Master Capstone Project

The Effects of Ability Grouping in a First Grade Math Class

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I give permission to City University to store and use this MIT Project for teaching purposes.

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Abstract

Some first-grade students are struggling to maintain a learning pace equivalent to other first-graders during mathematics instruction. In this classroom action research study, ability grouping is used in an attempt to improve students' performance in first-grade math. The goal was to create an inclusive learning environment where each student's individual learning needs could be met. The participants included nine students from a general education first-grade class at a public elementary school in Washington state. Students were given a written pre-assessment to determine baseline data and the same written test as a post-assessment. The research showed that small group interventions helped to improve all students' performance in first-grade mathematics.

Introduction

This Action Research study took place during a pandemic, referred to as Covid-19. The state of the country affected many of the educational decisions made and potentially influenced student learning. Throughout the study, the students received instruction in many different forms. They were taught remotely, in-person and as a hybrid-mode where some students were in the classroom and some students were streamed into the class from their homes. Each of these different modes of instruction caused changes to the way that the assessments and the intervention was delivered. Another factor related to the pandemic that potentially influenced student learning was that students and staff were required by state law to wear masks and keep a social distance, three feet between students and six feet between staff.

Problem Statement

The problem is that in the first-grade class, some students are struggling to maintain a learning pace equivalent to other first-graders during mathematics instruction as evidenced by student work.

Rationale

Math is an important subject for students to grasp early on in their education because the material builds on previously learned skills. The mathematical skills students learn in elementary school, starting as early as Kindergarten, are the foundations for higher level math concepts (Wriston, 2015). The standards that are set are important benchmarks that help professionals to understand if students are grasping the material and if they are meeting the grade level expectations set by the district. Benders and Craft (2016) pointed out that greater importance has been placed on students to meet standards and make measurable progress in key academic areas, such as math. Benders and Craft (2016) also said that there are a significant number of children who start below standard in math and/or start out with a negative outlook towards the subject.

In first grade, students learn math skills that will be applied in subsequent grades. If students do not meet grade level standards, they risk falling behind and will most likely need to spend time catching up before they can learn new math skills. Benders and Craft (2016) suggested that early intervention programs designed to target early mathematical skills in the primary grades can have positive effects on children's achievement throughout their educational career, thus, it is important to implement math interventions early on in a student's math career.

Literature Review

Educators use various methods of intervention to help enhance the mathematical performance of students at all different levels. Small group learning can be used to focus mathematical instruction in order to target individual student learning needs. Small groups have been proven to raise the mathematical performance of below standard students as well as enhance learning for above standard students (Dixon, Brooks, & Carli, 2018). There are many different ways that small groups can be implemented in the classroom, including ability grouping and flexible small grouping. A teacher's role in small group learning is to be a facilitator of learning (Dixon, Brooks, & Carli, 2018). Within small group learning, teachers use various strategies to teach math, such as scaffolding, peer collaboration and math games.

Small Group Learning

One way that has proven to be effective in meeting the needs of individual students is working with students in small groups. Generally, teachers use small groups as a way to meet students' individual needs and fill in learning gaps (Dixon, Brooks, & Carli, 2018). Dixon, Brooks and Carli (2018), Sloane (2007) and NAEYC & NCTM (2002) supported the use of small groups to formatively assess students and check-in with individuals to see what concepts they may have missed during the regular class lessons. The benefit of teaching students in small groups is that teachers can engage all students as active learners, which experts say is an

important aspect of good mathematics instruction (Kamii & Housman 2000; Kamii & Lewis 2003; Leinwand & Fleischman 2004; Sloane, 2007). By using small groups to engage all students as active learners, students develop a better understanding of the math concepts being taught rather than memorizing or copying down the information.

Not only can math interventions, like small group learning, help those students who are struggling in the subject, but the instruction can also be catered to meet the needs of students who are at or above standard. Small group learning can be effective in helping advance and deepen mathematical understanding for each learner including students who have met the learning target (Dixon, Brooks, & Carli, 2018).

Ability Grouping

Grouping students by their academic abilities or performance levels is referred to as ability grouping (Sloane, 2007). By grouping students based on their abilities, teachers are more easily able to deliver the appropriate instructional strategy to meet students' needs and provide students with the right content at the right pace (Sloane, 2007). Kiefer, Ellerbrock and Alley (2015) found that by facilitating a learning environment that is receptive to their students' individual needs, teachers and peers can support students' motivation and engagement in the classroom.

Ability grouping can be classified into two categories based on how the strategy is implemented: between-class or within-class ability grouping (Matthews, Ritchotte, & McBee, 2013). Between-class ability grouping is the assignment of students to classrooms based on their academic performance so that students are grouped with students of similar academic abilities. This is also sometimes referred to as schoolwide cluster grouping. Within-class ability grouping is when teachers divide students into ability groups within the same classroom (Matthews, Ritchotte, & McBee, 2013).

Ability grouping has been a topic of debate for years as some people have claimed that the strategy does not elicit academic gains for highly capable students and hinders learning for typical students (Oakes; Slavin; Matthews, Ritchotte, & McBee, 2013). Conversely, research conducted by Benders and Craft (2016) showed that below level math students benefit far more from small group learning than from whole-class instruction.

Flexible Small Grouping

Flexible small grouping, also known as a guided math framework, is a modified ability group strategy where students are still assigned to groups based on their academic abilities (Sloane, 2007). Flexible small grouping is more effective than ability grouping because it is an on-going intervention process where students are assessed more frequently and their assignment to a particular group can change based on their performance (Sloane, 2007). Research by Benders and Craft (2016) suggested that flexible grouping gives students the chance to learn at their level and advance to higher levels. Students will therefore get the support they need and will be able to progress towards higher levels of achievement.

Small Group Instruction

Dixon, Brooks and Carli (2018) found that teachers commonly viewed small group instruction as a time to support students who were struggling with mathematical concepts. One form of small group intervention is to support students by providing instruction on prerequisite concepts and skills. For example, if several students are struggling with a specific skill, the teacher would pull these students aside to help fill in the learning gaps and help make sense of the skill. In this strategy the teacher should not continue to provide students with more of the same instruction, but instead use an alternative method that may get the information across more successfully.

Small group settings afford teachers the opportunity to use visual representations and hands-on activities, using tools in the form of different manipulatives and drawings. Students can use these tools as resources to help support their exploration of the mathematical concepts (Ghousseini, Lord, & Cardon, 2017).

Another benefit of small group learning is that the teacher can work more closely with each student, which allows them to better diagnose each student's specific struggles (Dixon, Brooks & Carli, 2018). This setting can also help to guide whole class instruction. Educators will often use small groups to focus on specific mathematical concepts and observe student discussions to determine what instruction is needed during regular, whole class lessons (Ghousseini, Lord, & Cardon, 2017).

Enrichment Groups

Small group instruction can also be used for students who excel in mathematics. Many teachers overlook the benefits that a small group can provide this group of students because they are focused on assisting low-level students (Dixon, Brooks & Carli, 2018). Although it is important to make sure students who are not getting the material catch up to other students, it is also important to address the learning needs of all students. In a high achieving small group, students need to be further challenged. It is difficult to examine the thinking of each student in whole class instruction but in a small group, the teacher can take a close look at the students' strategies and ask them targeted probing questions to extend their thinking (Dixon, Brooks & Carli, 2018).

Scaffolding

As Fox and Hoffman (2011) described, scaffolding is an instructional support strategy whereby teachers incrementally shift the building of knowledge to the students. Scaffolding requires teachers to alter instruction and support for students based on their level of

understanding in the learning progression (Dixon, Brooks & Carli, 2018). The goal is to find the students' Zone of Proximal Development which is defined as the "level of difficulty at which a student can succeed with some support while still feeling challenged by the task" (Fox & Hoffman, 2011, p. 66). Optimal scaffolding can be achieved when the student feels challenged but is provided adequate support to be successful (Fox & Hoffman, 2011).

It is important to provide just-in-time scaffolding, which means giving students the methods to solve the problem after first releasing them to try the math on their own. It is good for students to engage in productive struggle while attempting to solve the problem (Dixon, Brooks & Carli, 2018). Giving students adequate time to process the mathematics encourages them to think critically about the math. The teacher can use this time to observe the students and gather evidence of their current levels of understanding. While observing students, if the teacher notices that the struggle becomes unproductive, this is when they should step in to provide scaffolding or support. The balance between support and productive struggle is an important component of encouraging perseverance in each individual learner (Dixon, Brooks & Carli, 2018).

Scaffolding can be provided in many forms. After observing the students, the teacher should engage with them by asking probing questions. This allows students to examine their thought process and possibly realize their own errors. A simple question like "what are you doing?" can start the conversation where students can start explaining their thinking (Dixon, Brooks & Carli, 2018).

Facilitate Learning

The teacher's role is to be a facilitator of learning for the students (Dixon, Brooks & Carli, 2018). When engaging with students, it is important to encourage the use of academic vocabulary and formal mathematical terminology. Phrases similar to, "I like your language" can reinforce this habit. Another strategy that can be used is allowing students to explain their

thinking in everyday language, and re-voicing their thinking with academic vocabulary (Dixon, Brooks & Carli, 2018).

If students seem stuck, teachers should provide clarity to what the task is asking of them (Dixon, Brooks & Carli, 2018). Pointing out key words and phrases that students should focus on can help simplify the problem for students. If this does not prove successful, breaking down the problem or equation into smaller parts can make a complex task much easier to understand (Fox & Hoffman, 2011).

Once students understand what is being asked of them, teachers can show them examples of what a completed problem looks like. This gives students an idea of what they need to do to solve the problem (Fox & Hoffman, 2011). Referencing prerequisite skills that students have already learned can also be helpful to them. Teachers can remind students to think of strategies they may have seen or used in the past (Dixon, Brooks & Carli, 2018).

Being a good facilitator also means providing students with resources and tools to reason about the mathematics (Dixon, Brooks & Carli, 2018). Visual components and models can be used to help aid students' understanding. The goal is to make sure each student has the tools to begin solving the problem the best way that works for them (Dixon, Brooks & Carli, 2018).

Games in Mathematics

Hull (2014) researched how students must learn "mathematics with understanding" (p. 5) or in other words the relationship between mathematical concepts and mathematical skills. The National Council of Teachers of Mathematics (2000) and the National Research Council (2001) supported this idea. These organizations stated that learning mathematics requires both conceptual understanding and procedural fluency. This means that for students to be successful in math, they need to practice procedures as well as develop their understanding of mathematical concepts (Hull, 2014).

Math games are one way to help students learn mathematics with understanding. Games make math lessons more fun for kids which keeps them engaged and motivates them to practice their math skills. Kids learn from play and when a lesson is presented as a game, they are more likely to engage and retain the information (Hull, 2014).

Math games also help foster valuable thinking and reasoning skills students need to learn mathematics. Worksheets generally do not promote thinking and reasoning skills but instead become mundane tasks where students' only goal is to fill in the blanks. This results in careless errors which may not be discovered until their worksheet is graded, which can sometimes be several days later. This type of learning also provides little motivation for students to learn a skill correctly because there is no immediate correction for mistakes, and often students do not care to find out if they have made a mistake. Worksheets are often completed in isolation which means students who are performing a skill incorrectly will most likely practice the skill incorrectly for the entire worksheet. Sometimes the student will not discover their misunderstanding until several days after.

Although the goal is to have students be able to solve math problems at a reasonable pace, teachers do not want them to stop thinking and reasoning when solving these problems. Students need to be actively engaged in learning, meaning that they need to understand what they are doing, why they are doing it that way, and connect their learning to previously learned skills (Hull, 2014). Online games can be used to actively engage students and foster mathematics learning. Shin, Sutherland, Norris, and Soloway (2012) provided evidence that online games positively impact students' elementary math performance of all ability levels.

Math games motivate students to get correct answers and provide them with more prompt feedback about their abilities (Hull, 2014). Many games require students to work together and therefore encourages them to learn from their peers. Students need time to work independently as

well as collaboratively with their peers. This helps them to conceptualize and absorb the information (Hull, 2014).

Peer Collaboration

Small groups can provide time for students to practice listening to and responding to one another's ideas (Ghousseini, Lord, & Cardon, 2017). When students work collaboratively, they are provided the opportunity to work together while the teacher is able to monitor and help facilitate the conversation as needed (Fisher, Frey & Rothenberg, 2008). Giving students the opportunity to work together and compare their thinking with their peers motivates them and helps to keep them engaged in the lesson (Hamm & Faircloth, 2005; Wentzel et al., 2010)

According to Acar and Yilmaz (2015), "mathematics learning is a naturally social and constructive activity rather than a passive one" (p. 992). In their research, Acar and Yilmaz found that small group work can be one of the best ways for students to work collaboratively with their peers. In a small group, students feel more comfortable speaking out and asking questions. In this structure, students are more likely to express their opinions and take risks which in turn provides them the opportunity for more critical thinking (Acar & Yilmaz, 2015).

Additionally, Acar and Yilmaz (2015) found that students who were not able to solve a problem individually were able to contribute more when working as a group to problem solve (Acar & Yilmaz, 2015). Kiefer, Ellerbrock, and Alley (2015) found that peer support may help give students a feeling of school belonging because they are more often able to relate to and form close relationships with their classmates than with their teachers. This in turn could help lessen math anxieties that can arise when students are studying mathematics.

Conclusion

There is a substantial amount of research that supports the use of small group learning to teach students of all levels in various subjects. In elementary school, small groups are used

primarily to teach reading to young learners but is used much less frequently in mathematics (Jacob & Jacob, 2018).

Question

How does ability grouping impact students' performance in first-grade math?

Theory of Change

The purpose of this study was to determine whether ability grouping is effective in positively impacting first-graders' performance in math. I believed that separating first-grade students into small ability groups would positively impact their performance in math.

Methodology

During this action research study of first-grade students in a suburban public school, the researcher used qualitative and quantitative data to study the effects of teaching math to first-grade students in small ability groups. The goal was to determine how small ability group instruction impacted first graders' performance in mathematics.

Baseline Data Collection

A written pre-assessment was given to participants at the beginning of the study in order to establish how students would be grouped. Students who received a score below 90% would be selected to participate in the intervention. It was determined that nine students would participate in the intervention.

Participants

The participants were nine first graders in the class where the researcher was placed for student teaching. There were five female students and four male students. There was one student on a 504 plan and one student who receives extra help in reading. The student on a 504 plan was accommodated with more frequent teacher check-ins and provided with preferred seating. This student was also allowed extra time to complete assignments and tests, but this was not needed

during the time of the intervention. The student who received extra help in reading was accommodated by having questions on the worksheets read aloud to them and was also allowed extra time to complete assignments and assessments as needed.

Context

Students received small group instruction in groups of three students, once a week for 20 minutes in the afternoon following their lunch break.

Intervention

The intervention used in this study was ability grouping to address students' math needs. Students took a written pre-assessment to determine baseline data. They were then divided up into four small groups; one below-level group of three students, one mid-low-level group of three students, one mid-high-level group of three students.

Baseline data was used to determine which areas students needed small group instruction in. The researcher used this data to plan out the four weeks of small group lessons. All nine students were given the same written assessment as a post-assessment to determine if the intervention was effective in improving their math performance.

The researcher met with each group once a week for four weeks and instruction was developed to meet each groups' specific learning needs. During small group meetings, students who were not in the scheduled group were supervised by their teacher, the researcher's mentor teacher. The school's assigned curriculum, Envision, was used for small group instruction (Savvas Learning Company, 2020). During each session, students engaged in a mini-lesson that addressed a skill that the researcher identified by analyzing the pre-test. The researcher used worksheets, SmartBoard activities, hands-on manipulatives and incorporated math games into the lessons to help students practice the skills that they learned.

During week one, baseline data was collected using a written pre-assessment. During weeks two through five, the researcher implemented small group instruction and recorded observations at the end of each session.

Due to COVID-19 restrictions, the pre-assessment was given to students remotely. Students were then able to meet with the researcher in-person for the first two weeks of the intervention but during the third week, instruction was all remote so the intervention had to be adjusted to be taught online. During the fourth week, the last week of the intervention, some of the students were taught in-person while other students were live-streamed into the small group sessions from their homes. Students were all back in-person during the last week of the study and the post-assessment was administered in-person. Small group instruction was carried out as follows:

Intervention: Week one

Low-level Group. Students re-learned how to make ten by using ten-frame mats and counters to solve problems. Students then took turns solving problems using the SmartBoard counters and ten-frames.

Mid/low-level Group. Students used the SmartBoard to work as a team to count on a number line, then they each completed a worksheet where they counted on a number line. They practiced adding and subtracting on a number line by playing an online game from the Envision math curriculum.

Mid/High-level Group. Students worked with a tally chart that showed the survey results of students' favorite Harry Potter houses. Students surveyed the researcher and other students in the group on the topic and added their votes to the tally chart. Students then answered questions about the tally chart and practiced interpreting and comparing data as well as writing equations to show how they came to the answer.

Intervention: Week two

Low-level Group. Students re-learned to identify tens and ones digits of one-digit and two-digit numbers. They used white boards to write their answers and blocks to show their work. They drew tens/ones tables on their white boards and held up their answers when the teacher prompted them. Then they used place value blocks to show their tens and ones. Students volunteered to come up and draw the numbers using the SmartBoard tools, place value blocks or by drawing sticks for tens and dots for ones.

Mid/low-level Group. Students learned to solve word problems in steps by filling out a graphic organizer. The steps were the following:

Step 1: What do we know?

Step 2: What do we need to find out?

Step 3: What is our equation?

Step 4: Draw and solve

Students then wrote their own word problems to try and stump the other group members.

Mid/High-level Group. Students re-learned how to make a ten when adding two-digit numbers. They learned when it is possible to make a ten and when it is not possible to make a ten. Students used place value blocks to make tens and drew sticks and dots on their worksheets to show making ten.

Intervention: Week three

Low-level Group. (*Note: This was a remote lesson due to Covid-19 restrictions. Involved parties were notified about the restrictions the day before so students did not have any materials with them. Worksheets were sent home the following day for students to work on as extra practice.)* Students observed how when adding tens to a double-digit number, the tens digit changes while the ones digit always stays the same.

Mid/low-level Group. (*Note: This was a remote lesson due to Covid-19 restrictions.)* Students were shown how to solve word problems with missing addends in steps. They deconstructed numbers into tens and ones, then made a table showing all of the ways to show numbers using tens and ones.

Mid/High-level Group. (*Note: This was a hybrid lesson due to Covid-19 restrictions. One student was remote while the other two were in-person.)* Students solved word problems and wrote double-digit addition equations. Then students solved the equations using different strategies. Strategies included making a ten by drawing sticks for tens and dots for ones, or adding the ones first and then the tens. Students played an online math game where they practiced adding double-digit numbers.

Intervention: Week four

Low-level Group. (*Note: This was a hybrid lesson due to Covid-19 restrictions. Two students were remote while the other one was in-person.***)** Students added double-digit numbers by making ten. Students had their own worksheets at home and were following along while the teacher was showing them how to add double-digit numbers by drawing sticks and dots to represent the number, then making ten with the ones and adding up all tens and remaining ones to find the answer. Students then played an online game where they practiced adding.

Mid/low-level Group. (*Note: This was a remote lesson due to Covid-19 restrictions.)* Students learned to solve word problems with a missing addend in steps. Students worked on adding double-digit numbers by first learning how to count-on using a number line and then drawing out the problems using sticks for tens and dots for ones. Once they drew out the problem, they were instructed to make a ten with the ones, then add up all of the tens and remaining ones to find the sum.

Mid/High-level Group. (*Note: This was a hybrid lesson due to Covid-19 restrictions. One student was remote while the other two were in-person.)* Students reviewed adding double-digit numbers and played an online math game where they practiced adding double-digit numbers.

Data Gathering Instruments/Assessments

A combination of quantitative and qualitative data was collected. Quantitative data included artifacts such as worksheets and tests from students. Quantitative data was analyzed by comparing pre-assessment data with worksheets and post-assessment data.

Qualitative data included detailed observation notes that the researcher recorded each day, after the small group intervention, about the participants and the intervention. These notes were used to examine students' progress throughout the intervention.

Assessment #1: Pre- and post-test

The same written assessment was used to measure student math performance before and after the intervention. The written assessment was created using Envision math curriculum (Savvas, 2020) that addressed first-grade math concepts that the students in this class had learned and been tested on throughout the year. The assessment was used to collect baseline data during the first week of the study, before the start of the intervention. The assessment was given again during the last week of the study, once the intervention was complete.

Assessment #2: Observational Notes

The researcher recorded observations at the end of each small group session. Observational data was analyzed by comparing the participants' behaviors and interactions in the small group intervention against whole class lessons. The researcher observed group and individual students' behaviors (Appendix D), including their participation, how they were answering questions, and how they were solving problems. The observational data was used to determine if there were any factors that may have influenced the data.

Action Research Cycles

An Action Research Cycle was followed throughout the course of this study. The Action Planning step needed to be revisited many times throughout the study in order to adjust the intervention to fit the required delivery mode of instruction put forth by school and district administrators.

- **Learning:** Reviewed strategies and literature related to the research topic, problem and intervention.
- **Diagnosing:** Analyzed the lessons and observed the students to diagnose the problem and search for potential solutions.
- **Action Planning:** Planned assessments that would be used to gather baseline data based on the structure of the class and materials that need to be covered. Planned curriculum that would be used for each small group session. Worked with mentor teacher and administrators to figure out a schedule and a space for the intervention that would work best for students.
- **Action Taking:** Assessed students, selected participants, divided them up into ability groups based on the baseline data, and carried out intervention. Took observation notes and assessed students at the end of the intervention.
- **Evaluating:** Evaluated pre-assessment and post-assessment data to measure the success rate of the study. Used observation notes to look for potential limitations and any factors that may have had an influence on the study.

Results

The primary source used to measure the effectiveness of the intervention was a written assessment that addressed first-grade math concepts the students in this class had learned and been tested on throughout the year. The assessment was used to collect baseline data and again to

collect summative assessment data. The results of this assessment showed that on average, participants performed 17.2% better than they did before the intervention took place (Appendix B). The pre-assessment results showed an average of 69.4 % while the post-assessment results showed an average of 86.6% (Appendix B). The results also showed that each of the nine students received a higher score on the assessment after the intervention than they did before the intervention (Appendices A and C).

Since students received their pre-assessment at home due to Covid-19 restrictions, I am unsure if the students worked on any of the problems with other adults in their household. If so, I cannot attribute 100% of the success rate to the small group intervention used.

Conclusions

The results showed that each student performed better on the assessment after the intervention took place, therefore the small ability group intervention was successful in improving students' performance in first grade mathematics. The results also showed that after the intervention, the average of all nine students' test scores increased significantly, by 17.2%. Appendices A and C show that the most significant increase was shown by students 8 and 9 whose math performance both increased by 27.27%. Student 8 improved from a score of 61.36% to 88.64% and Student 9 started with a 45.45% and increased their score to a 72.73%. Five of the nine students received above 90% on the post-assessment and four students earned full points.

Implications or relevance

The results of this study indicated that students of all levels can benefit from added small group math instruction and that it can be beneficial to group students based on their abilities. These findings are important because they demonstrated that using small grouping can be effective in improving students' performance in mathematics. Small ability grouping can be used

in addition to whole-group math instruction and can be easily incorporated into elementary educators' math instruction.

Limitations

There were three limitations related to the Covid-19 pandemic. First, students took the pre-assessment remotely, over an online meeting with the researcher. Due to remote instruction, the researcher had no way of knowing if the student received help from an adult or other member of the family.

Second, some of the small group sessions were remote so students had to work with the researcher over the computer for part of the intervention.

Third, students and staff were required to wear masks, which made communication more difficult. Students and staff were required to social distance and needed to remain six feet apart at all times. Students were also unable to share any school supplies, manipulatives, or other items that could potentially spread germs. This limited the types of activities that could be used during the small group sessions.

Recommendations

The first recommendation is to increase the time frame of the intervention so that more small group sessions could be added, more skills could be addressed, and students could move between groups as skills improved.

A second recommendation is to keep the delivery of the assessments and intervention consistent by working with students in-person for the entire length of the study. This would ensure that there were no outside influences that affected the intervention or the results of the study.

A third recommendation is to have a second enrichment pre-assessment for those students who get above 90%. Then, the researcher could create enrichment curriculum for the highly capable students and their performance could be measured before and after the intervention.

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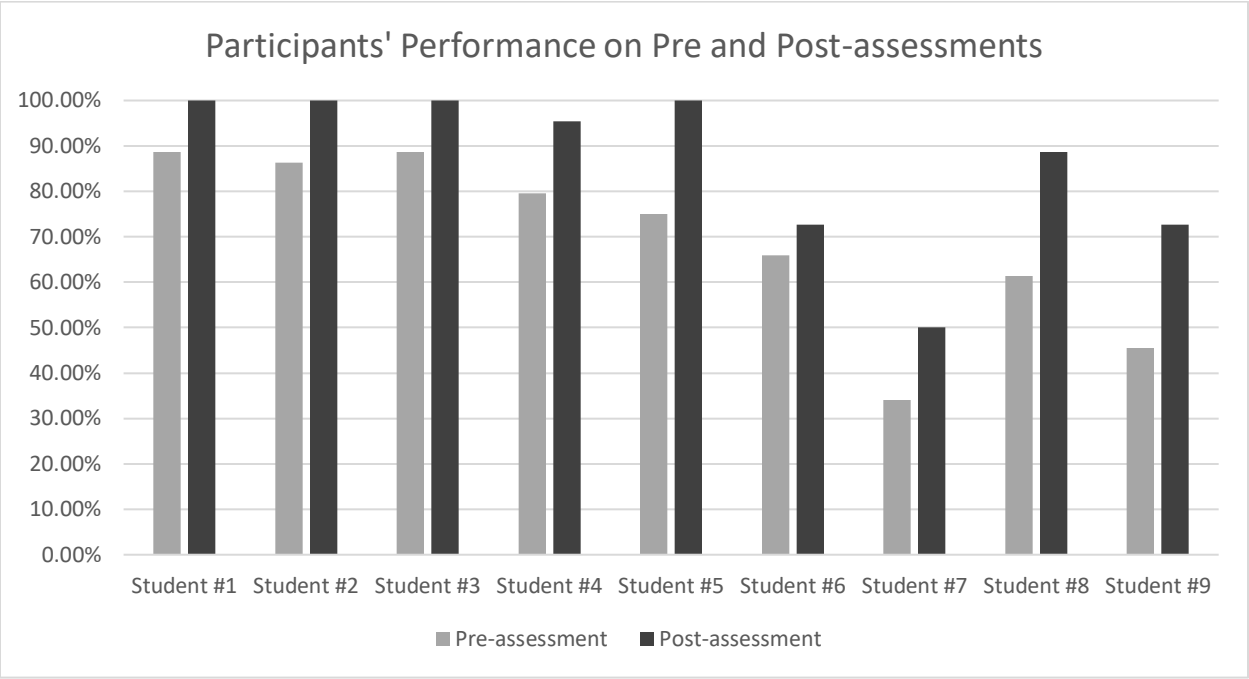
Appendix A

Comparison of student grades on pre-assessment to post-assessment



Appendix B

Average pre-assessment and post-assessment scores

Pre-test Participant Average	Post-test Participant Average	% Change
69.4 %	86.6 %	17.2 %

Note: This table shows the average of all nine participants' scores on the pre-test compared to the average of all nine participants' scores on the post-test. The percent change shows the difference between the two averages.

Appendix C

Participants' individual pre-assessment and post-assessment scores.

Student Name	Pre-assessment	Post-assessment	%Change
Student #1	88.64%	100.00%	11.36%
Student #2	86.36%	100.00%	13.64%
Student #3	88.64%	100.00%	11.36%
Student #4	79.55%	95.45%	15.91%
Student #5	75.00%	100.00%	25.00%
Student #6	65.91%	72.73%	6.82%
Student #7	34.09%	50.00%	15.91%
Student #8	61.36%	88.64%	27.27%
Student #9	45.45%	72.73%	27.27%

Note: This table shows each of the 9 participants' scores on the pre-test compared to each 9 participants' scores on the post-test. The percent change shows the difference between the two test scores.

Appendix D

Observation Notes

Example of template used to take observation notes throughout the intervention.

Date:
Group Level:
Number of students in group:
Details of the small group lesson:

Observation Notes:
How many students were actively participating during small group time?
How many students were volunteering to answer questions?
Are all students getting the correct answers to the questions the teacher is asking?
What methods are students using to solve math problems?
Are students engaged in the lesson?

Individual student observations:

Name of Student #1:
Does the student take initiative and actively participate during small group time? Ask question, answer questions etc.
Can the student explain and/or write about the mathematics?
Does the student seem confident in their math abilities and/or do they say that they like or dislike math?