trouble with patterns. Given a set of numbers counting by ones, twos, fives, and tens, with two numbers missing in the pattern, the students often couldn’t tell what the missing numbers were. Student three, and student two did the best with determining the missing number, but it was more difficult than all other weeks. Through observation all students did great with place value. Looking at the post-test that was given, student three got all three of the place value and pattern questions correct. All other students got question fourteen incorrect which was determining what the missing numbers were in the pattern but got the place value questions correct.

The pre-intervention survey was given the same day as the pre-test. Prior to the pre-intervention survey being given, the students were told that a smiley face would represent yes to
the question, a sad face would represent no to the questions and the straight face would be sometimes. This helped them think about the questions more. All questions were read aloud to so the students didn’t need to worry about not knowing what the statements said. They were told to answer honestly, and their answers would be kept confidential.

The post-intervention survey was given on the same day the post-test was given. The questions were read aloud to them and explained if needed to ensure the students were answering correctly. During the post-intervention survey, they were told the same as the pre-intervention survey, which was to think about the smiley face being yes, straight face being sometimes, and sad face being no. Table 4.2 shows the results from the survey. The first face, on the left, is the pre-intervention survey. The second face, on the right, is the post-intervention survey.

Table 4.2.

Survey Results

<table>
<thead>
<tr>
<th>Questions</th>
<th>Student 1</th>
<th>Student 2</th>
<th>Student 3</th>
<th>Student 4</th>
<th>Student 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I enjoy completing math problems</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
<tr>
<td>2. I am good at math</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
<tr>
<td>3. I am not good at math</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
<tr>
<td>4. Math makes sense to me</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
<tr>
<td>5. I want to get better at math</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
<tr>
<td>6. Math will always be difficult for me</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
<tr>
<td>7. I try my hardest during math</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
<tr>
<td>8. I enjoy answering math questions</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
<tr>
<td>9. Math time makes me nervous</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
<tr>
<td>10. I would rather do a subject other than math</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
<tr>
<td>11. There is only one way to solve math problems</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
<td>☺ ☺</td>
</tr>
</tbody>
</table>

Note: Red means their response changed from the pre-intervention survey. Black means the response was the same as pre-intervention survey.
Data Analysis

The researcher gathered information about the gradual release of responsibility intervention and thought it would work well with their students. The gradual release of responsibility intervention that was used worked really well. While the researcher was teaching the mini lesson the students were engaged and interested. When the researcher moved to the we do stage, the students worked together to solve the problem. The you do stage the students completed on their own. The researcher gave the students a problem on a white board, and they completed the problem on their own. They enjoyed completing the problems on their own after learning how to, they also enjoyed using a white board to be able to complete the problems on.

Comparing the survey given prior to the intervention compared to the survey after the intervention showed the students attitude towards math changed in a positive way. Student one had the same number of improvements with regression. Student four showed their attitude changed in a positive way. Student two and student three had more responses that stayed the same (see table 4.3). The survey could be written different to have yes, no, or sometimes answers rather than the face emotions. This could help alleviate some confusion students may have had while answering the questions.

Table 4.3.

Survey Progress

<table>
<thead>
<tr>
<th></th>
<th>Improved</th>
<th>Regressed</th>
<th>Stayed the Same</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>+5</td>
<td>-5</td>
<td>1</td>
</tr>
<tr>
<td>Student 2</td>
<td>+3</td>
<td>-2</td>
<td>6</td>
</tr>
<tr>
<td>Student 3</td>
<td>+4</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Student 4</td>
<td>+7</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Student 5</td>
<td>+3</td>
<td>+3</td>
<td>5</td>
</tr>
</tbody>
</table>
Comparing the pre-test scores to the post-test scores all students made improvement. Student one made the most improvement from the pre-test to the post-test. Student three also made a good amount of improvement. All other students made some improvement, but it was smaller improvement compared to student one and student three. This shows that small group math interventions done with students who are high risk helped increase students’ math achievement (see table 4.4).

**Table 4.4.**

<table>
<thead>
<tr>
<th>Pre-Test to Post-Test Progress</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>50%</td>
</tr>
<tr>
<td>Student 2</td>
<td>7.05%</td>
</tr>
<tr>
<td>Student 3</td>
<td>35.72%</td>
</tr>
<tr>
<td>Student 4</td>
<td>21.43%</td>
</tr>
<tr>
<td>Student 5</td>
<td>14.29%</td>
</tr>
</tbody>
</table>

The pre-test, post-test, weekly tests, and survey worked well to gather information. The researcher was able to compare their observations with the tests that were given. They correlated with each other majority of the time.

Not many problems arose while conducting the study. The biggest problem that created some difficulties were COVID related. Student three missed a couple days of week three due to having to stay home from COVID. Student one had to stay home a couple days towards the end of week four and therefore was not able to take the post-test and post-intervention survey on the same day as the rest of the students. Student one still made improvements from their pre-test to their post-test. This student could have made more progress, but still made the most progress out of all five students. The other problem that arose were with student five and behaviors. This
student would get frustrated easily and at times would leave the group before we were finished. This resulted in student five missing the last couple of problems on six out of the total twenty days, which could have resulted in his lower post-test score.

**Conclusion**

After analyzing the results from the intervention that was completed, it was shown that the gradual release of responsibility was a beneficial intervention when done in small groups. It also showed a decrease in math anxiety in the students who participated. The pre-test was compared with the post-test results, while taking the weekly tests, observations, and survey into account.
Chapter 5

IMPLICATIONS FOR PRACTICE

A study was conducted to see if small group math interventions helped increase student math achievement. The purpose of conducting this study was to allow other educators to be able to utilize the small group math interventions in their own classroom. The study was conducted for four weeks. Four days were for intervention, and the last day being Friday was for the weekly tests and post-test. The small groups lasted fifteen minutes on each day interventions were being completed. The weekly tests also took approximately fifteen minutes on the last day, while the pre-test and post-test took approximately thirty minutes also done on a Friday. It was found that small group interventions using the gradual release of responsibility for high-risk students helped increase their math achievement.

Action Plan

The researcher will give a pre-test of second-grade standards to all third-grade students. From there the researcher will create small groups based on the areas of need. This is what the researcher did for this study but focused on only one small group to determine if it was beneficial. After seeing an increase in math achievement after completing the study, it showed that it would be beneficial for all students. During small group math rotations each group would complete math interventions at the back table with their teacher. The intervention would follow the gradual release of responsibility structure that was used to complete the study. This will help all third graders, or any grade level that chooses to complete this intervention with their overall math achievement.

This small group intervention could be done at any grade level. The standards that are given during the pre-test should be the grade level prior if given at the beginning of the school
year. For example, if the intervention is being done in a fifth-grade classroom, the pre-test at the beginning of the year would be on fourth grade standards. If the intervention is being completed mid-year or end of the year, the teacher could create a pre-test with the fifth-grade standards that have been covered previously that year.

One way this can be even more beneficial for schools is to combine grade levels. If a school has a block for math interventions, the students can go with different teachers but stay with students that are at the same grade level. For example, third graders could be with fourth or second graders, but all students that would be together would be at the same math level. They would go with a specific teacher that would do the gradual release of responsibility intervention in a small group setting that would be beneficial to their math achievement. This would allow the school grade levels to work together to help all grade levels get math intervention for fifteen to twenty minutes each day. After seeing student Fastbridge scores along with the weekly tests, pre-test and post-test the teachers will be able to see if this intervention is continuing to be beneficial for the students.

If students have mastered all standards from the previous grade level, they would be tested on the current grade level standards. They would be tested on standards until standards are found that they have not yet mastered. From there, it wouldn’t be an intervention but instead having them learn skills they are ready to learn. Mini lessons would be taught using the gradual release of responsibility. Students would still be with other students who are ready to learn the same standards.

**Plan for Sharing**

The researcher plans to share this study with multiple people in the district which they teach in. The study will be shared with the school principal, the Title I teacher, and other general
education teachers. The researcher will also share this information in their PLC group. The data that was collected along with the structure that was followed for the intervention will be shared. The intervention of gradual release of responsibility will be shared on how that was beneficial and how the students continued to stay engaged while the small group intervention was being completed.
REFERENCES


This is to certify that:

**Brittany Folk**

Has completed the following CITI Program course:

**Social & Behavioral Research - Basic/Refresher**
(Curriculum Group)
Social & Behavioral Research
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

**Minnesota State University Moorhead**

Verify at [www.citiprogram.org/verify/?w3ba34165-0e56-4dc6-8483-bbe53eb34290-42658414](http://www.citiprogram.org/verify/?w3ba34165-0e56-4dc6-8483-bbe53eb34290-42658414)
To Whom It May Concern,

August 23, 2021

I, Cori L. McRae, give Miss Brittany Folk permission to conduct her coursework while obtaining her Master’s Degree in Curriculum and Instruction with an emphasis in Literacy.

Miss Folk teaches 3rd Grade in Lyle Elementary School and will be conducting her research within her classroom. Miss Folk will follow all expectations of the University while keeping confidentiality of our students while working on her Institutional Review Board (IRB) paperwork. I trust her professionalism and already know how hard she has been working to obtain this degree.

If you have any questions, please do not hesitate to reach out to me.

Sincerely,

Mrs. Cori L. McRae
K-8 Principal
Director of Assessment and Curriculum
Appendix C

September 16th, 2021

Dear Parent or Guardian,

Your child has been invited to participate in a study to see if small group math interventions help increase their overall math skills.

Your child has been selected because he/she is in my general education 3rd grade classroom. If you decide to participate, your child will be asked to do the following things. These are classroom activities that we would do in a normal day. There is no risk to your child with the activities they will be doing.

1. Your child will be receiving math interventions in a small group within our daily math rotations.
2. Your child will be given a pre-test to see which math skills they don’t already know.
3. Your child will be given a post-test to see which math skills they have learned since doing the math interventions.
   a. Neither pre-test nor post-test will affect their grade in any way.
4. Your child will be given a survey to see their comfort level of their math abilities and math skills.

Principal Cori McRae has given me permission to conduct this study in my classroom. Since this information is being used to help me complete my master’s degree at Minnesota State University Moorhead, I need to have parental consent to use the information in my final paper, that I am required to do as a part of my degree completion. If you sign this form, you give me permission to use the information I gather. All information that I use will be kept confidential, no names will be used. Please note, your child can choose to not participate at any time without consequences.

Please get in touch at any time with questions about this study. You may contact me here at school by calling 507-325-2201 or emailing me at bfolk@lyle.k12.mn.us or the Principal Investigator, Dr. Tiffany Bockelmann at 218-780-0757, or by email at tiffany.bockelmann@mnstate.edu. Any questions about your rights may be directed to Dr. Lisa I. Karch, Chair of the MSUM Institutional Review Board, at 218-477-2699 or by email at irb@mnstate.edu.

You will get an additional copy of this form to keep. You are able to make the decision to have your child participate or not to participate. Your signature indicates that you have read the information above and are allowing your child to participate. You may withdraw from participation in this study at any time after signing the form.

________________________________________________  ______________________________________
Signature of Parent or Guardian                          Date

________________________________________________  ______________________________________
Signature of Investigator                                Date
Appendix D

Name _______________________________ Date _________________

Math Pre-Test

Add or Subtract to answer the questions.

1. $4 + 8 = \underline{\hspace{2cm}}$
   A. 12
   B. 38
   C. 83

2. $8 - 3 = \underline{\hspace{2cm}}$
   A. 4
   B. 5
   C. 6

3. Describe the array with a number sentence.
   \[ \begin{array}{ccc}
   \ast & \ast & \ast \\
   \ast & \ast & \ast \\
   \ast & \ast & \ast \\
   \end{array} \]
   A. $4 + 4 = 8$
   B. $3 + 3 + 3 + 3 = 12$
   C. $3 + 4 = 7$

4. Stan needs an even number of paper clips. How many should he buy?
   A. 19
   B. 13
   C. 16

5. $45 + 28 = \underline{\hspace{2cm}}$
   A. 70
   B. 73
   C. 74

6. $55 - 30 = \underline{\hspace{2cm}}$
   A. 85
   B. 35
   C. 25
7. Mrs. Smith has 27 red pens and 11 blue pens on her desk. How many more red pens does she have than blue pens?
   A. 15
   B. 16
   C. 17

8. 200 + 300 = ______
   A. 400
   B. 500
   C. 600

9. There are 202 red apples and 234 green apples. How many apples are there?
   A. 426
   B. 436
   C. 463

10. 678 – 10 = ______
    A. 688
    B. 668
    C. 658

11. There are 207 green and blue blocks in a box. 116 are green. How many are blue?
    A. 96
    B. 91
    C. 90

Read each question and circle the correct answer.

12. What is another way to write 9 tens and 3 ones?
    A. 39
    B. 90
    C. 93

13. Which number is the same as 594?
    A. Five hundred ninety-four
    B. Five hundred forty-nine
    C. Five hundred ninety

14. What are the missing numbers in the counting pattern 320, 325, ______, 335, _______?
    A. 330, 350
    B. 340, 350
    C. 330, 340
Appendix E

Name _______________________________ Date __________________

Math Post-Test

Add or Subtract to answer the questions.

15. $7 + 6 = \underline{\hspace{2cm}}$
   D. 13  
   E. 37  
   F. 85

16. $10 - 6 = \underline{\hspace{2cm}}$
   D. 4  
   E. 5  
   F. 6

17. Describe the array with a number sentence.
   D. $5 + 5 = 10$
   E. $3 + 3 + 3 + 3 + 3 = 15$
   F. $3 + 5 = 8$

18. Stan needs an even number of paper clips. How many should he buy?
   D. 17
   E. 15
   F. 12

19. $37 + 25 = \underline{\hspace{2cm}}$
   D. 51
   E. 62
   F. 73

20. $47 - 20 = \underline{\hspace{2cm}}$
   D. 67
   E. 35
   F. 27
21. Mrs. Smith has 32 red pens and 15 blue pens on her desk. How many more red pens does she have than blue pens?
   D. 15
   E. 16
   F. 17

22. \(300 + 600 = \) ____
   D. 700
   E. 800
   F. 900

23. There are 306 red apples and 267 green apples. How many apples are there?
   D. 565
   E. 556
   F. 573

24. \(484 - 10 = \) ____
   D. 464
   E. 474
   F. 494

25. There are 314 green and blue blocks in a box. 231 are green. How many are blue?
   D. 86
   E. 83
   F. 80

**Read each question and circle the correct answer.**

26. What is another way to write 6 tens and 5 ones?
   D. 65
   E. 56
   F. 60

27. Which number is the same as 684?
   D. Six hundred eighty-four
   E. Six hundred forty-eight
   F. Six hundred eighty

28. What are the missing numbers in the counting pattern 410, 415, _____, 425, _____?
   D. 425, 440
   E. 420, 435
   F. 420, 430
Appendix F

Name _______________________________ Date __________________

Week 1 Assessment

1. Describe the array with a number sentence.

```
⭐⭐⭐⭐⭐⭐⭐⭐⭐⭐
```
   a. \(3 + 3 + 3 = 9\)
   b. \(5 + 5 + 5 = 15\)
   c. \(3 + 5 = 8\)

2. Describe the array with a number sentence.

```
⭐⭐⭐⭐⭐⭐⭐⭐
```
   a. \(3 + 3 + 3 = 9\)
   b. \(2 + 2 + 2 = 6\)
   c. \(3 + 3 = 6\)

3. Describe the array with a number sentence.

```
⭐⭐⭐⭐⭐⭐⭐⭐⭐⭐
```
   a. \(3 + 3 + 3 + 3 + 3 + 3 = 18\)
   b. \(3 + 6 = 9\)
   c. \(6 + 6 = 12\)

4. Describe the array with a number sentence.

```
⭐⭐⭐⭐⭐⭐⭐⭐⭐⭐
```
   a. \(4 + 5 = 9\)
   b. \(5 + 5 + 5 = 15\)
   c. \(4 + 4 + 4 + 4 + 4 = 20\)
5. Draw an array using this number sentence, \(2 + 2 + 2 + 2 = 8\).

6. Draw an array using this number sentence, \(9 + 9 + 9 = 27\).

**Determine if the number is even or odd, then circle the correct answer.**

7. Is this number even or odd, 17?  
   - Even or Odd

8. Is this number even or odd, 18?  
   - Even or Odd

9. Is this number even or odd, 72?  
   - Even or Odd

10. Is this number even or odd, 39?  
    - Even or Odd

11. Which number is even? 
    a. 45  
    b. 36  
    c. 17

12. Which number is even? 
    a. 40  
    b. 69  
    c. 35

13. Which number is odd? 
    a. 54  
    b. 33  
    c. 12

14. Which number is odd? 
    a. 32  
    b. 46  
    c. 97
Appendix G

Name _______________________________    Date __________________

Week 2 Assessment

Add or Subtract to answer each question.

1. 15 + 61
   a. 75
   b. 77
   c. 76

2. 22 + 61
   a. 83
   b. 80
   c. 84

3. 38 + 10
   a. 45
   b. 48
   c. 47

4. 49 + 21
   a. 710
   b. 71
   c. 70

5. 36 + 29
   a. 65
   b. 62
   c. 66

6. 95 + 36
   a. 130
   b. 132
   c. 131

7. 52 + 68
   a. 125
   b. 123
   c. 120

8. 37 – 25
   a. 12
   b. 52
   c. 21

9. 97 – 22
   a. 75
   b. 74
   c. 119

10. 67 – 15
    a. 61
    b. 72
    c. 52

11. 52 – 36
    a. 16
    b. 20
    c. 24

12. 97 – 29
    a. 62
    b. 68
    c. 75

13. 37 – 18
    a. 45
    b. 19
    c. 20

14. 54 – 27
    a. 25
    b. 26
    c. 27
Name _______________________________ Date __________________

Week 3 Assessment

Add or subtract to answer each question.

1. $452 + 327$
   a. 770
   b. 779
   c. 775

2. $726 + 344$
   a. 1072
   b. 1010
   c. 1070

3. $497 + 566$
   a. 1061
   b. 1063
   c. 1065

4. $819 + 478$
   a. 1217
   b. 1287
   c. 1297

5. $569 + 524$
   a. 1090
   b. 1093
   c. 1083

6. $824 – 712$
   a. 112
   b. 110
   c. 111

7. $536 – 413$
   a. 113
   b. 120
   c. 123

8. $742 – 516$
   a. 226
   b. 234
   c. 220

9. $637 – 356$
   a. 321
   b. 281
   c. 301

10. $498 – 279$
    a. 221
    b. 220
    c. 219
Appendix I

Name _______________________________ Date __________________

**Math Survey Questions**

Directions: Think about how you feel about each statement and circle the emotion that fits you best.

1. I enjoy completing Math Problems. ☺ ☻ ☼

2. I am good at math. ☺ ☻ ☼

3. I am not good at math. ☺ ☻ ☼

4. Math makes sense to me. ☺ ☻ ☼

5. I want to get better at math. ☺ ☻ ☼

6. Math will always be difficult for me. ☺ ☻ ☼

7. I try my hardest during math. ☺ ☻ ☼

8. I enjoy answering math questions. ☺ ☻ ☼

9. Math time makes me nervous. ☺ ☻ ☼

10. I would rather do a subject other than math. ☺ ☻ ☼

11. There is only one way to solve math problems. ☺ ☻ ☼