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The Numeracy Intervention Project

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Capstone Project: An Action Research Project

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Abstract

This study focused on the Numeracy Intervention Project designed to detect gaps in student's mathematical learning. Research took place in the special education setting with one participant. Participants qualified by having an Individualized Education Plan with a goal specific to math instruction. The intervention took place over a two-week time period where the researcher and student met each day for thirty minutes. The Numeracy Intervention provided a scripted baseline assessment, hands on manipulatives, and several specific skill activities. Results from the baseline to post assessment showed no significant results. Study limitations and future research are included.

Keywords: Numeracy Intervention, mathematical learning, special education

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The Numeracy Intervention Project

Recent researchers have identified increase correlation between math and anxiety (Aosi et al., 2019; Sorvo et al., 2020). Passolunghi et al. (2020) defines math anxiety (MA) as a specific form associated with a feeling of tension that interferes with manipulation of numbers, and the solving of mathematical problems in ordinary life and academic situations. According to Sorvo et al. (2020) there is increasing evidence that children report and demonstrate math anxiety as early as first grade. The decline in mathematical performance and limited cognitive thinking ability is one of the negative effects caused by math anxiety (Aosi et al., 2020). Math anxiety may be related to students having to show more work, follow specific strategies, and provide more in-depth explanations of their math answers.

The purpose of this action research was to identify and fill specific gaps in student's math skills. This study implemented the Numeracy Intervention Project with the goal of identifying specific skill gaps for students on an Individualized Education Plan (IEP). The hope with the Numeracy Intervention Project was to help close the gap for struggling math learners, improve teaching, learning, and collaboration. In addition, by identifying specific skill gaps, the intervention may identify students who could be considered for the talented and gifted program (TAG) as well.

Resources collected for this action research study were compiled from the DeWitt library at Northwestern College. In order for each article to be considered for inclusion, articles had to be peer-reviewed, published within the last ten years, and have a focus on mathematical interventions, math achievement, math readiness, intellectual disabilities, and the effective use of manipulatives. A total of 16 scholarly articles were selected as being relevant to the topic of this action research.

School districts can decrease the number of students on a math IEP by analyzing a student's district wide assessment scores. If a student scores below the seasonal benchmark for their grade level, the district can use the Numeracy Intervention Project to determine which stage the student is currently at, along with determining the specific skill that needs to be focused on. Upon the initial intervention, the student may need to be placed in an intervention group to work on the specific skills missed. By providing additional intervention services early on, school districts can begin to close that gap and lessen students' math anxiety.

The structure and organization of the literature review will be categorized into various components, each one with a specific focus to enhance students' math achievement. The literature review will begin by first explaining what math anxiety is and how it affects elementary aged students. The second section will describe the process to create critical thinking and discourse. Next, the literature review will focus on multiple strategy training methods. Finally, the last section of the literature review will focus on the use of manipulatives.

Review of the Literature

Math Anxiety and Math Achievement

Sorvo et al. (2020) conducted a study aimed to examine math anxiety and its relationship with basic arithmetic skills in primary school children, with an explicit focus on two aspects of math anxiety: (a) anxiety about failure in mathematics and (b) anxiety in math related situations. Participants in the study included 1,327 second through fifth grade students from 20 schools in urban and semi-urban areas in Finland. The study was carried out over the course of two school days and the assessment was structured in a way so that none of the math anxiety questions were presented immediately after the basic arithmetic skills tasks. Anxiety about failure in mathematics was assessed with items from the Math Anxiety Questionnaire (MAQ). Anxiety in

math-related situations was assessed with three statements on anxiety or tension arousal in situations involving mathematics. At the conclusion of the study, Sorvo et al. (2020) found that around one-third of participants reported anxiety about being unable to do math, one-fifth reported anxiety about having to answer teachers' questions, and around one-tenth reported anxiety about having to do math in general. Additionally, anxiety about math-related situations was more strongly associated with arithmetic fluency than anxiety about failure, this was most common among second graders and least common among fifth graders.

Passolunghi et al. (2020) also studied math anxiety, however, their focus emphasized emotional and math strategy training techniques. Two hundred and twenty-four 4th grade students were randomly assigned to one of three groups, (a) Math Anxiety Training, (b) Math Strategy Training, or (c) Control Training. Passolunghi et al. (2020) conducted the study over an eight-week duration with sessions happening one time per week for 60 minutes. Pre and post evaluations were conducted within each group with focal points generated towards math anxiety, general anxiety, and math achievement. Results from the study indicated a significant decrease in math anxiety in both Math Anxiety Training and Math Strategy Training, but not in the Control Training. There was a significant improvement in math abilities only for the group trained specifically on math. However, no significant reduction in general anxiety emerged in either one of the three groups.

In another study, Aosi et al. (2019) looked at Science, Technology, Engineering, and Math (STEM) based learning to help overcome math anxiety (MA). The purpose of this study was to determine the effects of STEM based learning and the level of MA for 58 fourth through sixth grade students. Before students received the STEM based learning, 15 students were identified with high MA, 35 students with medium MA, and 8 students with low MA. Upon

completing the STEM based learning, six students were identified with high MA, 32 students with medium MA, and 20 students with low MA. High and low levels of MA were influenced by several factors such as a negative attitude towards math, feeling insecure about not being able to explain what the teacher wants, afraid of peers laughing or making fun of them, not being able to answer the question, or making a mistake. Therefore, the teacher plays an important role in creating, preventing, or reducing MA. Like Passolunghi et al. (2020), Aosi et al. (2019) studied math anxiety with a strategy-based approach utilizing STEM based learning. Aosi et al. (2019) found that with STEM based learning, the MA level of students decreased when given a test and the ability to do tasks that required numerical calculations increased. These findings show that with the right strategy approach, the level of MA for students can decrease.

Schaeffer et al. (2020) took a different approach to math anxiety by focusing on teachers' math anxiety and students' math learning. The study recruited a total of 40 first grade teachers and 497 first grade students. Researchers assessed children's math knowledge at the beginning and end of the school year to examine growth in math learning over the year. Students completed the Woodcock Johnson Applied Problems subtest. In the fall, student scores ranged from 393 to 507 and 424 to 526 in the spring. Teachers' math anxiety ranged from 1.08 to 4.20 out of 5 on the sMARS. It is important to note that there was no relation between teachers' math anxiety and students' beginning of year math achievement. According to Schaeffer et al. (2020), results indicated that teachers' math anxiety was negatively associated with children's math achievement at the end of the school year, indicating the higher a teachers' math anxiety was, the less math their students learned over the course of the school year. The findings from this study correlate with researcher Aosi et al. (2019) that the teacher plays an important role in creating, preventing, or reducing math anxiety.

Critical Thinking and Discourse

Creative thinking ability (CTA) is one of the abilities that must be mastered by students from an early age (Hendra et al., 2019). Mathematics learning should contribute positively to make students' creativity grow and develop. Creative thinking skills are included in high order competence and basic skills continuation; therefore, creativity plays a role in advanced mathematical critical thinking. Hendra et al. (2019) conducted a study to describe the creative thinking ability of elementary students in solving open-ended math problems. Three fifth grade students, all with different mathematical abilities participated in this study. Hendra et al. (2019) utilized observations, tests, and interviews to collect and analyze data. Results showed students with a high or medium level of mathematical skills have good creative thinking ability, whereas students with a low-level mathematical skills have less creative thinking ability. Overall, students who demonstrate low ability still need guidance and attention by the teacher. Therefore, mathematical learning must facilitate and help students' creative and critical thinking skills.

Critical thinking within mathematic skills plays an important role in student achievement and needs to be mastered by students from an early age. Hornburg et al. (2022) poses the question, "Does the timing of children's formal understanding of mathematical equivalence matter for algebra readiness?" The study conducted by Hornburg et al. (2022) spanned over five years which initially included 136 students, however, in the final year only 84 students were still involved in the study. Children were assessed once a year from second through sixth grade. Each session was videotaped and lasted approximately 45 to 60 min. Children's IQ was measured in second grade. Math fluency and mathematics achievement were measured in second, third, fourth, and fifth grade. Reading fluency was measured in third, fourth, and fifth grade. Mathematical equivalence understanding was measured every year and algebra readiness was

measured in sixth grade only. Results show that the earlier children exhibited understanding of mathematical equivalence, the more algebra readiness they exhibited in sixth grade. This study provides the first direct, prospective evidence that an earlier formal understanding of mathematical equivalence in elementary school uniquely predicts algebra readiness in middle school, even after controlling for a variety of potential third variables, including paid lunch status, gender, IQ, and math fluency. Moreover, the timing of understanding of mathematical equivalence was a stronger predictor of mathematics achievement than of reading fluency across the elementary school years.

In order to help students grow and develop their critical thinking skills, teachers must model critical reflective thought and meaningful discourse within each lesson. Broza et al. (2022) conducted a study examining how employing an analytical model to analyze discourse promotes meaningful learning among preservice teachers. The intervention that was implemented was the discourse analysis model which was designed to develop critical observation and promote productive discourse in the spirit of accountable talk within the classroom. The study lasted two years and included 23 preservice teachers. First a pilot study served to activate the initial tool and collect initial data. Next, Broza et al. (2022) researched and analyzed the following: (a) the coding of types of questions asked by preservice teachers; (b) the coding of learners comprehension function; (c) discussion of the link between the type of question preservice teachers asked, learners reactions, and their comprehension performance; (d) preservice teachers' explanations and interpretations of the change occurring, if at all; and (e) preservice teachers' ability to develop hypothetical scenarios at times when they were not satisfied with discourse progress. The study was broken down into two ripples of influence, (a) improving discourse to promote learning by demonstrating hypothetical scenarios, known as the

"local ripple" and (b) perception of the role of teachers and class management, known as the "expanded ripple." Eighty-seven percent of preservice teachers reported satisfaction and a sense of meaning from the intervention. The key conclusion that emerged from this study was that by using an analytical tool to analyze discourse among preservice teachers showed great multidirectional potential.

Strategy Training

While many researchers have studied general math anxiety, critical thinking, and discourse, researchers Gottfried and Kirksey (2021) focused on the frequency and type of math instructional practices regarding activities and skills instruction occurring in inclusive classrooms with students with high-incident disabilities (HIDs). The type of HIDs that were presented throughout the study consisted of children with significant cognitive disabilities (SCDs), children with learning disabilities (LDs), and children with emotional-behavioral disorders (EBDs). The study examined a national data set of responses from kindergarten teachers about instructional practices. Gottfried and Kirksey (2021) found that in classrooms with students with HIDs, teachers reported different frequencies of math activities as well as skills instruction. The differences depended on the type of HID, however, there were no differences in the frequency of time spent on math.

Results from the study showed that teachers reported lower frequency of the use of manipulatives in classrooms with students with SCD but higher in classrooms with students with LDs. In classrooms with students with LDs, teachers reported teaching a higher frequency of practical skills instruction compared with classrooms that did not have students with LDs. Classrooms with students with SCDs, reported teaching lower frequencies of advanced practical skills compared with classrooms that did not have students with SCDs. In addition, classrooms

with students with EBDs, reported teaching higher frequencies of advanced practical skills compared with classrooms that did not have students with EBDs.

Swanson et al. (2015) investigated the role of strategy instruction and working memory capacity (WMC) on word problem solving accuracy for children with and without math difficulties (MD). Research for the study was conducted over two years. Swanson et al. (2015) compared three cognitive interventions to boost word problem solving performance on norm-referenced measures. The interventions focused on verbal strategies that direct children to identify relevant or key propositions within the problems, visual strategies that require children to place numbers into diagrams, and a combined strategy condition that combines both verbal and visual strategies. Results indicated in general, treatment outcomes were higher when WMC was set to a high rather than low expectation level. When set to a relatively high WMC level, children with MD performed significantly better under visual-only strategy conditions and children without MD performed better under verbal and visual conditions when compared to control conditions.

According to Begeny et al. (2019) more than half of students in the USA perform below a proficient level in math. This study examined the effectiveness of specific motivational strategies used in the small group Accelerating Mathematics Performance through Practice Strategies (AMPPS-SG). Of the interventions targeting students' math computation, instructional components such as drill and practice, modeling, speeded practice, using flash cards, and combining two or more intervention components are all reported to have large effect sizes for students with low math achievement or learning difficulties. In the study conducted by Begeny et al. (2019), eight second grade students were split into three instructional groups. Three students were placed in Condition 1 where they received each of the AMPPS-SG instructional

components which include evidence-based strategies: modeling, corrective feedback, guided practice with story problems, explicit timing, and flash card drills. Three students were placed in Condition 2 which included all instructional procedures as well as goal setting, performance feedback, and reinforcement for performance. The last three students were placed in Condition 3 which included all components from Condition 2, as well as a group-based reward contingency. The overall goal of AMPPS-SG is to improve whole number knowledge, including computation and word problem solving for elementary age students with low achievement in mathematics. Results show that students in Condition 1 and 2 performed similarly, while students in Condition 3 (i.e., AMPPS-SG instructional procedures, performance feedback with goal setting, reinforcement for improved math performance, and the You, Me game) performed significantly better.

Another math strategy, studied by Ennis et al. (2018) used low-intensity strategy training to support instruction. Instructional choice is a low-intensity strategy that can improve academic engagement. In this study, Ennis et al. (2018) investigated the effects of within-activity choices offered during math by third-grade teachers to participating students with behavioral and academic needs. Students with and at-risk for EBD are less academically engaged in the classroom than their peers, both typically developing and with disabilities. As a result, students with EBD often have low levels of academic engaged time of 50% or less whereas high-achieving students may engage for 75% or more of the time. Researchers found no clear functional relation between instructional choice and increases in student's academic engagement.

The Effects of Utilizing Manipulatives

There are many different types and benefits to using manipulatives. Bassette et al. (2020) explored the efficiency of app-based manipulatives compared to concrete manipulatives when

teaching mathematical skills to elementary students with Autism Spectrum Disorder (ASD). Participants consisted of three elementary students with an age range of 7-10, each being diagnosed with ASD and receiving special education services. The intervention that was tested was the implementation of three alternating conditions: (a) concrete manipulative using base 10 blocks or fraction equivalency cubes, (b) virtual manipulative using base 10 blocks app or Fraction Tiles app, and (c) paper/pencil with no manipulative. During each stage of the intervention where students used manipulatives to problem solve, each student was given ten seconds to initiate the first step. If the student did not initiate solving the problem independently after ten seconds, the researchers used the system of least prompts to aid the student. Prompts used, in order, included a gesture, indirect verbal, direct verbal, modeling, partial physical, and full physical. Results indicated two participants performed more steps on their own per minute during the app-based manipulative condition compared to the concrete manipulative condition, while one participant was more efficient with concrete manipulatives. Two participants completed more steps independently per minute during the app-based manipulative condition compared to intervention, while the third completed less.

Similar to Bassette et al. (2020) researchers Jimenez and Besaw (2020) explored Early Numeracy through virtual manipulatives for students with intellectual disabilities (ID) and Autism Spectrum Disorder (ASD). Virtual manipulatives have been shown to have a positive impact on students' mathematical achievement as well as student engagement and is a positive tool to help build understanding within the classroom. Participants for this study were two students ages eight and nine, both diagnosed with ASD and mild ID. Upon completion of the study both students showed an increasing trend following the implementation of virtual manipulatives across each of the three math skills (i.e., set making, measurement, and pattern

making) indicating a functional relation. Statistical analysis confirmed a large effect size for both participants.

While researchers Bassette et al., Jimenez and Besaw (2020) studied the effects of app-based manipulatives, Larson and Rumsey (2018) studied the effects of integrating literature and math manipulatives. Children's literature can offer students a glimpse into the daily use of mathematics for many different purposes while helping them relate mathematics to their own lives. Children's literature used for teaching mathematics comes in many different forms. Engaging students in active learning processes, such as the use of math manipulatives, can help them connect concepts and integrate knowledge. During Larson and Rumsey's (2018) study, second grade students listened to a story which involved a balance scale. The scale, which had been placed on the table but not formally introduced, piqued student interest. As the story progressed they spontaneously added pencils and other small objects to the trays of the balance scale to represent the plot. Following the use of the balance scale, students were asked to compare other numbers and explain their reasoning by writing, making connections, and providing illustrations and symbols. As a result, students tackled mathematical concepts while working toward mastery of multiple literacy standards collaboratively.

As we know from Larson and Rumsey's (2018) study, students piqued interest and curiosity when mathematical manipulatives were presented and were able to meet mathematical concepts while working toward literacy standards. Donovan and Alibali (2021) examined whether children view manipulatives as toys or tools. Manipulatives offer children a concrete depiction that is thought to bridge their understanding of concepts that may be considered abstract. Additional support for the use of manipulatives emphasizes active learning, with the child taking the dynamic role in physically manipulating the objects. However, some proposed

reasons for students' less than stellar performance with manipulatives include lessons not connecting the objects to the concepts appropriately, manipulatives that capture attention but are distracting, and lessons focusing on the quantity over quality of activities with manipulatives. Donovan and Alibali (2021) conducted a study with 127 second grade and 32 third grade students. Each student participated in a one-on-one 45-minute session. Students were either told to view the manipulatives as math tools or told not to view them in a specific way. Results found that manipulatives better supported learning if children construed them as mathematical tools. However, data does not support the hypothesis that manipulatives might hinder learning if children viewed them as toys.

Methodology

The goal of this research study was to determine if the Numeracy Intervention Project would help identify specific skill gaps for students on an Individualized Education Plan (IEP). The hope with the Numeracy Intervention Project is to help close the gap for struggling math learners, improve teaching, learning, and collaboration. Research questions for this study are as follows:

RQ1: How will the Numeracy Intervention Project affect the participants' mathematical skill ability?

RQ 2: How will the researcher use the participants progress monitoring skills to guide instruction?

Intended Research Site

This study was conducted in a small rural town in Iowa. The town consists of approximately 10,000 people with three elementary schools, a middle school, and a high school. Of those three elementary schools, two of them house kindergarten through second grade

students. The town is a lower to middle class socioeconomic community. In the specific school this study took place, there are around 140 students with the majority of student ethnicities being White. There is a moderate Hispanic/Latino and African American population, and a low Asian population.

This study was conducted in a public elementary special education classroom used to support students with learning gaps and behavioral disabilities. The special education classroom is one of two in the elementary school building serving students with various types of disabilities. This specific classroom is used primarily as a pull-out, resource setting to help students with academic and behavioral gaps. All students receive their core instruction in the general education classroom.

Participants

There are 97 first-grade students between two elementary buildings. Of those 97 students, 21 students were nonproficient on their MAP math assessment in the fall of 2024, which is 21% of the first-grade class. Out of the 97 students, 14 of them are currently on an IEP with a focus in math, additionally, five more students are going through the Numeracy Intervention process right now. The research participant for this study was a six-year-old African American first grade student who comes from a lower to middle class socioeconomic family and is the youngest of three children.

Intervention

The intervention that was implemented throughout the action research study was the Numeracy Intervention Project. The Numeracy Intervention Project was the independent variable. The dependent variable was the outcome of the Numeracy Intervention Project which was determined by the baseline and post-assessments. The Numeracy Intervention Project

consists of 9 Stages. Stages span from kindergarten to twelfth grade with each stage aligning to the Iowa Common Core State Standards. Each stage builds from one to another and follows the progressions of skills from one grade level to the next. The Stage being focused on for the study was Stage 2. Stage 2 focused on counting from one using physical materials. Students at this stage rely on counting physical materials such as their fingers or various manipulatives. When given a problem involving the joining or separating of sets, students in Stage 2 rely on physical materials to help find the answers. In this stage students will count all of the objects to help answer the math equation. Stage 2 consists of 11 State Standard and 14 instructional skills. The timeline for the intended research study took place over two weeks. Sessions took place each day for thirty minutes. Each day the researcher collected data on the student over the specific skills that they were working on. Data collected was stored in the students Iowa ACHIEVE IEP system along with the online Numeracy Intervention Project platform.

IRB Exemption

This research study required a completed Northwestern Application for Educational Practice Exemption form to be submitted to the Institutional Review Board (IRB). The researcher was approved to be exempt from the full IRB application due to the study meeting the following criteria: the research would be conducted in an already established classroom setting where the students currently attend, it uses normal educational practices, student identity would be protected, data collection would be in the format of educational assessments and observations, behavioral interventions are not included in this study, and the study poses minimal to no risk to the students (“Part 46”, 2018).

Prior to starting the study, the researcher acquired support from the school district and gained appropriate approvals to move forward with the study. Since the participants were

students, parent consent was attained, and parents were informed of the study's intent as well as the option to opt out of the study at any time. Introductory letters and consent forms were drafted, approved by the administration, and provided to parents before starting the study.

Data Collection

To begin the intervention, an assessment probe script was used to ask skill-based probe questions, based on common core standards. If the participant demonstrated mastery of the skill probe question correctly, a "1" was recorded in the "yes" column on the data sheet along with the date. If the participant answered the skill probe question incorrectly, a "0" was recorded in the "no" column on the data sheet. Once the participant demonstrated a "0" for three probe items with one "0" in three separate skill codes, the probe was discontinued for that session. The three "0"'s became the instructional skills that will be taught throughout the week. The participant needed to get two "1"'s consecutively under each skill probe question for mastery on that question. The student received 1 point after getting two "1"'s consecutively on the progress monitoring graph. The cumulative number of points earned after assessing weekly was recorded and graphed.

Data Analysis

The student participating in the Numeracy Intervention Project was given a baseline assessment over skills in Stage 2. The researcher read from a scripted probe assessment and provided all needed materials to the student. The student showed mastery of a skill when they were able to score a "1" on the baseline assessment two consecutive times. A score of "0" was placed on the baseline if the student answered the question incorrectly. The researcher continued the baseline assessment until the student scored a "0" for three separate skill codes, the assessment was then discontinued. Upon discontinuing the baseline assessment, the areas in

which the student scored a “0” would become the instructional skills to work on over the course of the two-week intervention.

During baseline the student mastered skill 2.1, rote counting 0-20 on the first attempt. The student showed mastery of rote counting to 20 by earning a score of “1” on the first day of the baseline assessment. Since the student showed mastery of this skill the researcher continued the assessment and moved onto the following skill. Figure 1 shows the student scored a “0” on day one of the baseline assessment. This skill will become the first instructional skill that will be worked on over the two-week intervention. The researcher worked with the student each day for thirty minutes on various strategies (i.e., counting manipulatives, writing a range of numbers, and filling in a number sequence) referring to counting a specific range of numbers. The researcher will provide direct explicit instruction and demonstration on how to count from a range of numbers. The researcher will scaffold through the process following the I do, we do, you do scaffold. According to Figure 1, the student met mastery of the skill on day four where he earned two consecutive “1”’s. The researcher then began to assess the next instructional skill level.

Figure 1

Students Baseline Score - Mastery: Skill 2.2 Counting forward from a range of numbers 0-20 starting and stopping with any number.

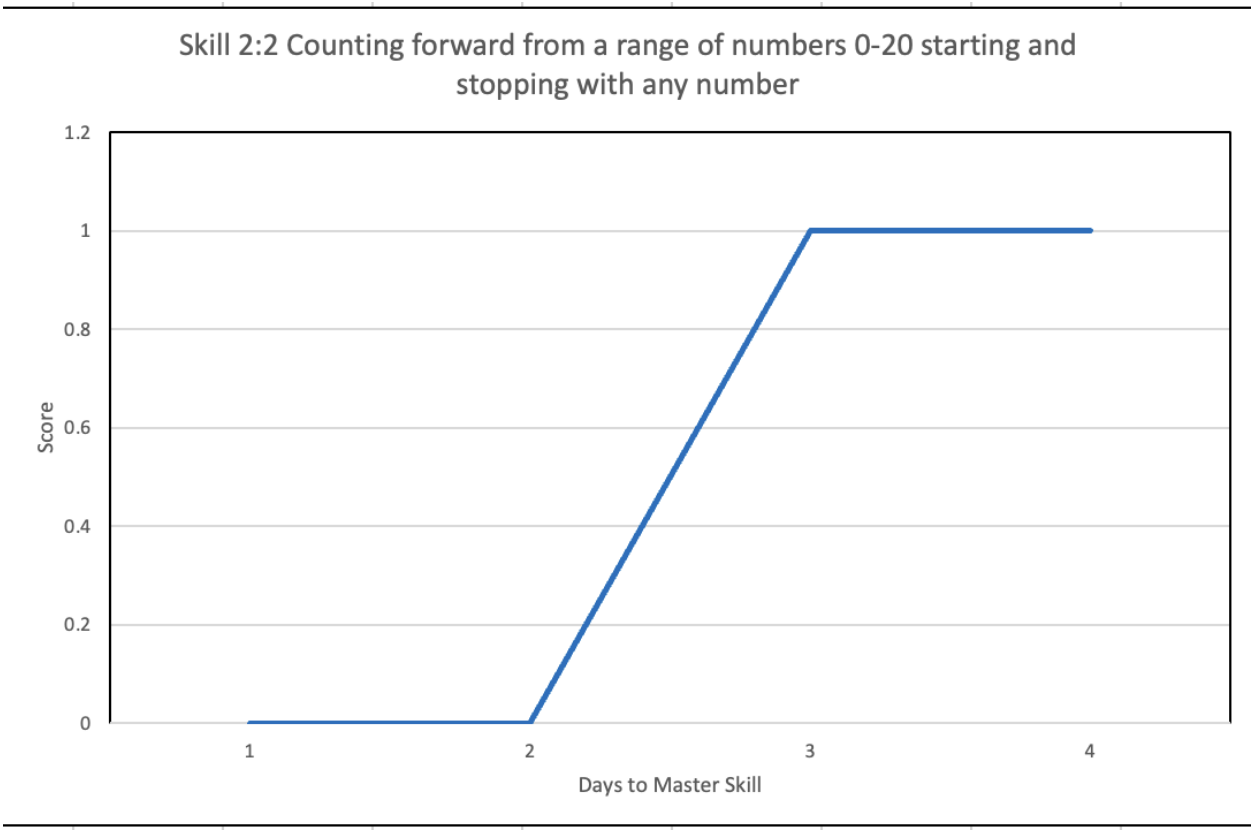


Figure 2 shows the student scored a “0” on day one of the baseline assessment. This skill will become the second instructional skill that will be worked on over the two-week intervention. As seen in Figure 2, on day two the student scored a “1” on the assessment, however he did not score another “1” until day eight. The student received a score of “0” for five consecutive days. Factors that contributed to the student receiving a score of “0” were due to incorrect counting, skipping numbers, and behavioral concerns. Although the student showed mastery of the skill on day nine, the researcher will continue to revisit this skill due to the amount of time that it took for the student to master the skill.

Figure 2

Students Baseline Score - Mastery: Skill 2.2 Counting backwards from 20-0.

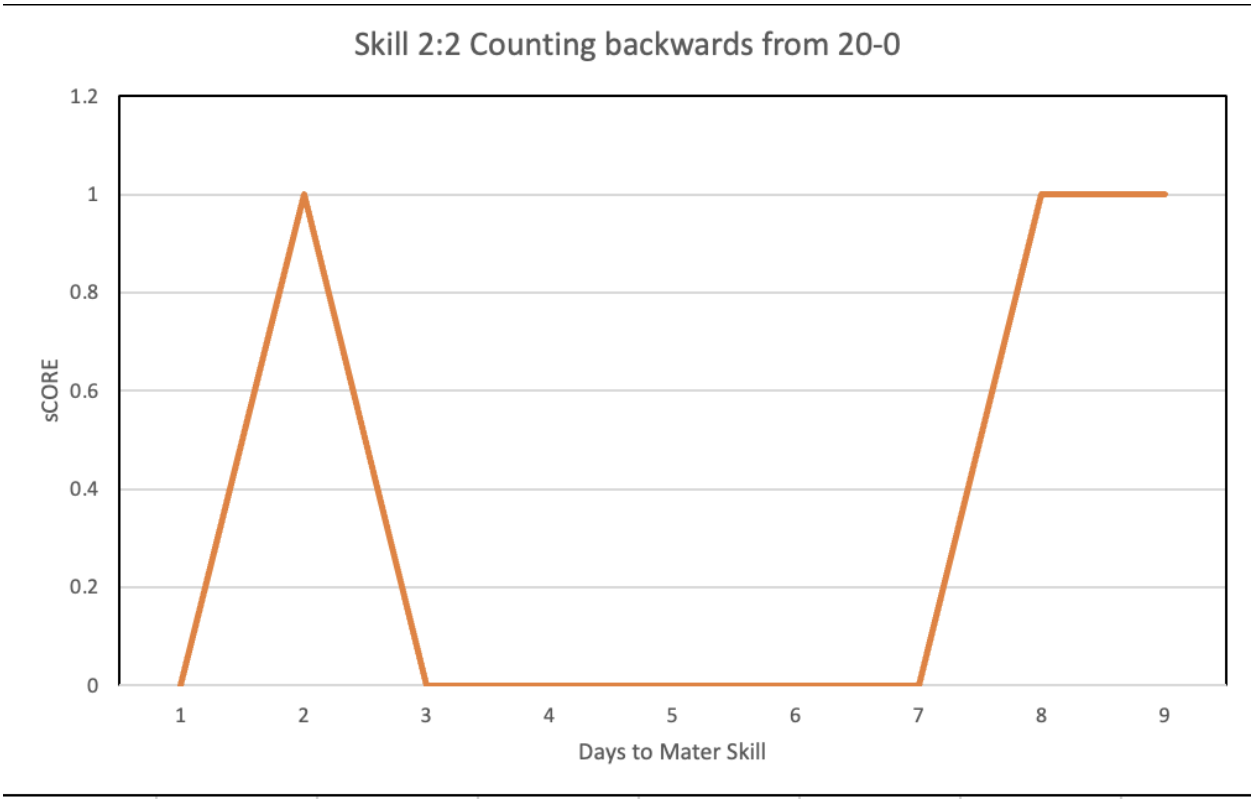
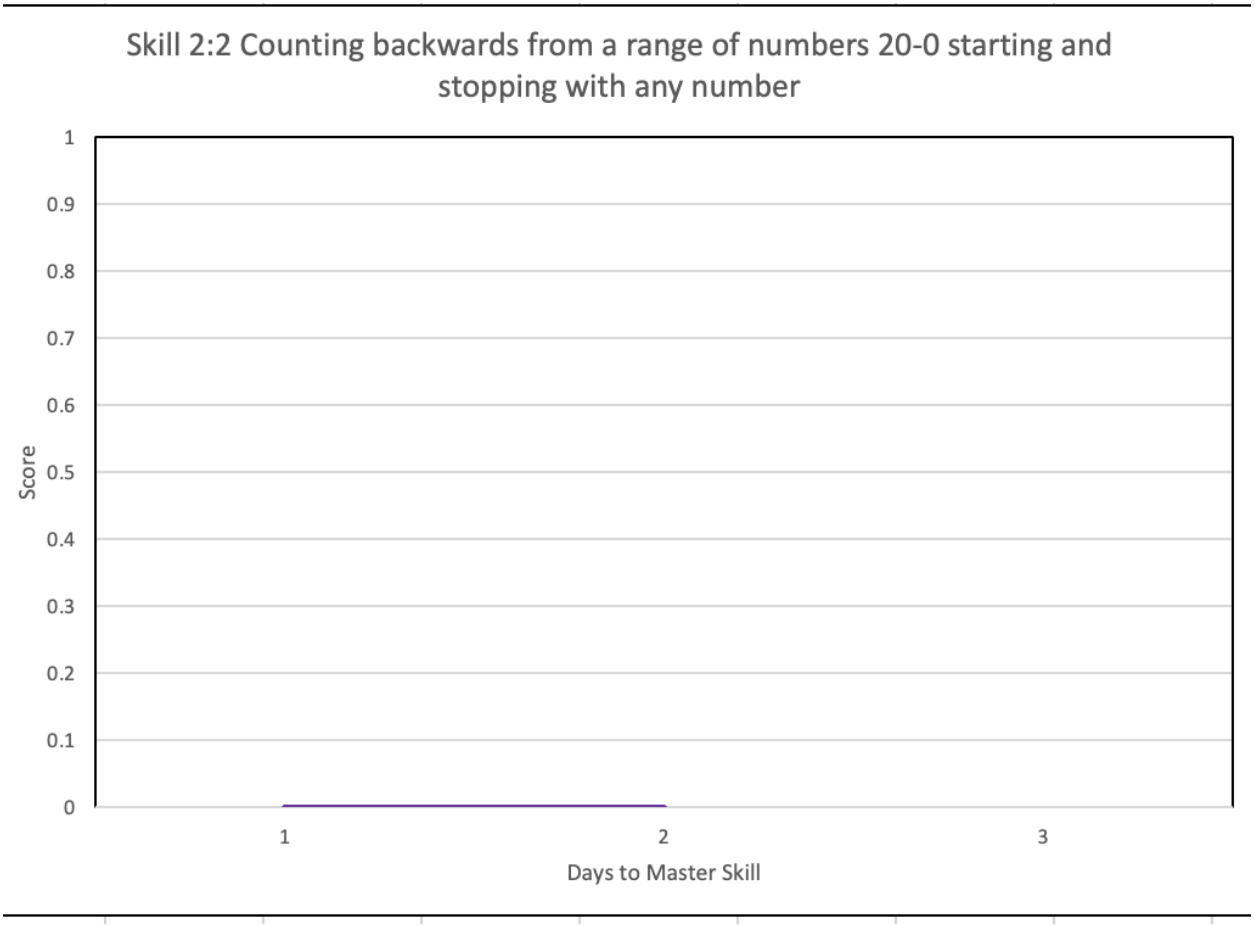


Figure 3 shows the student scored a “0” on day one of the baseline assessment. This skill will become the third instructional skill that will be worked on over the two-week intervention. Due to the student scoring three “0”’s on the baseline assessment, the assessment was discontinued at this point. Figure 3 shows two days of data collection and a score of “0” for each day. The researcher would then focus on this skill until the student shows mastery with two consecutive scores of “1”. Out of 11 state standards and 14 instructional skills the student mastered one standard and one instructional skill during the baseline assessment, and one standard and three instructional skills over the two-week intervention.

Figure 3

Students Baseline Score- Mastery: Skill 2.2 Counting backwards from a range of numbers 20-0 starting and stopping with any number.



A dependent samples *t*-test was conducted to determine whether there was a significant change in student's mastery of skill level following the Numeracy Intervention Project. A baseline assessment revealed the student was able to accurately master one instructional skill level out of four ($M = 0.25$, $SD = 0.5$). The student participated in a two-week intervention where they were taught explicit skill instruction in the following areas: counting forward from a range of numbers 0-20 starting and stopping with any number; counting backwards from 20-0; and counting backwards from a range of numbers 20-0 starting and stopping with any number. Upon

mastery of the instructional skill levels the student was able to accurately solve three out of the four instructional skill areas ($M = 0.75$, $SD = 0.5$). Results of the dependent samples two-tailed t-test revealed there were no significant differences between the baseline and mastery assessment, $t(3) = -1.73$, $p < .182$.

Discussion

Summary of Major Findings

The purpose of this action research was to identify and fill specific gaps in student's math skills. A comparison of data from the baseline assessment to when the student showed mastery, helped determine the impact of the Numeracy Intervention Project. Results from the two-tailed t-test showed no significant differences between the baseline and mastery assessment. Due to the student only demonstrating mastery of one skill on the baseline assessment of Stage 2, this indicated that this student requires explicit skill instruction with multiple learning opportunities and embedded practice both within the special education and general education setting.

Limitations of the Study

There were a few limitations to this specific study. The first limitation was that the intervention was only able to be implemented for two weeks with a total of ten sessions. This time period is not long enough to capture and fully understand the effects of the Numeracy Intervention Project. Due to the length of time that the intervention was implemented the researcher was unable to determine if the skills that the student showed mastery on, would be maintained over a longer period of time.

The second limitation was the number of participants. Only one student was able to be included in the study due to the researcher's current special education roster. The student

demonstrated several signs of behavior throughout the intervention process which made it difficult to complete each lesson.

Further Research

More research is needed on the implementation of the Numeracy Intervention Project. This study focused on a specific group of special education students who required an IEP goal specifically in math. Future researchers should consider implementing the Numeracy Intervention baseline assessment on general education students to determine their specific stage and skill level. By doing this, researchers will be able to check that students in the general education setting are maintaining benchmark and not falling behind.

Future researchers should take into consideration a longer testing period in order to ensure mastery of each skill and progression through each stage. A longer testing period will allow researchers to better understand the length of time it should typically take for students to show mastery of each skill. In addition to longer testing periods, researchers should include a larger number of participants, allowing a wider range of baseline and post assessment scores, along with more data collection.

Finally, researchers should take into consideration student behavior and the effects that it may have on the intervention (i.e., lesson completion, intervention location, manipulatives, and student's current skill level). Having background knowledge of a student's behavior will allow the researcher to prepare coping mechanisms, de-escalation strategies, provide a slower pace of skill instruction, implement breaks and rewards throughout the lesson, and provide positive praise and feedback.

Conclusion

In conclusion, this study provides support by helping target specific skill gaps in special education students. The Numeracy Intervention Project supports previous research by implementing hands on manipulatives and scripted baseline assessments allowing for critical discourse in the classroom. The Numeracy Intervention Project also provides many skill-based activities providing students multiple learning opportunities and strategy training, lessening students' math anxiety. Future research is needed to thoroughly understand the impact that the Numeracy Intervention can have on student's mathematical ability and closing the gap in their mathematical learning.

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