Strategies for Developing Growth Mindset in a Seventh Grade Mathematics Classroom with Hispanic Students in a Low Socioeconomic Secondary School

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Abstract

This thesis aims to address the following question: What is the impact of growth-mindset-developing strategies on the perceptions of math self-efficacy among Hispanic students from low socio-economic status (SES) background in a seventh-grade math classroom? The introduction of the Common Core State Standards and the eight mathematical practices shifted the pedagogical context in how teachers present math learning to students (National Council of Teachers of Mathematics, 2015). As a result of this pedagogical shift, a heightened focus and need to teach students non-cognitive skills emerged. The growth mindset developing interventions chosen for this project, are informed by the following theoretical frameworks: incremental (growth mindset), entity theory (fixed mindset), and self -efficacy theory (Bandura and Dweck, 1985). The interventions focused on teaching students growth-mindset-developing strategies in order to help them develop a growth mindset through a conscious transformation of their views of intelligence as malleable rather than fixed. Recommendations were made for future research with an underlying focus on the implications for practice, as these emerged, from the observed effects that growth-mindset developing strategies had on students' academic and social success.

Dedication

I dedicate my work to my parents, who sacrificed so much to ensure that my sisters and myself reached our potential.

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Chapter One

Introduction

The purpose of this study is to investigate how the use of growth-mindset-developing strategies influence students' views of math self-efficacy. This action research is guided by the following research question: What is the impact of growth-mindset-developing strategies on the perceptions of math self-efficacy among Hispanic students from low socio-economic status (SES) background in a seventh-grade math classroom? Students who struggle academically experience low-perceived efficacy, lack of perseverance, and/or a negative disposition towards learning (Bandura, 1997; Duckworth, Peterson, Matthews & Kelly, 2007; Dweck, 2006, 2007b, 2010; Schmidt, Shumow & Kackar, 2017). With the introduction in 2009 of the Common Core State Standards (CCSS) and the eight Mathematical Practices, teachers are required to introduce math concepts to students in ways they can relate to real life with the goal that students develop mathematical reasoning towards lasting learning rather than memorizing procedures (California Department of Education, 2018). This new implementation stresses the growing need for students to develop skills that can help them address these new challenges. Developing a growth mindset may be the tool that aids students in adapting to the changing academic demands they encounter as they transition through their educational path.

Typically, when students transition through grades the curriculum gets harder, the grading becomes more rigorous and the environment less personalized. For example, Blackwell, Trzesniewski, and Carol (2007) studied a group of 400 students transitioning into seventh grade. They reported that as a whole, most students showed a decline in motivation and grades, and this was due partly to their transition from elementary to seventh grade. However, this was not the

case for all students. Students with a growth mindset showed increased grades during their middle school years.

Growth and Fixed Mindset

A person with a growth mindset (Dweck, 2006) believes that they can develop their abilities over time through effort and hard work. People with a growth mindset become life-long learners and when encountered with challenges, exhibit a greater perseverance than those with a fixed mindset. On the other hand, people with a fixed mindset believe that they cannot improve their intelligence. This belief has negative consequences on their development of perseverance, self-efficacy, and learning disposition (Blackwell et al., 2007). People with a fixed mindset focus on their "level" of intelligence rather than on engaging in practices to improve their cognitive and problem-solving skills. They believe they cannot control their successes and failures, because these are determined by their "level" of intelligence. Furthermore, people with a fixed mindset believe that talent alone can help a person be successful, without effort (Dweck, 2006, 2007b, 2010). When teachers help students develop a growth mindset, they are also encouraging, students to develop the perseverance and passion needed to achieve long-term goals (Dweck, 2007b, 2010; Duckworth et al., 2007).

The lack of positive development of non-cognitive skills in students in areas of perceived math efficacy, perseverance, and/or learning disposition affect students' achievement and their college and career readiness. The results of a study by Paschall, Gershoff, and Kuhfeld (2018) detailed a growing math achievement gap since 1993 between poor and non-poor Hispanic students between the ages of 13 and 14 years old. What is further concerning about these data is that they show an increasing achievement gap in mathematics for low socio-economic students in higher grades (Arrivillaga, 2011). Using data from a longitudinal study, Riegle-Crumb and

Grodsky (2010) concluded that Hispanic youth consistently fall behind their White counterparts and this fallback does nothing to close the achievement gap.

When examining such a complex issue as the achievement gap, it is important to review how Hispanic students compare with other ethnic groups and how Hispanic students compare to other students nationwide. The comparison of the achievement gap between Hispanic students and other ethnic groups provides a view of the discrepancies in academic proficiency between ethnic groups. Seeing how Hispanic students compare to other students nationwide helps in determining what percentage of Hispanic students are at or above proficiency in mathematics nationally.

The narrowing of the achievement gap and the goal of preparing students to be college and career ready is something that educators across all levels continue to undertake. Teachers can continue to work towards achieving these goals by looking at factors such as self-efficacy, perseverance, and a student's disposition towards learning how growth-mindset-developing strategies positively affect college and career readiness when taught to students.

Recent Trends in the Achievement Gap

Data from the National Assessment of Education Progress (NAEP), the largest evaluator of education in the United States, reveal trends in proficiency levels and trends in the achievement gap between groups of students in the United States. The results of the 2017 NAEP mathematics assessment for eighth grade students (National Assessment of Education Progress, 2018) demonstrate that there is no significant change in the 24-point achievement gap between White and Hispanic groups since the last administered assessment in 2015. Effectively, the academic proficiency of Hispanic students is less than the academic proficiency of White students. In fact, comparing 1990 and 2017 assessment data, the achievement gap in mathematics

between White and Hispanic students holds the same 24-point difference. Nationwide, the 2017 NAEP mathematics assessment results demonstrate that 34% of eighth grade students scored at or above proficiency, with only 20% of those students being of Hispanic background. Additionally, NAEP's last mathematics report card of 2015 for 12th grade students reveal that only 25% of twelfth grade students were at or above proficiency; of which 12% were of Hispanic background.

Self-Efficacy

Self-efficacy (Bandura, 1997) refers to a person's belief that he or she can complete a learning task successfully. Essentially, it is what a student believes they are capable of achieving. Self-efficacy theory (Bandura, 1997) suggests that students with high self-efficacy in a particular area, such as mathematics, are more likely to approach problems and perform better in that area than students with lower self-efficacy in that particular domain. A study by Erturan and Jansen (2015) reported that higher math performance and higher perceived math efficacy in both boys and girls between the ages of 8 and 13 have a strong correlation. When students have a high-perceived math efficacy, they also performed better in that same subject. Carpenter and Claytons's (2014) study supports the positive connection between math self-efficacy and math achievement, suggesting that to increase math performance, students need to increase math self-efficacy. Self-efficacy is important because it can help students improve their academic performance, which can lead to a reduction in the achievement gap.

Teaching growth-mindset-developing strategies to students can target the four categories that influence self-efficacy, these include performance accomplishments, vicarious experiences, social persuasion and physiological states (Bandura, 1997). Teachers can provide meaningful, challenging learning experiences to help students develop a growth mindset (Dweck, 2010).

These learning tasks can simultaneously influence students' growth of self-efficacy by providing performance experiences in which students can experience success. Additionally, learning tasks may provide experiences where students can learn from their peers and there are opportunities for positive social persuasion in which teachers can provide constructive feedback. Challenging learning tasks may promote an environment of positive physiological states where students are less fearful of making mistakes.

Individual students perceive failure differently. A student with a growth mindset views failure as an opportunity for growth (Dweck, 2006). Bandura (1997) suggested that a student's self-efficacy perception declines when he or she experiences failure. With self-efficacy, all students view failure as a negative experience because it puts into question their perceived abilities. When students develop a growth mindset, even when they experience failure, they believe they can improve with effort and, thus, simultaneously helping improve their self-efficacy (Bandura, 1997).

Perseverance and Learning Disposition

Perseverance is essential for success in school and life; in both we encounter challenges that are either academic or social in nature. When a student takes on a challenge, their level of perseverance is a factor that influences their willingness to take and stick with challenges (Dweck, 2006). Duckworth, Peterson, Matthews, and Kelly (2007) suggested that having a growth mindset could develop traits such as perseverance and passion for long-term goals. To develop perseverance, students do not need self-esteem boosting messages or labels that describe their intelligence. According to Yeager and Dweck (2012) students "need mindsets that present challenges as things they can overcome with effort, new strategies, learning, help from others, and patience" (p. 312).

Mathematical Practices were introduced as part of the Common Core State Standards (CCSS) in 2009. The CCSS Initiative explains that the Mathematical Practices represent the type of thinking and behavior students have as they are learning mathematics (Common Core State Standards Initiative, 2018). These mathematical practices were developed using a set of processes created by the National Council of Teachers of Mathematics and the strands of mathematical proficiency set by the National Research Council (National Council of Teachers of Mathematics, 2015). One of those mathematical proficiencies is to have a productive disposition towards mathematics; from it derived Mathematical Practice 1 (National Research Council, 2001). The CCSS include eight Mathematical Practices, of which the first is to make sense of problems and to persevere in solving them (See Appendix A for more information). This Mathematical Practice underlines the importance of helping students develop the skills needed to support this type of attitude, perseverance.

Dweck (2006) explained that students who repeatedly fail become fearful of challenges and failures and, thus, develop a negative disposition towards learning that ends up affecting their academic proficiency. A frustrated student is often one who possesses a negative view towards mathematics. Additionally, these students risk developing a lack of confidence, a non-receptiveness towards challenging tasks and an increase in the achievement gap (Dweck, 2006). A growth mindset encourages a love for learning, particularly in difficult situations (Duckworth et al., 2007).

Conclusions

The literature shows that students with a growth mindset perform better academically, show higher levels of perseverance, higher self-efficacy, and positive attitudes towards learning. Yet, the literature has seldom shown the implications of growth-mindset-developing strategies on

students' math self-efficacy at the intersection of racial/ethnic and social-economic status of seventh grade students. To address this gap, the researcher will implement growth- mindset-developing strategies in a seventh-grade mathematics classroom with low SES and Hispanic background students and evaluate their effects on student perceptions of math self-efficacy.

The results of this study will provide further understanding of how to help seventh-grade students develop a growth mindset and how to evaluate its implications for student self-efficacy. This study has the potential to inform teachers and school administrators of strategies that may specifically help students from low- SES become successful in mathematics and in other subjects. When students learn they can improve their intellectual capacity, they become more willing to consciously change their fixed mindset habits and gain "the confidence necessary to be successful in…investigations and challenges" (Robinson, 2017, p. 19). Targeted interventions may help students develop a growth mindset and learn they have control over their intelligence by understanding that their brains change and form new connections every time they make mistakes and learn something new. In the next chapter, I explore the literature relating to growth mindset and mathematics achievement.

Chapter Two

Literature Review

With the introduction of the (CCSS) in 2009 and the eight Mathematical Practices, teachers and students inherited new learning challenges. Teachers continue to tackle obstacles such as narrowing the achievement gap in order to help students become college and career ready. The CCSS and the eight Mathematical Practices aim to push students towards lasting learning, and away from memorization of procedures. These efforts are a step in the right direction, but alone may not be enough to help students improve their academic proficiency or increase their beliefs in their own capacity to perform a task successfully in mathematics. Educators must also consider interventions that address non-cognitive factors if we want to see students' academic proficiency improve. This study will answer the following question: What is the impact of growth-mindset-developing strategies on the perceptions of math self-efficacy among Hispanic students from low socio-economic status (SES) background in a seventh-grade math classroom?

This literature review explored research studies that investigated the connections between students' growth mindset and their self-efficacy. An overview of the literature is provided, followed by specific trends, non-cognitive factors and interventions that have connections to the research question. Finally, overall relationships to the literature and a conclusion are provided that are essential for providing context to this study.

Theoretical Framework

The theoretical frameworks used in this study include incremental learning theory, entity learning theory, and self-efficacy theory. Bandura and Dweck (1985) coined the terms incremental and entity theory (now commonly known as growth mindset and fixed mindset,

respectively). The incremental learning theory helps students develop a growth mindset through a conscious transformation of their basic worldviews from believing intelligence is fixed to believing that intelligence is malleable and increased through effort positively affecting specific self-capabilities (Blackwell et al., 2007; Dweck & Legget, 1988). Conversely, entity learning theory impedes students from developing a growth mindset and from participating in valuable learning opportunities, because they believe that mistakes or failures judge their competence. Dweck and Legget (1988) and Blackwell and colleagues (2007) revealed that students with the same initial capabilities take different paths when tackling challenges. Their work showed that individuals formed either competence goals (concerned with views of competence) or learning goals (concerned with increasing competence), regardless of initial capabilities. The works by Dweck and Legget (1988), Blackwell, and colleagues (2007) are relevant to this study because their observations are similar to the initial student behaviors observed during this study. In addition, their work demonstrated that learning experiences influence students' development of incremental learning theory or entity learning theory. These findings are relevant to this study, because incremental learning theory (or growth mindset) strategies along with challenging learning experiences were used to see the effects on students' development of a growth mindset. In this action research project, students were observed taking one of two motivational paths—either quitting or confronting—when tackling challenges. In other words, it seemed that students were either concerned with outside views of their competence or concerned with increasing their competence.

Bandura's (1997) self-efficacy theory refers to a person's beliefs that they can accomplish a task successfully. Self-efficacy theory has suggested that learning experiences

influence students' growth of self-efficacy. Bandura's findings informed this action research of the many possible influences that learning experiences may have on students' self-efficacy.

Overview of the Context of Literature

Key areas of literature involving students' mindset and self-efficacy include benefits of developing a growth mindset, connections between self-efficacy, perseverance, and learning disposition, the achievement gap and learning environment, and interventions that support the development of a growth mindset. The first section of this chapter examines research that supports the use of growth-mindset-developing strategies that have positively influenced students' views of self-efficacy. Self-efficacy theory, as defined by Bandura (1997) was considered when examining the effects of growth mindset on students' views of self-efficacy.

The second section of this chapter examines how developing a growth mindset affects a student's perseverance. It will also discuss how perseverance connects to the students' self-efficacy. This part addresses the connections between growth mindset, self-efficacy, perseverance, and learning disposition.

The third section discusses the existing achievement gap in mathematics at middle school levels. It will consider the experiences of other ethnic groups and national level comparisons of mathematical proficiency. The literature examined past and current achievement gaps and the learning environment. The literature also addressed the effects on the mindset of students when teachers with a fixed mindset apply their instruction.

In the fourth section, the literature focuses on classroom interventions designed to foster students' development of a growth mindset. This section discusses the benefits of teaching these strategies to students. The research explores how those factors influenced by growth mindset will

be affected through each intervention including student perseverance, self-efficacy, and/or learning disposition.

Benefits of Developing a Growth Mindset

According to the research in the last 15 years, students' motivation and academic proficiency increases when they believe their own intelligence is malleable and that it can grow with effort (Blackwell et al., 2007; Dweck, 2006, 2007b; Moser, Schroder, Heeter, Moran, & Lee, 2011). When students progress through grades, they experience greater challenges due to the multiple changes in their schedules, the increasing difficulty of curriculum, grading, and changes in their environment. If a student has a fixed mindset, he or she places higher importance on looking smart and may be less likely to take risks for fear that failure will place their intelligence into question (Dweck, 2006, 2007b). The belief that intelligence is fixed causes students to establish lower achievement goals. Students experienced helplessness more regularly and lower academic grades when they lowered their achievement goals (De Castella & Byrne, 2015; Yeager & Dweck, 2012). For a student transitioning from elementary to middle school, having a growth mindset is important to be able to take on challenges, persist with them and experience personal and academic success.

The literature reviewed in this study shows that self-efficacy is not gender specific. Two separate studies, one by Erturan and Jansen (2015) and, a second, by Carpenter and Clayton (2014) have indicated a positive correlation between math achievement and math self-efficacy that is not gender specific. This means that, regardless of gender, if a student experiences high math achievement, their views on math self-efficacy also rises (Bandura, 1997). These findings are important to this study because it would help students and teachers understand that developing a growth mindset is not gender specific. This fact may mitigate students', teachers'

and administrators' preconceived gender stereotypes that one gender is better at a subject such as math. Furthermore, research findings have indicated that developing a growth mindset requires a physiological change in the brain not controlled by gender. As previously noted, academic proficiency has been shown to increase when students develop a growth mindset (Blackwell et al., 2007; Dweck 2006, 2007b; Moser et al., 2011). When a person with a growth mindset increases their academic proficiency, they are simultaneously improving their self-efficacy.

A teacher's mindset also influences how he or she responds to students who are struggling. Student confidence in their ability to learn math or other subjects is impacted by their teacher's mindset towards math or other subjects. Rattan, Good and Dweck (2012) undertook a qualitative study of a group of teachers and students to determine what effect the teachers' fixed mindsets have on their students' achievement. Their research demonstrated that when teachers have a mathematics fixed mindset, which is the belief that math intelligence is innate and cannot be changed, the consequences to their students' mindsets are detrimental to their academic proficiency. Furthermore, Rattan, Good and Dweck's (2012) study revealed that teachers are more likely to comfort their struggling students in detrimental ways and lower their expectations when they held a fixed mindset of math intelligence. The researchers explained that if a teacher holds a fixed mindset on a subject, they are more prone to judge the abilities of students on that subject as low-achieving. Once students consciously or subconsciously took notice of their teacher's judgments and expectations, they reported lower motivation and lower expectations of their own performance (Rattan et al., 2012). These findings are important to this study, because they revealed the impact that student's own mindset may have on the academic proficiency.

Connections between Self- Efficacy, Perseverance, and Learning Disposition

There are multiple factors that contribute to a student's academic success. One that pertains to this study is students' attitudes or dispositions towards learning and their connection to self-efficacy and mindset. According to self-efficacy theory, experiences matter. For example, when students accumulate positive experiences, self-efficacy grows and their learning disposition improves (Bandura, 1997). Howard and Whitaker (2011) examined the perceptions and experiences of students who recently had successful mathematical learning. The study's findings revealed that student perceptions of their past negative and present positive mathematical experiences were attributed to a change in their mindset. Students saw a change in their mindset as a positive turning point allowing them to experience successes in mathematics. This success provided the drive to use different problem-solving strategies resulting in successful mathematical experiences. Consequently, their self-efficacy and learning disposition towards mathematics was improved. This research is relevant to this study because it points towards possible interventions.

Another factor that pertains to this action research is perseverance and its connection to students' growth mindset, self-efficacy, and learning dispositions. Dweck's (2006) research results suggested that students with a growth mindset gain a love for learning and, when confronted with challenges, exhibit greater perseverance than do students with a fixed mindset. Kwok, Hughes, and Luo (2007) carried out a longitudinal study on 455 ethnically diverse first-grade students from three different school districts. The student selection criteria included their score on a state approved literacy assessment. Kwok et al., (2007) findings indicate that a student's resilient personality is a predictor of future academic proficiency in math and reading above the effect of cognitive ability, family economic disadvantages, and externalizing

behaviors. Consistent with the findings of Dweck (2006, 2007a, 2007b), and Duckworth, Peterson, Matthews and Kelly (2007), Kwok et al., (2007) also demonstrated that students with high levels of perseverance result in greater academic proficiency. The student samples included a diversity of low-achieving students. Participants were of both genders, different socio-economic levels, ages and ethnic groups. The cited literature is relevant to this study because it affirms the importance of a growth mindset to the development of other character traits such as perseverance. In addition, the literature also mitigates possible gender, socio-economic, or external behavior and judgments that the researcher may make regarding the ability of a student to develop a growth mindset.

Overall, the above literature delved into non-cognitive skills that positively affect school achievement such as growth mindset, learning dispositions and perseverance. Learning and understanding how we may help students develop non-cognitive skills is useful in making recommendations for interventions that may be implemented in the classroom by teachers and introduced school-wide by administrators. Limited longitudinal research is available demonstrating students' negative past and positive present mathematical perceptions and how the awareness of this change enables them to be successful in the future. Motivation is essential to learning. Educators must be able to adjust their strategies to help students understand that a growth mindset will allow them to see that through effort and hard work they can expand their learning (Howard et al., 2011).

The Achievement Gap and The Learning Environment

Schaper (2008) reported the achievement gap may be explained by differences between low- and high-achievers' perception of their learning environment. Schaper (2008) identified low- and high-achievers based on their results on a standardized based assessment. Her sample

included 575 middle school students. The data demonstrated that, of the students identified as low achieving, 23% were White and 56% were Hispanic. These findings echo the National Assessment of Education Progress (NAEP) data indicating that there have not been significant changes in the achievement gap between students of White and Hispanic backgrounds (National Assessment of Education Progress, 2018).

When questioned about their learning environment perceptions, the Hispanic low-achieving students stated they perceived teacher and student interactions as unfair (Schaper, 2008). According to Schaper's (2008) research data, students felt teachers invested more time in high achieving students. Schaper's (2008) findings are supported by Rattan, Good and Dweck's (2012) research on the possible implications the mindset of teachers has on student achievement. Rattan and colleagues (2012) explained that teachers with a fixed mindset on a subject are more likely to judge struggling students as possessing a low ability and, consequently, lower their expectations for these students. The ramification of these lowered expectations is called "soft" strategies such as shortening assignments (Rattan et al., 2012). Teachers who possessed a fixed mindset on a subject caused a decrease in a student's motivation and expectations of their own performance, therefore affecting their academic proficiency and aggravating the achievement gap. Both Schaper (2008) and Rattan and team's (2012) findings are important to this study, because they point to how a teacher's mindset on a subject may influence students' learning perceptions.

Closing the student achievement gap has been a topic of high interest among educators and policymakers long before the implementation of the Common Core State Standards. Blackwell and colleagues (2007) studied how growth-mindset-developing interventions influenced the motivation and math achievement of a group of seventh grade students with

students who were predominantly Hispanic and from low socio-economic backgrounds. The researchers measured students' initial mindset using a 10-question student survey to determine whether each student had a fixed or growth mindset. Then they applied growth-mindset-developing strategies to a focused group. Using growth-mindset-developing strategies on students seems to improve their academic proficiency (Dweck, 2006, 2007b, Duckworth et al., 2007). To add to this topic, a study explored the 2005 California Algebra for All program which was intended to close the achievement gap for eighth grade students in California. This program was designed to help improve student achievement by increasing student access to higher-level mathematics. The results showed that the district level implementation of this program had minimal effect on decreasing the achievement gap between low SES and high SES students (Arrivillaga, 2011). This trend suggested that although academic rigor may be enhanced through the implementation of new programs such as CCSS and the eight Mathematical Practices, students are not receiving the necessary non-cognitive skills such as growth mindset that could help them mitigate these academic challenges. Dweck (2006), Duckworth and colleagues (2007) and Bandura (1997) supported the idea of implementing challenging tasks in the classroom because these provide opportunities for students to develop non-cognitive traits such as growth mindset, perseverance, and self-efficacy all which help students overcome obstacles that are imminent with rigorous material. These studies confirmed that a combination of rigorous material and implementations of non-cognitive skills developing strategies are important for students' academic success.

Interventions that Support the Development of a Growth Mindset

It is important to provide interventions for individuals who work with children to help students develop the mindsets that encourage creativity and to take opportunities that propel

them towards academic success. The literature relevant to this study has argued that using growth-mindset-developing strategies may help students develop positive views of math self-efficacy. Dweck (2006, 2007a), Duckworth and colleagues (2007) and Robinson (2017) suggested that students need to explicitly be taught that the brain is malleable, so students begin to develop a growth mindset. In addition, teachers should normalize failures by introducing activities that ask students to write about obstacles they have conquered, by teachers sharing their own mistakes, and sharing the failures of famous personalities (Khan Academy, 2015, Robinson, 2017). These interventions are important to this research, because normalizing mistakes increases students' willingness to make mistakes. When students combine their learning of the brain's malleability with making mistakes, they are gaining better understanding that their brain is making new connections and their intelligence is growing. It is also important to provide students with relevant and challenging learning experiences (Dweck, 2006, 2007b; Duckworth et al., 2007; Robinson, 2017). This intervention is relevant to this study because challenging experiences foster a growth mindset and has the potential to improve students' self-efficacy by practicing perseverance as they tackle new material. Additional recommendations offered by Dweck (2006, 2007a), Duckworth and colleagues (2007) and Robinson (2017) suggested teachers reframe their language when communicating expectations and providing student feedback. This suggestion is important, because a teacher's mindset communicates their belief in students' abilities to learn a subject. An additional proposed intervention is to explicitly teach students to replace fixed mindset thought with growth mindset thoughts (Mindset Works, 2016). Doing so provides students with tools for self-talk as they are creating new connections in their brain that weaken the fixed mindset connections (Mindset Works, 2016).

There is a need for schools to target low SES students for participation in gifted programs. Shaunessy-Dedrick and Cobatish (2014) reported that low-income gifted students are not represented which is important as these environments tends to promote a growth mindset and love for learning by providing challenges that help facilitate this disposition (Peters & Mofield, 2017). Esparza, Shumow, and Schmidt (2014) analyzed 2011-2012 data of 380 seventh grade students from different middle schools to compare the mindset of gifted and typical students. In this data set 80 students were identified as gifted. The gifted sample was 38% White, 30% Hispanic, 7% African American, 1% Asian and 24% multi-racial and 61% identified as low SES background. Esparza et al. (2014) revealed that gifted students hold higher growth mindset beliefs than typical students, but that some gifted students can develop fixed mindsets.

Connections to Literature

There are major contributions on effects of growth mindset for developing strategies to facilitate students' academic proficiency. Likewise, the implications of teachers' mindset on students' perceptions of their abilities to learn has also been explored. The conclusions regarding student non-cognitive skills may be used to help understand which interventions students need to help them be academically successful**.** The investigations on the connections and effects of certain non-cognitive behaviors have on cognitive skills contribute to our understanding of how interventions support each student's success. For example, the work of Dweck's (2006, 2007b, 2010), Duckworth and colleagues (2007), and Bandura's (1997) on growth mindset, perseverance, and self-efficacy has contributed to understanding how these non-cognitive behaviors have a direct effect on cognitive skills such as improving achievement in topics like mathematics.

Conclusions

The lack of literature on the growth mindsets of students from low-SES and Hispanic background and the effects it has on their self-efficacy calls for the need to examine this topic further. Multiple factors contribute to the healthy emotional and cognitive development of a child. As mentioned above, Kwok et al. (2007) concluded that a student's resilient personality predicted present and future achievement. These factors included age, gender, ethnic background, and family and community relations. Family and socioeconomic backgrounds have independently contributed to predicting early school failure (Kwok et al., 2007). As previously mentioned, this study hopes to answer the following question: What is the impact of growth-mindset-developing strategies on the perceptions of math self-efficacy among Hispanic students from low SES background in a seventh-grade math classroom? The next chapter defines the qualitative methodology used in this action research project.

Chapter Three

Methodology

The purpose of this study is to observe whether the math self-efficacy of seventh graders can be improved by teaching growth mindset strategies. Several studies have shown that teaching growth mindset strategies offers a promising strategy and is beneficial for all students, especially low-achieving students. When students develop a growth mindset, assessment efforts and curricula may become more accessible to students with low socio-economic and Hispanic background. While previous studies have examined the effects of a growth mindset in various settings and across grade levels, this study focused on the use of growth-mindset-developing strategies during math instruction with seventh grade students who have a low socio-economic and Hispanic background as well as its effects on their views of math self-efficacy.

As its theoretical framework, this action research used incremental theory, entity theory, and self-efficacy theory, each of which will be described below. The intent of this research was to obtain information that would increase the pedagogical knowledge and skills of the researcher and to strengthen teaching methods. This action research used qualitative methods to examine the effects of how developing a growth mindset improves students' views of math self-efficacy. Following is a detailed description of the research design that highlights the different aspects of the approach used to gather data about seventh grade students and their views of math self-efficacy.

Research Design

Action research. When the Common Core State Standards (CCSS) were introduced in 2009, teachers began a journey to move away from direct instruction toward student inquiry-based learning. This transition signified a cultural shift for many education professionals and

students in the way teaching and learning should be approached. The CCSS led teachers to move away from merely providing information and procedures to student-led learning. The goal is that students take more control of their learning through an investigative process that leads them to derive big mathematical ideas.

An action research methodology was chosen because an opportunity for social progress and change in current teaching practice emerged from changes in the pedagogical context at the federal and state levels with the CCSS. An action research approach essentially encouraged the researcher to plan, take action, observe and reflect in order to inform change towards improved student learning and teaching practices (Putman & Rock, 2018). Further, this acknowledges that the researcher interacts with the students during math instruction in the school in which she works (Creswell, 2009). An action research approach was also relevant since it is self-reflective and encouraged the researcher to be more aware of her teaching which, in turn, inspired new teaching practices to advance student learning and understanding of self. A combination of observations, observational checklists, and anecdotal notes were used as data collection methods (available in Appendix B).

At the time this research was conducted, I was a seventh-grade math teacher at the K-8 public school. At the study site, the researcher witnessed inconsistencies in the students' level of perseverance. When math tasks became challenging, I noted that students would take action in two different ways. One, the students would not approach the problem if they found it too difficult. Second, the students would approach the problem but within the first or second obstacle quit the problem altogether. Previous work on growth mindset of Dweck and Legget (1988), Dweck (2006), Duckworth and colleagues (2007), and Blackwell and her team (2007) emphasized the importance of teaching students, growth-mindset-developing strategies to change

how students interpret obstacles. The aforementioned studies showed the importance of teaching students non-cognitive skills, growth mindset, along with cognitive skills such as math to help students become successful in academics and in math. The working assumption of this study, based on previous interventions, is that developing a growth mindset can positively impact perseverance when approaching challenging tasks, building a positive math-learning disposition, and increasing positive views of math self-efficacy.

The researcher gained an in-depth perspective through observations, use of checklists, a survey, and anecdotal notes on the effects of growth-mindset-developing strategies to the students' views of math self-efficacy (available in Appendix B and C, observation checklist and survey respectively). As previously mentioned, this method is similar to Blackwell's and others (2007) in that it compared the effects of teaching incremental theory (also referred to as growth mindset) to a group of seventh grade students divided into an experimental and control group. Blackwell and colleagues (2007) focused on seventh grade students from low socio-economic status of which 79% qualified for free lunch. The participants in Blackwell and colleagues' (2007) study varied in ethnicity, 45% Hispanic background, and were low achieving based on grade point average. Blackwell and her team (2007) focused on whether the interventions used on the experimental group had an effect on their mathematic achievement. Much like this study, their study measured growth mindset and achievement through observations, survey, and anecdotal notes and discussions with students.

Participants and Site Selection

Both the participants and the study site were selected using convenience sampling. The participants in the study were selected from the researcher's classroom. Participants in this study included 30 seventh grade students from a K-8 public school located in Southern California. This

public school is located in a low socio-economic status community that is predominantly Hispanic.

The participants involved in the study included 14 females and 16 males who were between the ages of 12 and 13 years old. The K-8 school is predominantly Hispanic (97.5% of all students at the school). The remaining ethnic demographics include, 1.2% White, 0.8% African American, 0.2% Filipino, 0.2% Asian, and 0.2% two or more races (School Accountability Report Card, 2017). The school's enrollment reflected 94.6% SES disadvantaged students, 61.3% English learners, 5.4 % students with disabilities, and .1% foster youth. The research took place in the students' first period mathematics classroom. All participants in this classroom are Hispanic. The researcher was the participants' math teacher.

Participants in this study used a math inquiry-based program developed for learners in the seventh grade. The curriculum is called Connected Mathematic Project third edition (CMP3), funded by the National Science Foundation and developed with support from the Michigan State University (2014). The curriculum focuses on problem solving, reasoning, proof, communicating results and findings, making connections, developing, and using mathematical representations. The curriculum presents challenging tasks that are relevant to the everyday lives of the students. The curriculum also provides manipulatives and various forms of communicating understanding such as explaining mathematical thinking and requiring reflections of mathematical practices used during each problem in the investigation. The design of this curriculum promotes and challenges students to develop problem solving, reasoning skills, and reflective practices.

Ultimately, three participants, each of whom through survey and observations appeared to have the most entrenched fixed mindsets in math class, were chosen for specific growth-

mindset interventions. Each participant was provided a pseudonym. Their stories are presented in Chapter Four.

Data Collection

As the math teacher to these students, I used various instruments to measure each student's understanding of mathematical concepts, development of growth mindset habits, and development of views of math self-efficacy. Such instruments included checklists, surveys, observations, and anecdotal notes (See Data Collection Instruments, Appendices B and C). These were informed by the literature in particular by what was available in Mindset Works (2016), Dweck (2006), and Blackwell's and others (2007) work.

Participant survey. I invited students in my seventh grade, first period mathematics to complete a survey (See Appendix C) to determine their initial mindset. I adapted Dweck's (2006) survey based on the literature on growth mindset. The survey included questions relating to students' learning disposition, their feelings in relation to feedback, challenges, and math, and whether they believe intelligence is malleable. The results of the survey assessed students' initial mindset as fixed or growth mindset. As mentioned above, of the 30 students surveyed three were selected for whom survey results showed an initial fixed mindset.

Observational checklist and notes. Observational checklists and anecdotal notes were used during classroom observations of students throughout their first period mathematics classroom and during peer interactions, including independent, group work, and whole class instruction. The researcher focused on recording individual and group behaviors, including conversations and social interactions between students. Checklists and anecdotal notes were also used to record students' attitudes, behaviors, use of self-talk, topics of conversations around the math problem including specific language, use and cues of in-the-moment development of

growth mindset and views of math self-efficacy. These observed attitudes were informed by the literature in particular Mindset Works (2016). The collection of data from students through the use of checklists and anecdotal notes informed the researcher of students' learning and influence of growth mindset strategies. The data collected included observations on multiple uses of growth mindset and fixed mindset talk and behaviors included embracing and avoidance of challenges, stating problems as difficult, expressing dislike towards math and not working past setbacks. The accumulation of data served to help the researcher understand and address particular needs of low-achieving students.

The Research Process

The study took place over a period of three weeks. The math curriculum (CMP3) was used along with growth-mindset-developing interventions throughout the study. Prior to implementing growth-mindset-developing strategies, students' initial mindsets were determined from the results of a student survey (see Appendix C). Pseudonyms were assigned for each of the three participants; Luna, Victoria and Gastelum. Once students' current mindsets were determined, the researcher implemented strategies obtained from growth mindset literature. A description of these strategies follows.

As the math teacher in the classroom where data were collected, I am an insider given my direct involvement and connection to the setting. As the insider researcher, I collected the data at the study site and interacted with the students during the math lessons. Each growth-mindset-developing intervention had a duration of approximately twenty-five minutes. Each math lesson had a duration of approximately twenty-five to fifty minutes taught during the students' first period math class. Direct instruction, independent work, and small group collaboration activities were used when teaching the math lessons. The researcher had the opportunity to observe the

students and document those observations, when the students were working individually, in small groups and with partners. The method I employed in this study was similar to Blackwell and colleagues (2007) who also collected observations, anecdotal notes, checklists, surveys and grades to measure their development in growth mindset and its effects on other factors, motivation and academic proficiency.

Multiple literatures and brain science show that human brains are malleable. Thus, students can develop a growth mindset that positively affects their perseverance, self-efficacy and learning disposition. Teaching students that the brain is malleable results in increased motivation, increased effort and higher academic performance (Dweck, 2007a). In this action research project, the researcher implemented strategies that taught about brain development and about neuroplasticity using a growth mindset lesson plan developed by the Khan Academy and Project for Education That Scales (PERTS), Stanford University's applied research center on academic mindsets (Khan Academy, 2015; Robinson, 2017).

The researcher avoided praising the students' intelligences, as Dweck (2007a) states doing this will only lead to students having misconceived notions that their performance is used to judge their level of intelligence. The researcher implemented an intervention strategy that reframed the communication of goals and feedback to students using the Growth Mindset Feedback Tool and the Growth Mindset Framing Tool from Mindset Work (Mindset Works, 2016). Carol Dweck's research has shown that "the most motivated and resilient students are not the ones who think they have a lot of fixed or innate intelligence" (Dweck, 2007a, p.6). In addition, the researcher in this action research project taught students to replace fixed mindset thoughts with growth mindset thoughts (Khan Academy, 2015; Robinson, 2017). The researcher provided challenging, relevant learning experiences to help students develop a positive learning

disposition through the accumulation of positive experiences along with the normalization of mistakes and failures and the researcher's reframing of language when communicating feedback and goals.

The researcher attempted to project a positive attitude about mathematics and presented to the students the idea that their ability to learn is malleable. Students' sense of math self-efficacy was fostered by conveying to students that the goal of understanding mathematics is possible, because their ability to develop a growth mindset gives them control over their learning of the subject. Additionally, students were told to be risk takers, to work harder and that their perseverance and motivation develops as they teach themselves to use growth mindset statements about their mathematical abilities.

Week One. In the first week of this study, the researcher used the first 25 minutes at the beginning of the week to introduce the first growth mindset strategy. To avoid providing students with the definition of growth and fixed mindset, the researcher introduced the concept of brain malleability using a 3-minute video by Khan Academy (2015) called "Growing Your Brain". This intervention closed with a whole class discussion. The researcher facilitated the class discussion by asking six questions aimed to help students understand how the brain works and to create their own definition of fixed and growth mindset. These questions included but were not limited to: "How do people become more intelligent?" "How does the diagram of neurons at birth and at age six demonstrate this?" (Khan Academy, 2015). Students had the opportunity to write their responses to each question prior to participating in the whole class discussion. To further students' understanding of growth and fixed mindset, the researcher conducted a class discussion about the characteristics of a person with a growth mindset and a person with a fixed

mindset. Students' input on the characteristics of growth and fixed mindsets were made accessible to students throughout various places in the classroom.

After the class discussion, the researcher showed students a two-minute video named "Neuroplasticity" by Khan Academy (2015), which introduced the concept of brain malleability. The question "What is neuroplasticity?" (Khan Academy, 2015) was used as a prompt to incite a class discussion on the brain's ability to change. This class discussion allowed for student clarification and varying student input regarding neuroplasticity. The researcher reinforced the teachings of the video with further examples on how our feelings, ideas, and behaviors can be changed by replacing them with new ones. The researcher documented students' answers using anecdotal notes.

For the remainder of the first week, the researcher reinforced the learnings on neuroplasticity to instill students' knowledge of this new concept. The researcher helped students improve their mindset self-awareness by pointing out their fixed mindset behaviors or verbal statements. Moreover, students were given growth mindset behavior or verbal statement to replace the fixed mindset.

At the beginning of each day in the first week, the researcher used growth mindset language to communicate the mathematic learning goal of the day (See Appendix D). Examples of this growth mindset language included, "I am hoping that you all do not know what we will be learning today. I want your learning to be challenging, because I would not want to waste your time" (Mindset Work, 2016). Student seating was arranged in groups of three or four. Each student had the CMP3 curriculum and Cornell note sheets where they documented their learning of the investigation. After a brief direct instruction, the researcher instructed students to begin their work on the investigation regarding the addition of integers. Students' social interactions

and use of growth and fixed mindset language and behavior were recorded as anecdotal notes. The researcher began using growth mindset statements to communicate feedback.

Week One contained several inquiry-based investigations with the expectation that students used different modalities to learn addition and subtraction of integers. For example, one of the investigations in the math curriculum included the use of a chipboard that contained red and black circular chips as manipulatives to relate addition and subtraction of integers. The black chips represented positive integers and the red chips represented negative integers. In the investigation, students were given and initial value on the chipboard, eight black chips and twelve red chips. They were given a set of different moves of chips that they had to apply to the chipboard, and for each move they had to write a number sentence that represented the total value of the chipboard. The investigation expanded to students describing, and then creating three different number sentences that represent a certain total value such as -2. For the last five to seven minutes of class, students summarized their learning. The researcher asked students to volunteer and share their learning with the class. The researcher walked around and took anecdotal notes observing students' behaviors and social interactions when working through these investigations. The researcher reminded students during various points of the class of what they learned at the beginning of the week about the malleability of their brains. In addition, the researcher used growth mindset language to provide students with feedback of their learning (See Appendix E for examples).

Week Two. In the second week, the researcher used approximately the first twenty-five minutes of class of the first day one to implement a growth-mindset-developing intervention using the growth mindset lesson from Khan Academy (2015). First, stories of famous people's experiences of overcoming failures were shared with the class. The researcher continued by

sharing a personal story in which she had to work hard to accomplish something. When sharing her story, the researcher made sure to highlight hard work, the strategies she used, and how getting help from others helped her improve her skills. After sharing her story, the researcher asked students to write a short letter to a future student about a struggle they had when they were learning. In this letter, students described how their struggle made them feel, how they overcame it, what they learned from it and any advice they can give the student (See Appendices F, G and H for examples of these letters). Students shared their letter with their group mates. During assessments, students were given access to the letters they wrote to a future student (See Appendices F, G and H for examples). The goal of this intervention was to initiate a conversation about how confronting obstacles, working hard, and finding the right strategy can help people become more skilled at a task. The researcher walked around, used an observational checklist (Appendix B) to record students' conversations, behaviors and use of growth, and fixed mindset language.

The second week of growth mindset instruction contained several inquiry-based lessons in the form of investigations on the topic of addition and subtraction of integers. During Week Two, the researcher communicated the mathematical learning goal each day before students worked on the investigations using growth mindset language (See Appendix D for examples). The framing tool was used in order to create a safe learning environment where students felt safe to make mistakes and take on new challenges. At the beginning of each day of Week Two, the researcher reviewed students' progress by asking students to share their learning summaries. The researcher took mental notes of students' answers and recorded them later as part of the anecdotal notes. One of the lessons in Week Two included an investigation from the math curriculum that included two tables of addition expressions that asked students to find the sum of

each expression. The first table of expressions had addends with the same sign and the second table of expressions had addends with different signs. Students had the task of determining what each table of expressions had in common. Once students determined what each table of expressions had in common, they had to come up with two new problems that belonged in each group. Lastly, students developed an algorithm for adding integers for addends with the same and different sign. Students were then asked to apply their algorithm to new addition problems. The goal of this task was for students to solidify their findings by seeing whether the algorithm worked for new addition problems. During the last five minutes of each class of Week Two, students summarized their learning in their Cornell notes.

The researcher walked around the classroom paying special attention to struggling students. She asked these students to explain their mathematical thinking. Asking students to explain their mathematical thinking was aimed at assessing students' understanding, and as a mindset developing strategy to instill in them that a process is more important than speed. The researcher continued to use Week One learnings on neuroplasticity by reminding students of this knowledge at key point during the observations. Students' prior knowledge was accessed at key points during the week's observations. Student's understanding and needs were assessed, through observations and student work samples, and growth mindset feedback provided depending on need. Mindset Works (2016) offers 52 growth mindset feedback statements, the researcher used approximately 10 (see Appendix E for examples). This feedback tool provided statements for the teacher to use to motivate struggling students to not give into failure but rather remain perseverant and focused during math learning. During the observations, the researcher used a checklist to document students' social interactions, behaviors, and use of growth and fixed mindset language.

Week Three. At the beginning of the third week before starting the math lesson, the researcher used the first twenty-five minutes to apply a growth-mindset-developing strategy from Khan Academy (2015). The goal of this strategy was for students to have a visual reference throughout the year to help them recognize when they apply a fixed mindset, and to give them ideas of self-talk to shift towards a growth mindset. Using students' input the researcher created a two-column poster of specific statements that replaced fixed mindset with growth mindset thoughts. The researcher explained to students that they could have a fixed mindset on a topic and a growth mindset on a different topic of their lives. These fixed and growth mindset self-talk statements were accessible to all students by placing them at various locations in the classroom.

Week Three contained several inquiry-based lessons in the form of investigations on the topic of addition and subtraction of integers. For Week Three, the researcher continued as in prior weeks to communicate the mathematical learning goal, before students delved into each investigation. At the beginning of each day of the third week, the researcher reviewed students' progress, by asking students to share their learning summaries. One of the lessons in Week Three pertained to students discovering the connection between adding and subtracting integers. Students had one addition and one subtraction number sentence. Both number sentences had the same starting addend with a missing second addend, and the same total value of two. The goal was for students to determine, using black and red round chips, two different ways to end with a total value of two. They repeated this process three times. The investigation expanded to discovering a pattern connecting addition and subtraction, where subtracting is the same as adding the opposite of the second addend. During the last five minutes of class, students summarized their learning. During each investigation, the researcher walked around to observe students' social interactions, behaviors, and skills.

The researcher observed and documented students' social interactions using anecdotal notes. The researcher used an observation checklist (see Appendix B) to record use of fixed and growth mindset statements that aligned with growth and fixed mindset during students' social interactions. The researcher also observed students' growth and fixed mindset behaviors when they worked individually, in groups or in class discussions with the math curriculum. A checklist (see Appendix B) was used to document these observations.

Data Collection Process

Data were gathered at various stages of this study. As mentioned, I used an observation checklist (Appendix B) to document students' conversations, and behaviors. The researcher was able to observe multiple uses of growth mindset and fixed mindset talk and behaviors including some such as embracing challenges, avoiding challenges, stating that a problem is too hard, stating dislike towards math and not working past setbacks such as mistakes. Analytic memos that documented students' overall views of math self-efficacy, growth and fixed mindset social interactions, and individual behaviors were collected in a research journal.

During the observations, the researcher challenged students to think deeply about their learning by having them create meaning of mathematical concepts through investigations rather than providing them a mathematical algorithm to solve problems. Students often derived the mathematical algorithm by thinking critically about their math work, looking for patterns, making connections with their prior-knowledge and then creating an algorithm that would solve similar future problems in mathematics. The researcher facilitated this learning by providing feedback and making multiple checks of understanding through each activity.

Students were challenged to think critically by constructing reasonable arguments and critiquing the reasoning of other students, by explaining their mathematical processes, justifying

their work, and summarizing their learning. A challenging environment ensured that students had opportunities to tackle challenges and work past obstacles to practice and develop their growth mindset. The researcher facilitated the practice and development of a growth mindset, by providing continuous growth mindset promoting feedback, and creating an environment that promotes a growth mindset.

Analysis

The results of the mindset survey were used to inform the study and teaching approach for supporting each student's growth-mindset-development and/or promotion. The results of the survey were not shared with the students to avoid any potential influence on the research process. The researcher collected data from multiple instruments throughout the research process (e.g. observational notes, checklists, and the like). The data were organized by topics and themes as it was being collected. In order to make the data collected from anecdotal notes analyzable, the researcher organized it in a structured manner. Categories and themes that included certain social interactions, behaviors and activities supported the organization of the anecdotal notes. The researcher also documented narrative notes about conversations students had during various mathematical group tasks. The researcher used Excel spread sheets and the determined themes to organize the narrative notes by categories and themes. This study used both descriptive and qualitative methods informed by entity, incremental, and self-efficacy theories (as described above) in order to analyze student learning and to advocate for the use of growth-mindset-developing interventions in the classroom, especially with Hispanic students from low-socioeconomic areas. The analysis examined whether the use of growth-mindset-developing interventions improved the group's individual student view of math self-efficacy.

Summary

The school where this study was undertaken is located in a low socio-economic area and consists of high percentage of students of Hispanic background that is representative of a larger target population. Participants in this study included 30 seventh grade students in their math classroom. A group of three students was chosen to receive targeted growth mindset interventions based on the results derived from the survey. Pseudonyms were assigned for each of the three participants. Multiple data collection strategies and materials were used to determine students' growth-mindset-development as demonstrated through social interactions, and observations. In the next chapter I will outline my findings.

Chapter Four

Findings

This chapter presents the findings of this action research in the following order: First, I discuss the overall implications of using growth-mindset-developing interventions during mathematics instruction. Second, I provide a review of individual behaviors, social interactions, conversations and interventions amongst three students chosen for their observed fixed mindsets in math class.

A student inquiry-based approach to learning, allowed the researcher to create an investigative environment providing students with opportunities to apply learned growth-mindset-development strategies. This shift in teaching and learning emphasized student collaboration and the teachers' role as facilitators to students' learning. The idea is that when students have more control of their learning and learn through an inquiry-based approach, they learn through collaboration and participation in explaining ideas to show that there are multiple ways to approach mathematical problems. This approach helped the researcher emphasize the importance of depth in mathematics and less emphasis on speed and learning from mistakes. Through lessons, students learned that speed is not a measurement of intelligence. Rather, time and effort lead to a better understanding of mathematics. Further, they learned that making mistakes is not a measurement of intelligence, but rather an opportunity to grow by using different strategies to solve the problem.

At the time of this research study, 30 students were enrolled in class in which three students identified as having a fixed mindset. The researcher is employed at the school district were each classroom can have up to 35 students enrolled per class in a seventh-grade classroom. The lesson being taught during the observation was addition and subtraction of integers using

CMP3 curriculum by Michigan State University. The researcher was able to observe all 30 students. However, for the purpose of this study, the experiences of three students who were identified as having a fixed mindset will be considered.

The growth mindset lessons were derived from Khan Academy (2015) Growth Mindset Lesson Plan. The goal of the first week is to introduce the concepts of growth mindset, fixed mindset and neuroplasticity. The goal of the second week was to build a safe learning environment that encourages taking challenges by normalizing mistakes, and finally in Week Three the students are able to recognize whether they are applying a fixed or growth mindset and utilized learned tools to transition from fixed to growth mindset thoughts. These strategies are presented in sequence and are not dependent on specific math lessons. Three of the 30 students were observed over the course of the study in order to understand the outcomes of the lessons and growth mindset strategies at the individual level.

Student Observations

Three students were specifically observed over the course of the research project. These students were from the focus demographic, Hispanic and low SES. Two of the students were female and one was male.

Gastelum

Description of the student. Gastelum is a twelve-year old male in seventh grade in a K-8 school in southern California. Gastelum transferred to this school during 5th grade within the same district. Gastelum is bilingual in Spanish and in English. Based on California English Language Development Test (CELDT), he has an overall score that places him at an intermediate level of language development. He qualifies for free lunch. According to the student survey Gastelum ranked low on the growth mindset scale as having a “fixed mindset”.

Based on the literature Gastelum displays behaviors associated with having a fixed mindset such as preferring to work individually rather than collaboratively. He is behind two grade levels in mathematics and 2.5 grade levels behind in language arts and sometimes expresses frustration during math class when he does not understand a concept and lacks intrinsic motivation to stick with challenges.

Overall achievement during study. Gastelum was engaged during each investigation of in the first and second weeks of this project. During Week One and Two, Gastelum was able to complete each investigation and demonstrate understanding through the daily written summaries of learning. Gastelum was able to discover Week One and Week Two big concept ideas through the inquiry-based design of the investigations. He was able to use the chipboard correctly and quickly made the connection with black chips representing positive numbers and red chips representing negative numbers. Gastelum was successful, in demonstrating that pairs of positive and negative chips result in zero, by connecting this concept to a number line. Gastelum was also successful in figuring out that taking chips off the board would result in a subtraction number sentence, while adding chips to the chipboard results in an addition number sentence. Gastelum was able to extend his learning from using manipulatives to representing his chipboard moves in text as number sentences. Furthermore, he was able to see that there are multiple solutions in how chips can be added or removed from the chipboard to represent a specific total value such as -2. For example, he was able to explain that if there are 8 black chips and 12 red chips on the board, then he can add two red chips to the board and that would give a total value of -2. As a second example, he explained that he can remove two red chips from the board and that it also results in a total value of -2.

During the second week, Gastelum was also able to figure out the big concept idea to come up with two algorithms that show the steps to adding integers. With help from his groupmates, Gastelum was able to make connections with using a chipboard to expanding his understanding without the use of the chipboard by creating an algorithm that would solve any addition problem. His work demonstrated that he was able to apply the developed algorithm to new problems. Gastelum was successful in explaining the steps of the algorithm when the researcher asked him to explain his mathematical thinking. The researcher provided two new addition problems with different sign addends, one negative and one positive number, and asked Gastelum to demonstrate the effectiveness of his algorithm. Gastelum was successful in demonstrating the effectiveness of the algorithm by following the steps and showing the correct answer. In addition, Gastelum showed eagerness to model the addition problems to the researcher using the chipboard model.

Gastelum struggled with discovering the patterns that connected addition and subtraction in Week Three. This challenge affected his level of motivation during Week Three. The researcher assessed Gastelum for understanding and noticed that he was successful in finding the missing addend of the addition number sentence, but he was not able to figure out the missing subtrahend in a subtraction number sentence. Failure to understand the subtraction concept of integers, affected his success in making connections between addition and subtraction. As a result, his engagement and collaboration with his group mates began to decline. He adopted a negative disposition towards learning and was hesitant to continue to attempt the problems.

Social interactions and behaviors. Overall Gastelum had demonstrated and increased growth mindset towards his math abilities, but also exhibited fixed mindset behaviors when he encountered obstacles. Gastelum accumulated several positive learning experiences in Weeks

One and Two, that reinforced his views of math self-efficacy and he was able to get past his first obstacle with ease.

Gastelum demonstrated multiple growth mindset behaviors and social interactions in Weeks One and Two. The content introduced in Weeks One and Two was new material for Gastelum. This factor did not seem to deter his motivation to delve into the investigation and explore how to use the manipulatives such as the chipboard, and black and red chips. The researcher documented Gastelum use of growth mindset language during the first two weeks. Gastelum used language such as "this is fun" and "let's try another one". His body language was also an indicative behavior of the use of growth mindset beliefs. For example, his level of engagement was not only evident by his participation in conversations and work with his other group mates; it was also evident by his leaning forward, his eye contact, his willingness to learn from others as he participated in collaborative work.

On the other hand, Gastelum began to exhibit fixed mindset behaviors during Week Three. The mathematical content during Week Three was also new material for Gastelum. The researcher was able to observe a decline in the students' motivation and learning disposition. For example, Gastelum demonstrated this decline when he was confronted with the challenge of coming up with chipboard moves that will determine the subtrahend, the number to be subtracted, that would complete a subtraction number sentence. Gastelum was not able to figure out the move that would accomplish this task. The researcher used growth mindset strategies to encourage Gastelum and to help heighten his views of math self-efficacy. The researcher asked of Gastelum, to explain the strategy he had used to gain insight into his understanding. The researcher then told Gastelum "remember when you worked really hard when creating addition number sentences using the chipboard, by adding chips to the board and were successful? Maybe

you can try some of those strategies again and see if you can come up with a way to represent the total value using different moves? It took Gastelum a few minutes before he began attempting the problem again. Gastelum exhibited growth mindset disposition toward feedback, because he used it as opportunity to learn rather than ignore the feedback.

Luna

Description of the student. Luna is a twelve-year-old female in seventh grade. She has been attending this school since kindergarten. She enjoys several long-term friendships as most of her friends are from her early grades in school. She is very social and friendly with her peers. Luna is of Hispanic background and receives free lunch. Luna primary language is Spanish. Based on her 6th grade California English Language Development Test (CELDT), Luna has an overall score of early-intermediate. District assessments show her mathematic grade level equivalency at fourth grade seven months and her reading grade level equivalency at fifth grade two months. According to the student survey, Luna ranked low on the growth mindset scale as having a "fixed mindset".

Based on the literature Luna displays behaviors associated with having a fixed mindset such as struggling to communicate with adults and peers when she needs helps in relation to academics. Luna struggles with maintaining focus and staying on task. She is respectful to her peers and adults in the classroom. However, in the past, she has been disciplined for her behavior outside of the classroom. Her mathematics skills are below grade level which interferes with her views of math self-efficacy, as she sometimes voices out her frustration resulting in quitting prematurely when she is given challenging learning tasks. Luna often lacks intrinsic motivation when it comes to beginning tasks.

Overall achievement during study. During Week One of the observations, Luna struggled to begin the week's investigation. When Luna began using the manipulative (chipboard, black and red chips) she was not able to make connections between setting the board to its initial value (8 black and 12 red chips) and what each move of chips did to the final value of the board. During Week One the researcher continued to remind students what they had learned about the brain's ability to grow, and how we control that change. The week's investigations expanded to next challenge in which students had to create number sentences that represented the moves done in their chipboards. Luna continued to struggle with this concept and was successful 25% of the time in coming up with the correct number sentence. Oftentimes Luna would be observed using the manipulatives incorrectly. This week's investigation moved further, by asking students to come up with different chip moves that would result in the same total value and where they had to model their chip moves as number sentence. By now, Luna began showing improvement, and when informally assessed by the researcher she was able to represent two out of four chips moves correctly as number sentences.

During Week Two of the study, the researcher observed that Luna began to show gradual progress. She was successful at using the chipboard to show the sum of addends with the same sign and the sum of addends with different signs. Luna struggled and was not able to come up with an algorithm to finding the sum for addends with the same sign or for addends with the different signs. Although she was able to represent addition with the use of manipulatives, she continued to struggle with representing her modeling with number sentences and extending it to an algorithm. Since Luna was not able to come up with an algorithm to solving new addition problems, she was not able to solve future problems without the use of manipulatives.

During Week Three of the study, the researcher observed that Luna continued to make small increments of progress. Luna was now able to come up with two different combinations of chip moves that would result in the same total value, but she struggled with coming up with chip moves that created a subtraction number sentence with the same total value as the addition number sentences. The researcher assessed the understanding of Luna and noticed that Luna had not made connections between the moves made on a chipboard and the operations that can are represented by each move. Overall, Luna made small increments of progress during the three-week study. She struggled with extending her understanding from using manipulatives, to creating algorithms, and them applying those algorithms to new problems.

Social interactions and behaviors. The observations on Luna demonstrate that she showed a gradual growth of her growth mindset and beliefs of her math capabilities. She had shown resistance to feedback throughout the three-week study, but with persistence, the researcher has been able to motivate her to some degree. Luna successful experiences were limited during this study, and this carries implications towards limited progress towards a stronger growth mindset and a higher belief in her math self-efficacy.

The researcher observed Luna social interactions and behaviors and noticed that she exhibited multiple fixed mindset behaviors. The researcher observed that Luna showed improvements but they were gradual. During Week One the researcher overheard Luna express her frustration by making statements such as “this isn’t working, I’m done”. During Week One, the researcher also noticed that Luna gave up easily after making mistakes at the beginning of the investigation. Two students provided feedback to Luna at multiple times during the three-week study, but Luna decided to ignore their feedback for the majority of the time. Instead of asking help from her group mates, Luna decided to quit attempting the problems until the researcher

approached her to help her. During Week One, Luna views of math self-efficacy continued to decline as she continued to experience failure.

During the three-week study, the researcher assessed Luna's understanding and noticed that Luna lacked some skills. In order to help Luna, overcome her learning obstacles, the researcher used growth-mindset-developing strategies. Statements such as "Give it a try and we can fix mistakes once I see where you are getting held up" and "Let's ask another student for advice. They may be able to explain it in a new way" (Mindset Works, 2016). The researcher suggested some ideas and strategies to Luna. In this occasion Luna asked the teacher for further explanation of the task. Her receptiveness was evidence to the gradual growth she showed during the three-week study. Throughout the three-week study the researcher reminded students of the growth mindset lessons they had done at the beginning of each week. The researcher did this to instill in them the belief that their level of intellectual capacity is malleable.

Victoria

Description of the student. Victoria is a thirteen-year-old female seventh grade. She began attending this school in second grade. According to the student survey, Victoria ranked low on the growth mindset scale as having a "fixed mindset".

Victoria appeared to have positive social interactions with her peers. She is not very social during class and is timid during classroom discussions. Victoria is a hard worker and exhibits a lot of effort when the teacher is present. Victoria struggles with seventh grade mathematics concepts. District assessments show that her grade level equivalency for mathematics is third grade and seven months and her reading level is at third grade five months equivalency. This current gap in achievement makes it difficult for her to access grade level content. Yet, Victoria shows determination when teacher's presence is nearby.

Victoria is of Hispanic background and receives free lunch. Her primary language is Spanish. Based on her sixth grade California English Language Development Test (CELDT), Victoria has an overall score of Basic. Victoria has CELDT for speaking and listening is early intermediate and basic for writing, reading, and comprehension. Victoria has advocated for herself to get help during class when she does not understand something. Based on the literature, Victoria displays behaviors associated with having a fixed mindset such as quitting when obstacles arise and if the teacher is not nearby to keep her motivated.

Overall achievement during study. Victoria was able to complete the investigations from the curriculum during the three-week study. She showed consistent growth and understanding of the concepts and big ideas from each investigation. Victoria experienced multiple setbacks during the three-week study, but her level of motivation continued to improve as we moved more deeply into the subject. Her learning summaries were concise, but she was able to capture important details in the understanding of adding and subtracting integers.

During Week One, Victoria showed the researcher how to use the chipboard to represent addition and subtraction. She explained that when she added chips to the board that meant addition, and when she removed chips from the board that meant subtraction. She struggled extending this understanding to writing number sentences. Yet, before Week One was over Victoria was able to write number sentences with the assistance of the researcher. During Week Two, she continued to make connections with her Week One learning and apply them to Week Two. She accumulated many successful learning experiences throughout the three-week study. When completing the table of expressions, she moved back and forth between using manipulatives, paper pencil, and mental math. Victoria was able to come up with the algorithm for adding integers with the same sign. She struggled with coming up with the algorithm with

addends with different signs. Yet, she asked for help from her classmates and teacher and was able to make a connection and understand the steps of the second algorithm.

By Week Three, Victoria was able to continue to extend her learning and create addition and subtraction number sentences that lead to the same total value. The researcher noticed that Victoria continued to experience setbacks, but also continued to make great progress in understanding the big ideas of each week's learning goals.

Social interactions and behaviors. Before this study, Victoria had shown perseverance and for the most part a positive learning disposition as long as the teacher was nearby to assist. The researcher observed that Victoria biggest growth was her intrinsic motivation. When Victoria experienced setbacks during the math investigations, the researcher was there to provide growth mindset feedback while also reminding her of each week's growth-mindset-developing strategies.

Victoria was able to experience success early on during Week One. For the most part, Victoria avoided talking to other students; this may be attributed to her timid personality. During Week One, she completed most of her work without the help of her group mates. As observed prior to the study, Victoria was engaged when the teacher provided help with strategies. Victoria was observed to have increased social interactions during the three-week study. Victoria demonstrated an increasing use of growth mindset language and intrinsic drive. The researcher observed Victoria make statements such as, "this is fun", "let's try the next one", "do you need help?", despite some setbacks. The researcher also observed Victoria increase her group interactions and conversations with others during the three-week period. She showed full engagement in her conversation with other students, paying close attention to their mathematical thinking. By midweek of Week Two, Victoria, began sharing her mathematical thinking with

other students. She was able to explain how to use the chipboard with an initial value of 8 black and 12 red chips and what moves to take to show subtraction and addition of integers to get a value of 4. By Week Three, the researcher also observed Victoria comparing her work with other students and asking for feedback, a behavior that is outside of her character. She asked one of her classmates to check her number sentences as she explained how she had derived them. Additionally, Victoria started using the word "yet" during her peer social interactions. For example, Victoria was heard stating "I do not understand this yet" while working on a math activity. This word was important to the observations because it was introduced at the beginning of Week Three-growth mindset intervention to replace fixed mindset thoughts.

Summary of Observations

The observations took place over a span of three weeks, during the students' first period math class which provides a total of 50 instructional minutes each day. Within those 50 minutes the researcher was able to adequately observe the social interactions, behaviors, and document the effects on their development of growth mindset and views of math self-efficacy with Hispanic students from a low socio-economic status in a seventh-grade classroom. The data provided insight into students' development of growth mindset, and the obstacles they encountered in their development. In addition, throughout this action research project, I garnered a better understanding of student experiences that, in future, may inform further research as well as considerations regarding implementation of growth mindset strategies.

The observations, anecdotal notes and checklist provided evidence in support of implementing growth-mindset-developing strategies in a mathematics classroom can provide students with non-cognitive skills and tools to improve the student's views of math self-efficacy. The data derived from the observations and instruments showed that student motivation

increased, despite many setbacks, different personalities, and different academic skill levels. The researcher taught the students growth-mindset-developing strategies, how to use these strategies to change their fixed mindset behaviors into growth mindset behaviors and was able to observe varying levels of growth.

Chapter Five

Discussion and Conclusion

Preparing students to be college and career ready and closing the achievement gap to help students reach this goal continues to be a topic of discussion among education stakeholders. Many researchers have studied the effects of non-cognitive factors on student achievement. Dweck and Legget (1988) and others, studied why students with equal intellectual ability take on challenges differently, behaviors that end up having an effect on the students' future academic success. Blackwell and colleagues (2007) among others have proposed a motivation model and determined that the theories of intelligence that students hold about their capabilities, fixed or growth mindset, influence how they respond to academic challenges.

The Common Core State Standards (CCSS) in mathematics also highlights the need for education stakeholders and researchers to analyze non-cognitive factors that influence students' academic proficiency. For the past thirty years, researchers have studied the implications of teaching students that intelligence is malleable. Dweck was the first researcher to point out the need to pay attention to the implicit theories of intelligence (incremental and entity theories) in students. Her studies discovered that we each make assumptions about intellectual capacity drawing on a combination of incremental and entity theory, what is now commonly known as growth and fixed mindset, respectively. Multiple studies demonstrated that implementing growth-mindset-developing strategies in classrooms improves students' academic proficiency (Dweck et. al, 1988, Dweck, 2006; Blackwell et. al, 2007; Duckworth et al., 2007). Furthermore, students have been shown to increase their views of self-efficacy, their perseverance, and learning disposition when they are taught growth mindset strategies (Dweck, 2006; Blackwell et al., 2007; Duckwork et al., 2007). The effects of implementing growth-mindset-developing

interventions continues to be a new topic of discussion among educators and researchers. Therefore, further research is needed to determine whether effective use of implementing growth-mindset-developing interventions will increase students' views of math self-efficacy and other non-cognitive factors such as perseverance.

The purpose of this study was to determine if applying growth-mindset-developing interventions in a seventh-grade mathematics classroom would positively affect the views of math self-efficacy among Hispanic students from low-socio economic status. The research study took place in a southern California K-8 public school of approximately 1,200 students. The participants in this study were seventh grade students with Hispanic background and from low-socio economic status. The researcher gathered data from three students of Hispanic and low-socio economic background identified as having a fixed mindset on their mathematics capabilities. The researchers gathered data using a checklist (Appendix B) and anecdotal notes. The data was organized and analyzed to reveal the importance of themes such as students' overall achievement, and social interactions and behaviors. These themes were also represented in the literature on growth mindset.

Interpretation of Data.

There are multiple factors that influence the effectiveness of a mathematics classroom. Such factors include, but are not limited to, the teacher's mindset regarding students' capabilities with mathematics, the learning environment, and the rigor of the curriculum. Past literature explains that when teachers have a fixed mindset regarding students' mathematical capabilities; they are more likely to judge them on their abilities consequently resulting in lowered student expectations (Rattan et al., 2012).

Blackwell and others (2007) created a safe learning environment, were risk taking was encouraged and mistakes were expected and seen as necessary for student to develop a growth mindset that allowed them to get past obstacles. In addition, maintaining a challenging curriculum is also important since it fosters an environment of high expectations where students are challenged and encouraged to overcome setbacks. Throughout the study, the researcher kept these three factors in mind. This allowed her to cultivate an environment in which students challenged themselves and practiced critically thinking about their understanding and growth. The growth-mindset-developing strategies helped students increase their perseverance when tackling obstacles and increase their beliefs in their math abilities as they constructed new meaning of mathematical concepts.

Overall Academic Proficiency, Social Interactions and Behaviors Interpretation

The researcher observed that the use of growth-mindset-developing strategies had an overall positive affect with varying levels of growth including students' academic proficiency, social interactions and behaviors associated with having a growth mindset. The growth-mindset-developing strategies implemented in the classroom-increased students' academic proficiency while also improving their social interactions and behaviors in the classroom.

For all three students the researcher observed varying levels of improvement in their attitude towards learning. The researcher attributed these growth differences to students' past mathematical experiences. In other words, a student's number of unsuccessful mathematical experiences may be greater than that of their peers. Some students may have a bigger collection of unsuccessful learning experiences in mathematics than others, which can affect them in different ways, in particular their self-efficacy (Bandura, 1997).

The students were able to tackle the math investigations even when they encountered obstacles. The students who adopted the growth mindset belief early in the study overcame obstacles at a higher frequency. The students who were not entirely receptive to growth mindset feedback still experienced success and development of growth mindset skills, but at a lower rate.

For this action research project, using growth-mindset-developing strategies in a mathematics classroom enhanced the experimental students' social interactions as an increase in confidence was observed by the researcher. Throughout the observations, students were actively participating in conversations about adding and subtracting integers and using the manipulatives. The experimental group of students asked inquiry-based questions at varying points during the study. On several occasions, Gastelum and Victoria were frequent active participants in the collaboration aspect of the math investigations. By contrast, Luna struggled with maintaining focus and motivation and was often non-receptive to feedback. One assumption to explain Luna's lack of receptiveness to feedback may relate to her past mathematical experiences, or fear of making mistakes. A student with a fixed mindset would rather avoid challenges for fear of failure than having their intelligence judged (Dweck, 2006; Duckworth et al., 2007). Victoria demonstrated a gradual acceptance of feedback. The researcher observed an increase in her receptiveness as growth mindset feedback was modeled and provided to her. Indeed, it is imperative for teacher to share their knowledge of skills, ideas, strategies, and insight to ensure that all students, including those from Hispanic and low-socio economic backgrounds, experience academic success in mathematics. In summary, the most significant findings to have emerged from this study included an increase in confidence, an increase in tackling challenges and an increase in receptiveness towards receiving feedback.

Recommendations

Implications for research. This study was conducted in a seventh-grade math class in a largely Hispanic K-8 public school in southern California. The teacher distribution for this public school's seventh grade students is one teacher per subject. It is recommended that research be extended to more seventh grade classrooms with similar demographics as in this study. Further studies should aim at using the same data collection strategies such as instruments, anecdotal notes and checklists to compare similarities and differences in findings. Furthermore, it is recommended that the same set of growth-mindset-developing strategies be applied to future research in order to assess similarities and differences in application and findings. The results of this study may contribute to the literature on the use of growth-mindset-developing strategies during mathematics instruction and math self-efficacy among Hispanic students from low socio-economic backgrounds.

Studying the low-SES, gifted population may not appear to be directly related with this study since my focus is on the experiences of struggling students. Yet, it would seem important to consider and to learn about the strategies used to challenge gifted students to inform interventions for struggling students. It is important to keep in mind that gifted students also run the risk of developing a fixed mindset despite the assumptions that gifted students tend to have growth mindsets. In classrooms where both gifted and struggling students are present, differentiations in growth mindset strategies may be implemented to prevent gifted students from developing a fixed mindset.

Implications for practice. Additionally, this study may be beneficial for teachers, either tenured or aspiring, who are seeking strategies that may have positive influences on non-cognitive skills. This study may also be helpful to teachers who may not be math content

teachers but who wish to positively affect their students' view of self-efficacy. Indeed, the growth mindset strategies used in this study are not dependent on the academic subject taught.

The findings of this action research suggest that helping students develop a growth mindset has many positive effects on students' academic success, social interactions and behaviors. I found that students' intrinsic motivation improved, and their perseverance when delving into mathematical challenges improved. Moreover, the students gained confidence and were more likely to participate in conversations about their mathematical thinking. Their belief in their math abilities improved, and their excitement to participate in mathematical challenges also improved. This action research suggests that implementing growth-mindset-developing strategies in a seventh-grade mathematics classroom with Hispanic students from low-socio economic status will also improve students' views of math self-efficacy.

This study may also hold importance to school and district administrators regarding the potential to change institutionalized school and district cultures. Implementing growth-mindset-developing strategies may advantageously influence test scores, school rankings and the collective future successes of the students who come through their doors.

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Appendix A

Standards for Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

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Appendix B

Teacher Observation Checklist and Observation Notes

	Asks Questions to teacher	Ask questions to other students	Asks help from teacher	Asks help from other students	Is receptive to teacher feedback	Is receptive to student feedback	Demonstrates active listening when another student is listening	Is respectful to other students		Gives up easily	celebrates successes	Is happy when another student succeeds	Demonstrates discontent when another student succeeds	Shows discouragement when answer is incorrect	Wrong answers are viewd as worthwhile	Speaks negatively about abilities			Looks for different strategy to solve problem	Uses a variety of math manipulatives	Select tools that are appropriate	Look at problems and ideas in different ways	Demostrates frustration when something becomes difficult	Is able to extend learning		Engaged in Math Investigations	Is able to extend learning	Is able to explain misconceptions	Is able to construct viable arguments			
Student 1																																
Student 2																																
Student 3																																

Appendix C

Student Survey

	Strongly agree	Agree	Disagree	Strongly Disagree
1. One big reason why I do my homework is because I like to learn.				
2. I like when people, parents, coaches, teachers, tell me how I am doing.				
3. I do not try new things because they are stressful.				
4. An important reason why I do my school work is because I like to learn new things.				
5. You can always change simple things about who you are.				
6. Math is much easier to learn if you are a boy or maybe if you come from a culture who cares about math.				
7. You have a level of intelligence and there is not much that can be done to really change that.				
8. No matter how smart you are you can always be more smart.				
9. Very smart people do not have to try.				
10. Intelligence is something people are born with and it cannot be changed				

Adapted from Dweck (2006). *Mindset: The New Psychology of Success*.

Appendix D

Growth Mindset Framing Tool

mindset works

MindsetMaker™ | Growth Mindset Feedback Tool

When they succeed with strong effort

- I am so proud of the effort you put forth.
- I am very proud of you for not giving up, and look what you have to show for it!
- Congratulations – you really used great strategies for studying, managing your time, controlling your behavior, etc.
- I want you to remember for a moment how challenging this was when you began. Look at how far you have come!
- All that hard work and effort paid off!
- The next time you have a challenge like this, what will you do?
- What choices did you make that you think contributed to your success?
- It's exciting to see the difference in your work now when we compare it to your earlier work.
- Doesn't it feel good to master this? How does it feel to master this?
- Are you proud of yourself? Tell me what makes you most proud.

When they succeed easily without effort

- It's great that you have that down. Now we need to find something a bit more challenging so you can grow. That's what we all come to school to do.
- It looks like your skills weren't really challenged by this assignment. Sorry for wasting your time!
- I don't want you to be bored because you're not challenging yourself.
- We need to raise the bar for you now.
- You're ready for something more difficult.
- What skill would you like to work on next?
- What topic would you like to learn more about next?
- Could you find two other ways to solve that problem? Solving problems in different ways helps us deepen our understanding and be able to apply it.
- Can you help Billy learn what you've learned? By helping others, we not only contribute to their success, but we also deepen our own understanding.

When they don't put in much effort and then don't succeed

- I understand that it may seem daunting at first. How can we break this down into smaller tasks so it's not so overwhelming?
- What are your goals for this assignment/class/year? How can you make a plan to achieve those goals? What effort will be required?
- It looks like you're not putting forth much effort. Is this the way you see it? If not, what is it that you are doing, and how can I help you with some new strategies?
- What are the barriers to your success? How can I help you overcome them?
- Remember when you worked really hard for _____ and were successful? Maybe you could try those strategies again.
- If improvement is your goal, it's going to take effort and practice to get there. Our brains won't grow if we don't try hard things.
- What choices are you making that contribute to this outcome? If you want a different outcome, maybe you need to make different choices.

MindsetMaker™

Appendix D

Growth Mindset Framing Tool

mindset works

MindsetMaker™ | Growth Mindset Framing Tool

Growth Mindset Framing Tool

In order to create a safe classroom environment where all students are willing to take on challenges and push themselves, it is important to make the focus on learning clear, make it safe to make mistakes, and communicate a high confidence in all students' ability to rise to the learning challenges. Use the following statements when introducing a new topic, concept, skill, or assignment in class:

For Communicating a Learning Goal

- New material is an opportunity for all of us to stretch our abilities!
- Today, your brain will get stronger.
- I am hoping that you all do not know this already; I wouldn't want to waste your time!
- I really want us to stretch beyond our comfort zone on this!
- After you do this, I'm going to ask everyone to share one mistake and what you learned, so we can all learn from it.
- I'd like everyone to share one thing that is really confusing, at this point, with their partner.
- The point of the lesson is learning; I want to know what parts are unclear so we can all meet our learning target.
- Today's target for learning is [x learning objective.] Tomorrow, we will continue our work and take a deeper dive by working on [y learning objective].
- I do not expect you to know this already. I am here to help you learn challenging material.
- Today, I want you to challenge yourself. Stretch to learn this challenging material.
- This is very dense and challenging material. You may not understand all of it right away, but I want you to give it a first try.
- This is just the first draft—you'll have lots of chances to improve it.
- I want you to push yourselves to tackle this concept.
- You won't be graded on this—it's a risk-free zone!
- We're in the learning zone today. I expect you to make a lot of mistakes because mistakes are normal when we're learning new things.
- This is a very challenging task. I want you to try, even if you think you won't get it right. I'm not looking for right answers; I'm looking for risk-taking.
- We'll be firing a lot of neurons today while we learn, and we may not make all the necessary connections to understand this material, and that's OK. We'll get there.

For Communicating High Expectations

- I know that you all have the ability to learn this, so I have set the bar high.
- This will be a challenging concept to learn, but all of us can reach the goal.
- If you begin to get frustrated, be sure to communicate with me about your progress so I can provide support to you. I am confident you can learn this with the right support.
- I am going to push you all because I know that you can all achieve amazing work!
- Our classroom is a place for everyone to learn challenging material. I am here to help you meet that goal.
- I expect you to make mistakes when you try hard things! This is challenging, but rewarding!
- This may be difficult right now, but as you learn more, it will become easier.
- When you master this learning, you can be proud of yourself, because this isn't easy.
- Here is my challenge for you. I know you can meet it. I want you to challenge yourself.
- I have seen you stretch and succeed in the past. Let's do it again.

MindsetMaker™

Mindset Works (2016). Growth Mindset Framing Tool. Retrieved from:

https://www.mindsetworks.com/free-resources/default

Appendix E

Growth Mindset Feedback Tool

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Growth Mindset Feedback Tool

Growth minded language motivates students to ensure they remain persistent, resilient, and focused on the process of learning. It is important to give learners feedback about how their process leads to a result so they can understand that their abilities will develop with effort.

Use these language frames in the following situations:

When they struggle despite strong effort

- OK, so you didn't do as well as you wanted to. Let's look at this as an opportunity to learn.
- What learning strategies are you using? How about trying some different ones?
- You are not there yet. *or,* When you think you can't do it, remind yourself that you can't do it yet.
- I expect you to make some mistakes, since we're learning new things. If we examine what led to our mistakes we can learn how to improve.
- Mistakes are welcome here! Our brains grow if we learn from our mistakes.
- You might be struggling now, but you are making progress. I can see your growth (in these places). (Note: Say this only if they're indeed making progress).
- Yes, it's tough – we come to school to make our brains stronger! If it were easy you wouldn't be learning anything!
- You can learn to do it – it's tough, but you can; let's break it down into steps.
- Let's stop here and return tomorrow with a fresher brain.
- I admire your persistence and I appreciate your mental effort. It will pay off.

When they are lacking specific skills needed for improvement

- Let me add new information to help you solve this.
- Here are some strategies to figure this out.
- Describe your process for completing this task.
- Let's practice this so we can move it from our short-term to our long-term memory.
- Give it a try – we can always fix mistakes once I see where you are getting held up.
- What parts were difficult for you? Let's look at them.
- Let's ask [another student] for advice—they may be able to explain it in a new way, suggest some ideas, or recommend some strategies.
- Let's write a plan for practicing and learning.
- If you make [these specific] changes, we can reassess your score. Let's discuss a plan for you.

When they are making progress

- Hey, do you realize how much progress you've made?
- That's a tough problem/task/concept that you've been working on for a while. What strategies are you using? They are really working for you.
- I can see a difference in this work compared to your earlier work. You have really grown with ___.
- I see you using your strategies/tools/notes/etc. Keep it up!
- Hey! You were working on this for a while and you didn't quit!
- Your hard work is clearly evident in your process/project/essay/assignment.
- Look at how much progress you've made so far! Do you remember how difficult this was when you first started?

MindsetMaker™

Mindset Works (2016). Growth Mindset Feedback Tool. Retrieved from: https://www.mindsetworks.com/free-resources/default

Appendix F

Student Letter to Future Student

Dear Future Student,

I remember one time I struggled was when I wanted to ride a bike. I was so frustrated that I did not know how to ride a bike. I overcame it by practicing my balance, it didn't work. After trying that a few more times I tryed something new and that is leaning my bike against the wall and went on it, I started peddling and I was riding a bike. It taught me to not give up. The advice that I'd give the future student is to not give up and to find different stradegies. Also, just face the problem instead of running away from it.

Sincerely,

Appendix G

Student Letter to Future Student

Dear, futer Student,

One thing that I us to Struggle is with Math. I Struggled with math because I did not us to tell my teacher that I needed help. I overcame my struggle is that I Started to ask for help and I told my parints and the help me. It teach me that I not Wrong asking for help and to never Say that I don't need help when I do need help. One advice that I can tell you is that to tell people when you need help

Sincerly,

Appendix H

Student Letter to Future Student

Letter to a Future Student.

Dear, future student.

The time I strugle with something make me feel really bad about my self because my struggle was that I didn't no how to speak English. To help my self to overcome my bad feeling about my self I spend all my time, reading lots of books. And I also had and app in my computer that really help me how to speak English, how to read it and how to write it. my advice to the future student will be to never give up on your dream because no matter how long it takes to learn something you will achive your goal. So remembered future student never ever give up in your dream you will always achive your dream.