Fall 2020

Growth Mindset and its Impact on Math Performance in Third Grade

Alicia Wenger

Growth Mindset and its Impact on Math Performance in Third Grade

Alicia Wenger

Northwestern College

An Action Research Project Presented

in Partial Fulfillment of the Requirements

For the Degree of Master of Education

Northwestern College

Dr. Daniela Syed

Table of Contents

Abstract

The purpose of this action research is to describe the effects of the application of daily growth mindset lessons upon the accuracy and level of work completion in math assessments. Participants included the researcher's class of 13 third grade students from a small rural Midwest school district. Students participated in a daily growth mindset lesson intervention for a period of four weeks. Data was collected using math assessments and growth mindset surveys. The results concluded that although students can develop an improvement in mindset with intervention, it does not always directly correlate to the improvement of math accuracy and work completion.

Keywords: elementary math, social emotional learning, growth mindset, third grade

Growth Mindset and its Impact on Math Performance in Third Grade

Social emotional learning in the elementary grades has become increasingly visible in classrooms around the world. One component of this type of learning is student mindset. Mindset within students is a reflection of how they view their ability to learn and experience new things. The beliefs and attitudes that children and adults have regarding their own learning and intelligence falls on a continuum. The ends of the continuum are known as fixed and growth mindset. These terms were developed by the psychologist and author Carol Dweck (Robinson, 2017).

In the academic area of math, research shows that mindsets are often fixed and math anxiety is commonplace among students. Neural pathways close and learning becomes difficult. The right amygdala regions of the brain process negative emotions. Hyperactivity within this area of the brain is associated with math anxiety. Given a functional magnetic resonance imaging (MRI) study of 7- to 9-year-old children, authors discovered the correlation between math anxiety and these negative emotions (Young et al., 2012). Stress in the form of anxiety makes a physiological change to the brain. Mindset research notes that we know we can change the brain. As studies have shown people that have this growth mindset see a value in developing math skills. In turn this results in perseverance and higher career aspirations in areas such as science, engineering, technology and math (Degol et al., 2018).

Educators are continually striving to improve student outcomes and build student self-efficacy. Many teachers have taken on a mission to teach students about the brain, its processes, and how they impact learning. The role of teachers is to help students develop growth mindset within the academic setting (Robinson, 2017). Developing this mindset within adults and upper grade students has been attempted and reviewed by many researchers. At the lower elementary

level it is less frequently implemented and studied but is growing in popularity. More and more articles have begun to show that the mindsets of children regarding their ability and intelligence can impact their motivation and in turn, effect the trajectory of their learning (Hamovitz & Dweck, 2017).

The goal of this researcher is to create a growth mindset intervention in a 3rd grade classroom that could impact the math anxiety and fixed mindsets often established early in life. The idea is to turn math into a productive struggle in which students are in charge of their learning. Teaching them to reflect and have a positive outlook on failure will be done with growth mindset training, positive classroom language and teacher modeling. The purpose of the research is to answer the question, will daily growth mindset lessons improve accuracy and work completion in third grade math assignments?

Literature Review

Student Mindset

The following review of literature establishes how the mindset of students in the area of mathematics can be impacted by teacher language and growth mindset interventions. A substantial amount of research shows that students have beliefs about their own intelligence, talent and personal attributes known as mindset (Boylan et al., 2018). These beliefs are shown to impact student dispositions that lead to stronger effort and better academic outcomes (Schmidt et al., 2016; Snipes & Tran, 2017). Students develop what researcher and author Carol Dweck labeled fixed and growth mindsets. Students that see their traits as something that can be improved with effort and time are growth mindset oriented. Students who fall closer to the fixed mindset end of the continuum will see their personal traits as inflexible (Boylan et al., 2018). Students sometimes attribute their failures to their level of intelligence. When mindset is reinforced it creates academic and other behaviors within the classroom. Improving mindset could improve classroom performance in general (Rhew et al., 2018).

In a study conducted by Snipes & Tran (2017), a high percentage of students in upper elementary and high school, indicated that they believed themselves to have a growth mindset. High school students did have a slightly higher rate of positive responses than elementary and middle school students. The report notes this could be due to more training in mindset strategies and concepts as students go through the grades. In the same study, an equally high percentage of students believed that they engaged in academic behaviors. Elementary students had a higher rate of positive responses in the area of academic behavior. In studies teachers believed that their students either had a growth mindset or were able to establish a growth mindset with

intervention and practice (Education Week Research Center, 2016 and Snipes & Tran, 2017). This shows that the teachers often believe more in the potential to improve student performance than the actual students believe in their own abilities (Snipes & Tran, 2017).

Teachers surveyed by Education Week Research Center (2016), responded that they believed student engagement and motivation was the most important factor affecting student achievement. More than 600 teachers coming from a variety of settings, content areas and grade levels were surveyed. Teachers surveyed "strongly agree" that students can learn from failure and should be willing to try new things. According to the teachers surveyed, when students have grit, perseverance and malleable intelligence they are more easily taught. Excitement about learning, persistence and participation in class work are all traits that the teachers believed to be benefits of a student's growth mindset (Education Week Research Center, 2016).

Schroder et al. (2017) used a neurocognitive approach to research through the implementation of event-related potentials (ERP). ERP are small volts of electricity that occur within the brain when it is impacted by stimuli. In their study of 139 children between the ages of five and eight, they evaluated growth mindset correlation to response after failure. The older students did have a stronger growth mindset than the younger students and therefore were more successful in their post-error resilience. This study shows that students who develop these growth mindset attitudes show resilience and better accuracy after failure.

In Keown & Bourke's (2019) study only one out of the ten students participating had a fixed mindset. Observation notes state that this single student was generally unsuccessful within the classroom setting. The student had determination to get things over with, and complete tasks for the sake of compliance or external rewards. In some situations the teacher language only

promoted students to get high grades rather than making social connections. This resulted in the students developing a fixed mindset because they will not always get an A. Keown & Bourke (2019), note that the non-cognitive intelligence of a student is nearly as important as their cognitive intelligence to find success in a classroom. Taking into consideration a baseline of students' mindset would be beneficial to teachers and students.

One must consider that mindset interventions have the potential to be ineffective in a classroom setting. When fourth grade students were given a mindset intervention and a reading intervention in comparison to peers who only received the reading intervention, both increased in reading but there were no differences in the scores between the two groups (Wanzek et al., 2020). In another study about how mindset was related to effort in elementary students, it was discovered that a growth mindset was only moderately connected to a student's effort and there was a weak correlation between effort and fixed mindset (Petscher et al., 2020).

Mindsets in Math

Research shows that there is value in aiming to use growth mindset interventions and strategies to impact student math achievement. This study of seventh to ninth grade mathematics students in Australia showed that growth oriented students were more inclined to strive for growth, be engaged and achieve at a higher level (Bostwick et al., 2017).

There are mixed answers as to whether there are gender gaps in math performance. In a study by Lee, Fox, and Brown kindergarten students showed no gender differences in math proficiency (Lee et al., 2010). In Degol's (2018) research females had lower expectancy beliefs than males, but not lower grades. These beliefs eventually result in differences in future careers, particularly in the areas of science, technology, engineering and math (STEM).

Links between mindset and science, technology, engineering and mathematics (STEM) careers have been examined through research. The study results showed that the more a student ascribed to a growth mindset, the more they valued math. In turn there is a correlation between the student self-concept of math abilities and their motivation to continue to improve their math skills. The value of math did not seem to impact achievement or higher grades. It did however, result in an indirect link between higher task value resulting in a growth mindset and more likely STEM career aspirations (Degol et al., 2018).

The negative emotional reaction to math concepts is called math anxiety. In a study conducted by Peterman & Ewing (2019) second grade students made fixed mindset types of comments and exhibited behavior representative of math anxiety. This anxious behavior when working with math concepts led researchers to evaluate interventions that could reduce math anxiety. Research shows that math anxiety can be associated with hyperactivity, behavior issues, decreased math scores and a fixed mindset (Young et al., 2012; Peterman & Ewing, 2019). Research about math anxiety within elementary aged students is limited. Young et al. (2012) completed a neuropsychological assessment along with a functional magnetic resonance image (fMRI) of 46 seven to nine year old children in San Francisco. The results showed that even in young children math anxiety is connected to an abnormal effective connectivity of the amygdala. This is the region of the brain that is associated with negative emotion. Therefore, it shows that math anxiety can trigger hyperactivity and other behaviors.

When math interventions are combined with growth mindset training such as self-regulation, setting goals and self-monitoring students develop perseverance and show achievement in math. In this study of third grade students it was concluded that performance of fraction skills improved when a fraction intervention was conducted with an embedded self-

regulation component (Wang et al., 2019). Rau suggests that math lessons provide many opportunities for problem solving situations. Asking more open ended questions of students is another way to increase the process of learning rather than the rote memorization of facts. When introducing a new task or project it is helpful to use growth mindset language. Student processes changed from speed to content to process. Students responded to challenging situations by focusing on the process over the product. Teachers should be cognizant and intentions with the questions they use and the feedback they give students (Rau, 2016).

Teacher Impact on Mindset

In studies by Education Week Research Center (2016) and Boylan et al. (2018), teachers believe that teaching growth mindset in classrooms can increase learning. Growth mindset skills in students lead to increased levels of effort, participation and persistence. In both studies teachers surveyed believe that they need training to assist in facilitating growth mindset strategies in their classrooms even though they considered themselves familiar with the concept. In the Education Week Research Center (2016) report, teachers believe that their administration is more aware of growth mindset and its value upon students. As a result, teachers are requesting more professional development on the concepts and implementation of this process (Boylan et al., 2018). They would like to know more about how to encourage students to try new strategies and how to see failure as an opportunity to learn (Education Week Research Center, 2016).

In an elementary school in Kentucky a qualitative research study of third and fourth grade students showed that there were three primary themes that shaped a student's mindset. These were consistent adult support, trying again after failure and the ability to gain intelligence. Of

these three themes, consistent adult support, had the highest impact in shaping a mindset (Keown & Bourke, 2019).

In 2005 a folk ethnographic research project was conducted to find out the perceptions people had of math in a small Midwestern town. The research revealed that although adults in the community believed that math gives youth a more successful future and more opportunities, they also believed that schools are failing to offer effective math education. The author stated that local individuals considered some math teachers to be ill tempered therefore creating fear among students (Lucas & Fugitt, 2009). The interviewee noted that this is often a result of teachers being critical and exhibiting too much pressure. This perspective was shared by several individuals in the community that were concerned that their younger generation were not able to do arithmetic. Examples follow of students unable to calculate a 10% discount at the restaurant or balance a checkbook (Lucas & Fugitt, 2009).

In Palmer & Wehmeyer's (2003) study of goal setting for kindergarten level students, one teacher discovered that she could relinquish power as the teacher and turn over more control to the students. The young students that set goals continued to need teacher support in developing problem solving strategies, offering choices and scaffolding instruction to support learning. This study showed that interventions need trained teacher support to develop student skills and progress. Teachers received training as a large group and also one-on-one so that the model was properly implemented. This consistent adult support was also noted in the following study by Keown & Bourke (2019). All of the students responded to the interviewer that consistent adult support was the most important factor in shaping growth mindset. This was a mix of adults within their homes, older peers and teachers. They were often encouraged by verbal encouragement to try new things, give advice and help to develop a sense of pride in their

classwork (Keown & Bourke, 2019). *"I really like the way you tried all kinds of strategies on that problem until you finally got it."* These encouraging comments are excellent teacher language to promote growth mindset thinking within the classroom (Education Week Research Center, 2016). In a study by West et al (2016) teachers being able to devote time, attention and resources for students in charter schools could be the result of test-score gains. In the study gains were evaluated from fourth to eighth grade. All students had gains regardless of their self-reported non-cognitive skills.

Rau (2016) implemented a study of fourth grade students. This study looked at the language that teachers use with students. The results were an increase in perseverance and resilience over quickness and completion of a product. Students went from speed to process. When teachers strive to develop intentional process-oriented language in their classrooms they show that they value the process of learning. This in turn can encourage students to shift in the direction of a growth mindset rather than a fixed mindset. In an article by Education Week Research Center (2016) some statements that foster growth mindset could include; *"Great job. You must have worked really hard on this. I love how you stayed at your desk and kept your concentration in order to keep working on that problem. You really studied for your test and your improvement shows it."* As teachers use growth mindset interventions within their classrooms they begin to weave the language into the various parts of their school day. It is important to be aware of language during transitions and non-academic times (Rau, 2016).

Mindset Interventions

In a survey teachers responded by stating that connecting with struggling, apathetic or resistant students was one of the biggest challenges when trying to develop a growth mindset within the classroom (Rau, 2016). Rhew et al. (2018), suggests that mindset interventions within the classroom could change self-beliefs and increase motivation. The authors go on to state that there is a relationship between self-efficacy, motivation, achievement and growth mindset interventions. This research suggests that educators that use a growth mindset model find more success when it is combined with the daily curriculum (Rhew et al., 2018). In the study of second grade students by Peterman & Ewing (2019) it is suggested that the first step in an intervention is for the teacher to develop their own abilities to reduce math anxiety and grow their mindset. Once this has been accomplished there are three areas that students can develop. The first is self-image. This is done by teaching children to believe that their intelligence is malleable and they can persevere through failure. The second is looking at the influence of personal factors upon a student's mindset. This can be through the impact of peers, home life, family and teachers. The third factor to assist in developing a growth mindset in the classroom is to be culturally responsive to the students.

In the research of Zeeb et al. (2020) on seventh grade physics students; self-belief, motivation and mindset were measured before and after a six-month training period. Students did report a higher self-belief compared to students that were not given the training. This study showed that teachers may improve the mindset of students with explicit instruction when it is embedded into core academic areas. One of the reasons that this can occur is because students are not connecting the training to academic contents such as reading or math performance. Studies suggest that implementing a lesson integrated mindset training based on a domain-

specific area, like math, rather than traditional general mindset interventions can have a larger positive effect on student self-belief (Zeeb et al., 2020 & Rhew et al., 2018). Schmidt et al. (2016) suggest that the effect size of an intervention can be significant in relation to the outcomes. In their specific intervention it was implemented during a science block and took less than five percent of the student's scheduled academic time each week.

In a study conducted by Palmer & Wehmeyer (2003) students as young as five were able to successfully set goals and implement strategies to complete the goals in the kindergarten classroom. This was done using the *Self-Determined Learning Model of Instruction*. Although many of the interventions and growth mindset instruction has been designed for adolescents, this study uses the model with younger students to evaluate if they were able to become self-regulated problem solvers by setting goals in a preferred content area. Teachers involved in the study were surprised to find that younger students are able to define goals they wanted to accomplish and learn in the classroom. All students showed some improvement after the intervention with the largest growth in the academic area of math. Students that are actively involved in their own learning are able to self-evaluate and revise goals. Establishing these attitudes and abilities early assist students in becoming self-determined (Pamer & Wehmeyer, 2003).

Mindset interventions such as the above mentioned goal setting not only helps students gain control of their learning but also develop skill and interest in academics. In Schmidt et al. (2016) study of seventh and ninth graders the group that did not receive a mindset intervention showed a continual decline in their self-perception of their own interest, control, learning and skill throughout the school year. In comparison, the group that received the mindset interventions eliminated and partially reversed the above mentioned declines (Schmidt et al.,

2016). Peterman & Ewing (2019) suggest that a teacher may ask; "How do these children learn?" "Are students alert and focused?" "How can I make this a more social task?" After the interventions of movement, growth mindset discussions based on math, number talks and journaling were introduced positive responses in all areas of mindset improved and student's classroom interaction increased. The mindset interventions led to students gaining confidence in their abilities, speaking up during lessons, answering problems in front of the class and helping each other solve problems when they got stuck.

Conclusion

A student's self-concept can be located anywhere upon the mindset continuum between fixed and growth. Student mindsets can be impacted by many external factors. Having an awareness of the student population and a baseline of their mindset can assist educators in developing appropriate instruction (Keown & Bourke, 2019). Specifically in the area of math; students have been known to develop math anxiety and fixed mindsets about their skill set that can impact their future experiences through their education and into their career (Peterman & Ewing, 2019). Teachers and interventions can have a significant influence upon these student mindsets by developing a positive classroom experience that includes mindset training (Schmidt et al., 2016). Mindset training within the education setting should be strongly encouraged as the instruction not only impacts student belief about their own ability but also their academic performance overall (Zeeb et al., 2020).

Methods

This research will focus on student's math abilities and work completion in comparison to student mindset. At a research site in Iowa the researcher will uncover whether the student group increased their mindset. It will also examine if student's math scores were impacted by this mindset. Social emotional learning is a common practice in the classrooms of this elementary school. A better understanding of the impact of mindset interventions upon academic performance will assist the program in developing a mindset training as part of their current social emotional learning practice.

Participants

An entire third grade classroom of thirteen students participate in the study. The research site is located within a small rural district with less than 300 students preschool – sixth grade. According to School Digger (2020), Student population is 91% White and less than 5% Hispanic or other races. Students that qualify for free and reduced lunches account for 50.3% of the district. Data collected from 2019 ISASP testing shows 64.3% of third grade students were proficient in math in comparison to 71.7% in the state of Iowa.

The student group consists of seven females and six males with an average age of eight years five months. Student names are not used for data collection, each student is assigned a corresponding number 1-13. Students in this district attend school four days per week. Due to this schedule the mindset intervention is set up on a rotation of data collection after every five academic instructional days.

Measures

The growth mindset survey is a worksheet with five questions pertaining to a student's thoughts and feelings about their own mindset. Questions include; I feel smart. I try my best. I ask for help. I always learn. Mistakes help me learn. Students mark their opinion about each of these with always (2pts), sometimes (1pt), and never (0pts).

Five different math assessments with a total of seven points are developed to use throughout the research period. An assessment is given to all students prior to the intervention. During the intervention students are given an assessment every five instructional days resulting in a total of five assessments during the research period. All math content within the assessments comes from second grade skills and has been previously taught to all of the students in the research group. The first four questions in the math assessment are based on basic operations. One each of multiplication, single digit addition, single digit subtraction, and double digit addition with carrying are used. The second section of the math assessment contains a one-step story problem that results in multiplication. Students receive one point for attempting the story problem, a second point for completing the problem with a drawing or a multiplication sentence and a third point for getting the correct answer for a total of zero to three points.

Procedures

Data was collected by the researcher with permission from the research site's administrator in the 2020-21 academic school year. Student guardians signed forms agreeing to data collection with the understanding that student names would not be used in the reporting. The researcher received an exemption form from Northwestern College's Institutional Review Board (IRB) when conducting this research. The research conducted during the study was viewed as normal educational practice.

Mid-September of the 2020-21 school year, prior to any intervention or conversations about growth mindset, the student mindset survey and the first math assessment are given to students. Starting the following day students begin morning meeting time with the researcher conducting the mindset intervention lessons. Daily for 15 minutes, students watch a video from class dojo, and have a discussion about mindset. The researcher acquired content from a free account at classdojo.com. Videos focus on growth mindset, perseverance, and big challenges. The website also offers discussion questions used in the discussion section of the lessons.

At the end of each five-day period during regular math instruction students are given the math assessment. Students are unaware that the math assessment is linked to data collection or the mindset intervention. At the end of 5 four-day sessions and a total of 15 mindset lessons, a final math assessment and the same student growth mindset survey are given.

Data Analysis Results

As the research was conducted, very little bias was included. The teacher researcher was looking for ways to improve student achievement specifically in the area of math problem solving. The teacher researcher was also interested in implementing growth mindset lessons, a new form of social emotional learning within the classroom. Both the social emotional learning and the math instruction would have occurred independently of each other. By collecting quantitative data the researcher is looking for connections and correlations that would justify further use of the growth mindset lessons.

Growth mindset surveys were given pre and post intervention. The survey comments included; “I feel smart. I try my best. I ask for help. I always learn. Mistakes help me learn”. The multiple choice answers were; always (2pts), sometimes (1pt), and never (0pts). Figure 1 and Figure 2 below show the results of these answers.

Figure 1

Mindset Pre-Survey

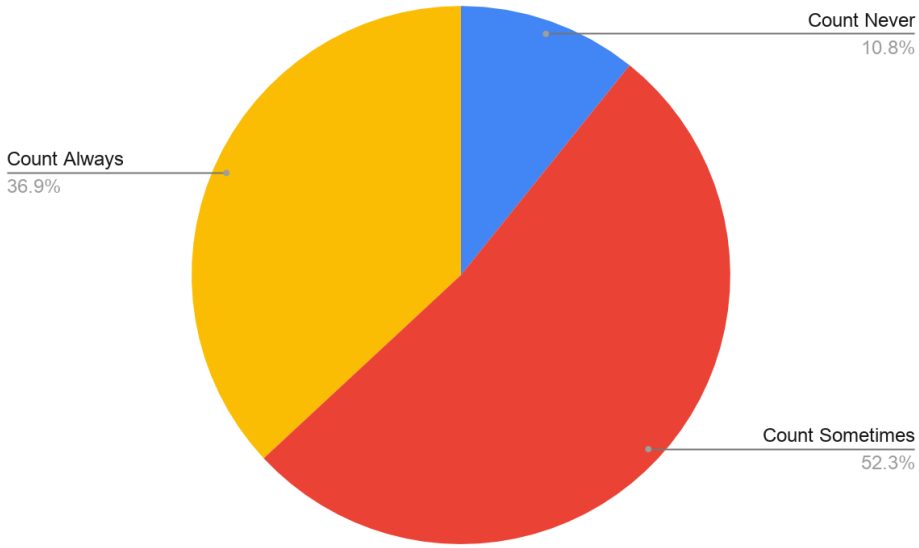
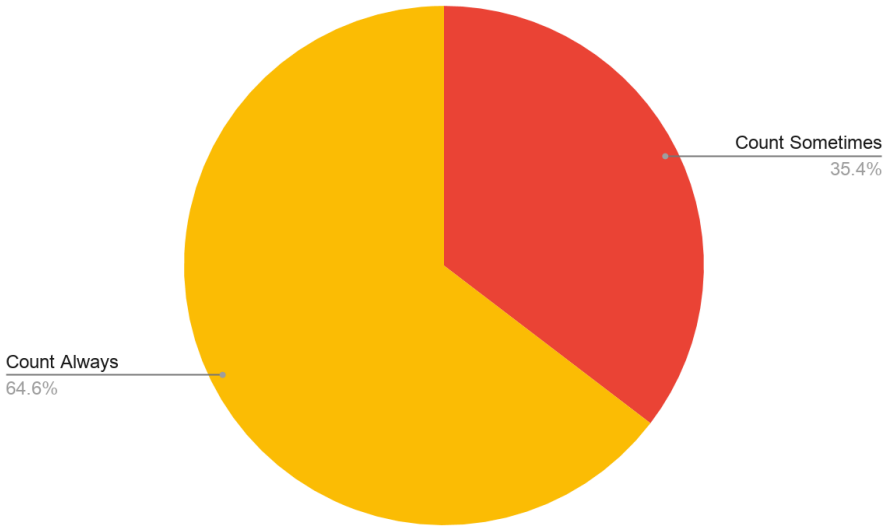


Figure 2

Mindset Post-Survey



Data from the mindset pre-survey in Figure 1 shows that 10.8% of the total answers were never, 52.3% sometimes and 36.9% always. In the mindset post-survey, Figure 2, 0% of the answers were never, 35.4% sometimes and 64.6% always. The survey scores were totaled and averaged. The average mindset pre-survey score was 6.31. The average mindset post-survey score was 8.23. The mean improvement in total scores was 1.92.

Dependent groups, paired *t* test revealed that there was a statistically significant difference in pre-survey scores on growth mindset ($M = 6.30$, $SD = 2.02$, $n = 13$), as compared to post-survey scores on growth mindset ($M = 8.23$, $SD = 1.09$, $n = 13$) following a mindset intervention with strong effect size, $t(12) = -2.89$, $p < .05$, $d = 1.19$. On average there was a 1.92 point difference between the groups.

Looking at individual student data on the growth mindset survey, the score of student 12 had a 0 point change between the pre and post survey. This student answers “always” to all of the questions on both of the surveys. There is an increase in all students except for students 8 and 12 with students 1, 6, and 9 having the most mindset increase. Student 1 and 6 had the largest average growth with a four point increase. Students’ mindset increased an average of 1.92 points over the course of 5 weeks. Out of 13 total students 85% of them had an increased mindset survey score.

Math scores were collected weekly during the intervention. The scores were totaled and averaged by individual students. The data shows that the average scores from week 1 prior to the intervention were generally lower. There are also lower average scores during week 3. During a 9 day period between week 2 and part of week 3 the researcher was not in the classroom and a substitute was filling in.

Individual student math scores were collected. Students 6, 11, and 13 made the highest gains with a four point increase in their math scores from week 1 to week 5. Students 7 and 8 had a 0 point increase and student 10 reduced their score by 1 point.

Dependent groups, paired *t* test revealed that there was a statistically significant difference in math scores on Week 1 Question 1 ($M = 3$, $SD = 1.15$, $n = 13$), as compared to Week 5 Question 1 ($M = 3.77$, $SD = .43$, $n = 13$) following a mindset intervention with strong effect size, $t(12) = -2.99$, $p < .05$, $d = 0.89$. On average there was a 0.77 point difference between the groups.

Dependent groups, paired *t* test revealed that there was a statistically significant difference in math scores on Week 1 Question 2 ($M = 1.15$, $SD = 1.86$, $n = 13$), as compared to Week 5 Question 2 ($M = 2.38$, $SD = .87$, $n = 13$) following a mindset intervention with strong effect size, $t(12) = -2.94$, $p < .05$, $d = 0.85$. On average there was a 1.08 point difference between the groups. More *t* tests were conducted comparing math scores between consecutive weeks. None of these were statistically significant.

The first four problems on the math assessment are based on the understanding of the four operations. The scores of those problems are totaled as “Question 1”. Results show 54% or seven out of thirteen students had an increased score. The remaining problem on the math assessment is based on math word problems. The scores of this problem are totaled as “Question 2”. Problem solving, had better results with nine out of 13 or 69% of students improving their score from week 1 to week 5.

Finally, data for individual students from the mindset survey was compared to individual math score data. In the results of math question 1, it is clear that student number 6 had growth in

both areas. Taking both math question 1 and growth mindset survey results into consideration 6 students, 54%, improved in mindset and also in math score. On math question 2, problem solving, student number 13 showed a significant difference between mindset growth and math problem solving growth. As a group, 8 out of 13 or 62% of students improved on both math question 2 and the mindset survey.

Discussion

Summary of Major Findings

Data analysis shows that most of the third grade students increased their growth mindset by one or more points during the intervention period. Two of the thirteen students had a zero point increase. With this data it is concluded that the intervention did increase the students' belief that they were able to grow their own mindset through strategies such as "the stair step technique" that were taught within the intervention.

A difference between the increase in mindset and the increase in math scores was the goal of the researcher. Each data set showed improvement independently and there were some commonalities between the mindset and the math scores. The results show that there were 6 students that had growth in all three areas including mindset, math general operations and math problem solving. The researcher must note that there was a significant difference in math scores as a whole during the third week. A substitute teacher was part of the classroom during the second week.

Do daily growth mindset interventions impact math accuracy and completion? This researcher concludes that the answer is yes. However, the impact upon math scores is not consistent. Although there was improvement for a portion of the students in the study, it is concluded that the percentage of students that had growth in all three areas was not significant enough. The researcher arrives at the conclusion that student mindset can improve and impact math scores on occasion.

Limitations of the Study

This study was impacted by the limited absence of the researcher / classroom teacher during the second week of data collection. Students were also limited by their own ability to

complete the math problems that were presented. Although the math problems were second grade level and can be considered content already understood by this population, there were a few students that were unable to complete the problems due to learning disabilities and delays. The consideration of these special needs should be considered in future research.

Future Research

Given the opportunity to repeat the research consideration could be made by using a more standardized math testing mechanism such as scores from the STAR math test. One should also take into account a possible control group such as the other third grade class that had no mindset intervention.

Conclusion

The researcher takes all of the data and information from this study into consideration. Due to the fact that results of the growth mindset intervention show an increase in social emotional learning skills, math accuracy and work completion the researcher will proceed forward with implementation of the mindset skills training within the classroom. Students have exhibited math anxiety or continue to experience problems that are difficult for them. The researcher believes that providing this opportunity for students to build their own understanding of their mindset and develop skills to help them in these situations will be to their advantage long term. This competence will be beneficial not only in the area of math, as proven in this study, but also in other academic areas.

References

Bostwick, K. C. P., Collie, R. J., Martin, A. J., & Durksen, T. L. (2017). Students' growth mindsets, goals, and academic outcomes in mathematics. *Zeitschrift Für Psychologie, 225*(2), 107-116. https://doi.org/10.1027/2151-2604/a000287

Boylan, F., Barblett, L., & Knaus, M. (2018). Early childhood teachers' perspectives of growth mindset: Developing agency in children. *Australasian Journal of Early Childhood*, *43*(3), 16-24. https://doi.org/10.23965/AJEC.43.3.02

Degol, J. L., Wang, M., Zhang, Y., & Allerton, J. (2018). Do growth mindsets in math benefit females? Identifying pathways between gender, mindset, and motivation. *Journal of Youth and Adolescence, 47*(5), 976-990.

Education Week Research Center (2016). Mindset in the classroom: A national study of K-12 teachers. Retrieved March 2017 www.edweek.com

Haimovitz, K., & Dweck, C. S. (2017). The origins of children's growth and fixed mindsets: New research and a new proposal. *Child development*, *88*(6), 1849–1859. https://doi.org/10.1111/cdev.12955

Keown, S. R., & Bourke, B. (2019). A qualitative investigation of fixed versus growth mindsets of third and fourth grade students. *Education, 140*(2), 51+.

Lee, J., Fox, J., & Brown, A. L. (2010). Content analysis of children's mathematics proficiency. *Education and Urban Society*, *43*(5), 627-641. https://doi.org/10.1177/0013124510380906

Lucas, D. M., & Fugitt, J. (2009). The perceptions of math and math education in "midville," illinois. *Rural Educator, 31*(1), 38-54.

Palmer, S. B., & Wehmeyer, M. L. (2003). Promoting self-determination in early elementary school. *Remedial and Special Education*, *24*(2), 115-126. https://doi.org/10.1177/07419325030240020601

Peterman, Christina J. and Ewing, Jim (2019) "Effects of Movement, Growth Mindset and Math Talks on Math Anxiety," Journal of Multicultural Affairs: Vol. 4 : Iss. 1 , Article 1.

Petscher, Y., Al Otaiba, S., & Wanzek, J. (2020). Study of the factor, structure, profiles, and concurrent validity of the mindset assessment profile tool for elementary students. *Journal of Psychoeducational Assessment*, 073428292094345. https://doi.org/10.1177/0734282920943456

Rau, A. (2016). Exploring the influence of teacher language on fourth grade students' mindsets: A multi-case study. *The Qualitative Report, 21*(9), 1684-1707.

Rhew, E., Piro, J. S., Goolkasian, P., & Cosentino, P. (2018). The effects of a growth mindset on self-efficacy and motivation. *Cogent Education*, *5*(1). https://doi.org/10.1080/2331186X.2018.1492337

Robinson, C. (2017). Growth mindset in the classroom. *Science Scope, 41*(2), 18-21.

Schmidt, J. A., Shumow, L., & Kackar-Cam, H. Z. (2016). Does mindset intervention predict students' daily experience in classrooms? A comparison of seventh and ninth graders' trajectories. *Journal of Youth and Adolescence*, *46*(3), 582-602. https://doi.org/10.1007/s10964-016-0489-z

Schroder, H. S., Fisher, M. E., Lin, Y., Lo, S. L., Danovitch, J. H., & Moser, J. S. (2017). Neural evidence for enhanced attention to mistakes among school-aged children with a growth mindset. *Developmental Cognitive Neuroscience*, *24*, 42-50. https://doi.org/10.1016/j.dcn.2017.01.004

Snipes, J., & Tran, L. (2017). *Growth mindset, performance avoidance, and academic behaviors in clark county school district. REL 2017-226.* ().Regional Educational Laboratory West, Available from: Institute of Education Sciences. 555 New Jersey Avenue NW, Washington, DC 20208.

Wang, A. Y., Fuchs, L. S., Fuchs, D., Gilbert, J. K., Krowka, S., & Abramson, R. (2019). Embedding self-regulation instruction within fractions intervention for third graders with mathematics difficulties. *Journal of Learning Disabilities*, *52*(4), 337–348. https://doi.org/10.1177/0022219419851750

Wanzek, J., Otaiba, S. A., Petscher, Y., Lemons, C. J., Gesel, S. A., Fluhler, S., Donegan, R. E., & Rivas, B. K. (2020). Comparing the effects of reading intervention versus reading and mindset intervention for upper elementary students with reading difficulties. *Journal of Learning Disabilities*, 002221942094928. https://doi.org/10.1177/0022219420949281

West, M. R., Kraft, M. A., Finn, A. S., Martin, R. E., Duckworth, A. L., Gabrieli, C. F. O., & Gabrieli, J. D. E. (2016). Promise and paradox. *Educational Evaluation and Policy Analysis*, *38*(1), 148-170. https://doi.org/10.3102%2F0162373715597298

Young, C. B., Wu, S. S., & Menon, V. (2012). The neurodevelopmental basis of math anxiety. *Psychological Science*, *23*(5), 492-501. https://doi.org/10.1177/0956797611429134

Zeeb, H., Ostertag, J., & Renkl, A. (2020). Towards a growth mindset culture in the classroom: Implementation of a lesson-integrated mindset raining. *Education Research International*, *2020*, 1-13. https://doi.org/10.1155/2020/8067619