

Reflective Journaling in a Math Class

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## ABSTRACT

The impact of student reflective journaling in a mathematics class on students' level of self-efficacy was examined in this Action Research Project. Student mathematical self-efficacy was affected by math anxiety. Student level of self-efficacy was impacted by self-perception of mastery. Findings included a positive relationship between reflective journaling and improved quality of relationship between the student and the teacher, reflective journaling led to teacher's ability to discover and attend to individual student needs, and reflective journaling allowed students to attend to their math anxiety through exposure. Further research could include whether there is a correlation between the teacher's positive shift in attitude and the student's level of self-efficacy.

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## CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

### Context Of The Research

As our nation's educational leaders continue to struggle with developing and implementing strategies and protocols that will produce high achieving students, students are being subjected to scripted and uninspiring curriculums, intense standardized testing, and stringent assessment measures. Math students, who commonly report a negative relationship with math, such as experiencing math anxiety, now have the added pressures of learning complex mathematical concepts in shorter amounts of time, continuous assessments of their performance, and district policies that label a large percentage of students as underachieving or "at risk" for potentially failing to pass high school graduation requirements. In my experience working with middle school students in mathematics, I have found that many students perceive themselves to be "bad" at math. This negative self-perception of their competence in mathematics reveals their low mathematical self-efficacy. Self-efficacy has been defined by Bandura as, "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances, which strongly influences the choices people make, the effort they expend, and how long they persevere in the face of challenge" (Pajares & Miller, 1994, p. 193). For students, this means that self-efficacy is how the

student perceives their own abilities or chances of succeeding. These perceptions often affect decisions they make about which classes to take, subjects to study or careers to pursue. Researchers have concluded that self-efficacy is predominantly centered on perceptions of mastery (Kesici, Erdogan, & Kelesoglu, 2010). Harford (2008) writes, “A student’s belief that he or she is capable of accomplishing certain tasks proficiently is a key factor in achievement. When students experience a feeling of self-efficacy, they are more likely to continue the cycle by setting new, ambitious goals and working to achieve them” (p. 63). As an important component of student achievement, self-efficacy beliefs contribute to aspirations, commitment to goals, level of motivation, level of perseverance, resilience, “quality of analytical thinking... vulnerability to stress... depression” and anxiety (Bandura, Barbaranelli, Vittorio Caprara, & Pastorelli, 1996, p. 1206).

With the implementation of Common Core State Standards, schools have begun adopting curriculum that is purported to be more rigorous and aligned with standards that will ensure high levels of mathematical competence. School districts, driven by data, are labeling students based on test scores and assigning them to leveled classes accordingly. In my district, the data, collected through multiple standardized tests, has indicated that over 70% of seventh grade students are at risk for failing high school graduation requirements and



have been placed in intervention math classes with a specific curriculum, called KEMS<sup>1</sup>, designed to back-fill gaps in learning. Student selection for this class is based on several factors, such as state assessment scores, the previous years' math grade, teacher recommendation, and parent/guardian approval. In my district, instructional content in KEMS classes includes learning strategies focused on building fluency, flexibility and accuracy of basic math facts through conceptual understanding. KEMS classes are offered in place of students' elective classes and are in addition to their core math class. KEMS lesson plans are not coordinated to support students' core math class. Students new to the district who do not have test data or teacher recommendations are given a test, which assesses their mathematical aptitude and may place them in this intervention class. This assessment is given on a computer and is written only in English, making it inaccessible for non-English speaking students. There are alternative math classes for students who score below the KEMS level.

According to the school district's mathematics director for students in fifth through eighth grade, students are typically offered KEMS for only one year, but are sometimes enrolled for a second year. Students generally remain in the class for the entire academic year. In rare circumstances, students may exit the class if they perform well in their core math class, the KEMS class, and

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<sup>1</sup> *The Key Elements to Mathematics Success*, also known as KEMS (Enright, Schueren, Maldonado, & Landes, 2010)

also score high enough on the district measures of progress assessments, which are conducted five times per year.

Students in the KEMS class have typically been labeled “low achieving” in mathematics for many years prior to beginning this intervention math class. I have noticed that students in KEMS tend to demonstrate attitudes of low self-efficacy. This trend is supported by Ozgen & Bindak’s (2011) research study, which found that students assigned to lower level classes had lower self-efficacy. In another study, researchers found a significant correlation between schools with higher percentages of students eligible for free or reduced lunch, English Language Learners, with higher reported levels of math anxiety, and lower reported levels of self-efficacy (Swaim Griggs, Rimm-Kaufman, & Merritt, 2013). In general, it can be concluded that any marginalized student is more likely to suffer from low self-efficacy and the resulting repercussions.

Educators who are concerned with addressing the individual needs of each student must challenge their students to see beyond the labels placed upon them by the institutional educational system. Teachers who recognize that every student is capable of being a valuable math student must apply transformative strategies in hopes of refining students’ negative self-perceptions. Research has shown that reflective journaling is one strategy that

may play an integral part in reducing math anxiety, raising student perception of competence, and [improving a student's level of self-efficacy](#).

## Literature Review

In an effort to inform my understanding of students' mathematical self-efficacy, I sought out peer reviewed journal articles from experts in the educational field. I explored areas of self-efficacy, mathematical anxiety, mastery and reflective journals. Through this research, I discovered that the use of reflective journal writing could potentially have a positive benefit to students' level of self-efficacy.

### Self-Efficacy

Self-efficacy is defined as “beliefs in one’s capabilities to organize and execute the courses of action required to manage prospective situations” (Bandura et al., 1996). Self-efficacy, then, influences the choices students make, such as the courses they take and the level of effort they put into their studies (Pajares, 1996). Naturally, people tend to choose those subjects in which they feel confident, and avoid those they find intimidating. Researchers have also found that the higher a student’s self-efficacy, the more effort they are willing to expend (Ozgen & Bindaka, 2011; Pajares, 1996).

Mathematical self-efficacy is the perception of one’s mastery of the subject, and their belief in their abilities to complete a task and achieve success.

Students with high self-efficacy [often](#) have higher levels of academic achievement, show greater levels of effort and are [typically](#) more tenacious than students with low self-[efficacy](#) (Bandura et al., 1996). Research has found a strong correlation between students with high self-efficacy and higher levels of effort and persistence when they are faced with a difficult problem (A. Akin & Kurbanoglu, 2011). [These students also](#) pay attention more in class (Harford, 2008) resulting in higher levels of achievement ([Harford, 2008](#); Usher, 2009).

In framing one's interpretations of their competence, students tend to use their past successes and failures, peers as models and comparisons, and feedback received from teachers and parents. Furthermore, students with high self-efficacy are more likely to use cognitive strategies, tools for assisting in learning such as cues, rehearsal, imagery and mnemonics (Jordan, n.d.), and exhibit better self-regulation of their learning, thus increasing self-efficacy (2009). Students with a higher level of self-efficacy tend to set goals, and are self-motivated to work towards achievement (Harford, 2008).

Usher is a prolific researcher in the area of self-efficacy and held in high regard among researchers. Usher's research is considered credible and valid, and necessary for my action research project. Harford's [\(2008\) research](#) [focused](#) on English Language Arts, yet is highly relevant to my research project as it explores the ideas of self-reflection and goal setting as measures of

improving student self-efficacy. In combination, these researchers' work added a meaningful dimension, offering ideas and processes I considered and implemented in my own action research project.

Self-perception has been found to have a positive correlation with student self-efficacy. Some factors that affect a student's perception of their competence includes our culture of efficacy (expectations surrounding efficacy); a student's parent's level of academic achievement; economic status (Ozgen & Bindaka, 2011), and negative internal dialogue (Usher, 2009). Some traditionalists believe that mathematics achievement is based on inherent ability. The constructivist theory espouses the belief that self-efficacy levels are not stable, not inherent, and can be changed or be improved (Ozgen & Bindaka, 2011). Teachers can help raise students' level of self-efficacy by imposing interventions that will help them [positively](#) identify their abilities. Some interventions teachers could implement include: encouragement (Usher, 2009), helping students with goal setting, giving useful feedback (Ozgen & Bindaka, 2011), maximizing opportunities for academic success (Martin, Anderson, Bobis, Way, & Vellar, 2012a) and establishing a relationship of trust with students (Hamdan, 2005).

Ozgen & Bindak and Usher's research again add credibility and validity to my action research project as it deals directly with self-efficacy and

mathematical literacy. In addition, this research also includes multiple factors I considered and implemented in my action research project, including gender, culture, and socio-economic status. These additional considerations are important to keep in mind as important variables that may have an impact on research results. Hamdan's research lacked triangulation, member checks and rich descriptions, leaving many questions to consider. However, in combination with the other two research studies, Hamdan's research can be considered as valuable when exploring the concept of journaling in a mathematics classroom.

Teachers who choose to maximize opportunities for student success by addressing self-efficacy issues can implement the use of reflection journals.

Journals allow teachers to communicate with students in a safe environment, allowing teachers to offer encouragement, help students set goals, and give useful feedback. This process of reflection allows the student to identify their competence and accomplishments as well as recognize areas for improvement (Harford, 2008). Reflection has been shown to play an important role in the learning process, involving self-appraisal and an opportunity to set goals (Stevens, Harris, Aguirre-Muoz, & Cobbs, 2009).

### **Math Anxiety**

For some students, math anxiety can be debilitating, creating a barrier to math achievement that can limit their ability to participate in higher-level

courses and likely limiting their future academic and career opportunities (Ozgen & Bindaka, 2011). Students have reported feelings of anxiety when they felt the material was too difficult or when they felt pressure to do the math correctly (Stodolsky, Salk, & Glaessner, 1991). Anxiety may manifest as avoidance. This avoidance may be evident in students' behaviors, such as disassociation (Martin, Anderson, Bobis, Way, & Vellar, 2012b), causing distractions and misbehaving. These tactics allow the students to avoid the anxiety-provoking factor, participating in mathematics. Researchers (Craske, Treanor, Conway, Zbozinek, & Vervilet, 2014) have found that one powerful tool to combat anxiety is through exposure to that which causes anxiety, also known as exposure therapy. My research project supports the idea of educators using reflective journaling in a math class as a form of exposure therapy, creating a safe bridge between the content and the teacher.

In the study conducted by Akin & Kurbanoglu (2011), researchers surveyed 372 students on their levels of math anxiety, mathematical attitude, and self-efficacy in order to measure and determine possible correlations. The survey included a scale rating for mathematical anxiety (1 – 5 scale), a mathematics attitudes scale (1 – 5 scale) and a self-efficacy scale (1 – 7 scale). The surveys were translated from English into Turkish language and validity tests were conducted to ensure reliability. Data was analyzed using descriptive

statistics. Researchers found that math anxiety [was](#) correlated with negative attitudes and low self-efficacy. The mix of students included 58% female and 42% male, with ages ranging from 18 to 26 years old. Prior to the administration of the survey, participants were informed of the purpose of the study. The strengths of this study include credibility, as it was conducted in a rigorous, systematic and ethical manner and the results can be trusted. The findings are also congruent with other related research studies and triangulation was created through the use of three different surveys. Rich and thick descriptions were used, allowing future researchers to identify possible similarities and acknowledge differences in circumstances. The weakness of the study comes in the description of the coding process, which requires future researchers to develop their own system. This study meets [standards](#) for credibility and validity, including triangulation through multiple surveys and peer review.

In another study, Martin et al. (2012a) found that math anxiety is a common phenomenon many students experience as tension, fear, and avoidance of math, often resulting in a poor performance and disengagement. This study consisted of 1601 middle school students with 34% in the sixth grade, 24% in seventh grade, and 42% in eighth grade. Of these students, 58% were girls, and 42% were boys. One in five of these students spoke a language other than



English. The schools that participated in this study were comprehensive, mixed ability, with a wide range of socioeconomics represented. The study consisted of student self-evaluations using a rating scale in order to quantify students “switching on” and “switching off” in mathematics class.

This study was conducted in a rigorous, systematic and ethical manner, lending to its credibility. The results are consistent with other research findings I have found, making it congruent with other studies. Triangulation was established through measures and analyses. The study was peer reviewed, thick and rich descriptions of the study were provided, and external validity exists. I find this study credible and reliable because it includes triangulation through multiple measures and analysis.

\_\_\_\_ Stodolsky, Salk & Glaessner's (1991) research found that math students typically view math from a performance orientation. The combination of these research studies add to the validity of their findings, that math anxiety is correlated with low-self-efficacy. However none of these studies differentiated for ethnic groups, ELL students, gender, students with IEPs, or 504 plans and I am left wondering how these factors contribute to students' self-efficacy and math anxiety.

In addition to motivation, math anxiety is a major component of student self-efficacy, therefore it is important to uncover contributing factors. There

are many possible factors that may contribute to a student's math anxiety. Some factors include social comparisons, low self-esteem (Kesici et al., 2010), the student's perception of their own abilities (Ahmet Akin & Kurbanoglu, 2011), hostile teachers, gender bias, unrealistic expectations, embarrassment, language barriers, poor instruction, poor evaluation methods, and difficult material (Furner & Duffy, 2002). Furner and Duffy's (2002) review on math anxiety suggests that in order to prevent math anxiety, teachers must accommodate different learning styles; offer a variety of testing environments; create a positive learning environment; attend to student status in the classroom; use mistakes as a learning opportunity; make the math relevant to real life; encourage students to co-create their learning; support student discovered concepts instead of formulas and procedures; and recognize that mathematical understanding is a journey. While a daunting list of suggestions, these concepts provide a foundation for a democratic classroom environment that attends to the individual needs of students, contributing to their academic success. Other research has suggested that a positive attitude (Ahmet Akin & Kurbanoglu, 2011), positive self-esteem, and increased experiences of success (Kesici et al., 2010) may help prevent math anxiety. In my experience, students who have overcome their math anxiety are more likely to participate in

group discussions, volunteer to work problems out in front of the class, assist fellow classmates, and persevere when faced with a challenging problem.

Furner & Duffy's article offers important considerations for my action research project, but as it is not peer-reviewed research, leaves questions of validity and credibility. While not empirical evidence, common sense and practice suggests that the measures suggested in their article are worth considering during my action research project.

Researchers have also investigated ways of reducing math anxiety. These comprehensive studies state that desensitization and relaxation training, training in coping skills, such as breathing techniques, discussing and writing about math feelings, training in good study skills, providing opportunities for students to evaluate their own learning, and building on successes will build confidence, lessening anxiety (Furner, 2002). Increasing student success in math and decreasing math anxiety may have a positive impact on self-efficiency (Kesici et al., 2010).

In addition to research findings that indicate math anxiety could be considered a result of low self-efficacy, Akin and Kurbanoglu's (2011) extensive study found that negative attitudes could produce negative results in math, creating anxiety. Ozgen and Bindak's (2011) study found that ninth grade students' level of self-efficacy is higher than twelfth grade students and have

posed the question of whether twelfth grade students' experience higher levels of anxiety as they prepare for university exams, thereby having a negative effect on their self-efficacy. This study connects with other research findings that self-efficacy has a positive correlation with a student's future goals and achievements, including higher education and career paths.

Anderson, Bobis, Way and Vellar's (2012) study revealed additional predictors for mathematics anxiety, including perceived classroom disengagement or "turning off" (2012, p. 1), schools' non-English speaking background composition (NESB), and the schools' socio-economic status. They also state that disengagement is strongly correlated with math anxiety and avoidance of subjects. In a separate research study conducted by Pajares (1996), it was found that, "ability [is] related to performance but that, regardless of ability level, children with high self-efficacy completed more problems correctly and reworked more of the ones they missed" (p. 552). Attending to students' math anxiety will facilitate turning students "on", allowing them access to the content, and increasing their personal perception of ability and level of perseverance.

In order for transformative teachers to attend to the individual needs of our students, we must address the very real existence of math anxiety and the negative consequences associated with it. We can no longer allow anxiety to

interfere with the learning and potential of our students. Researchers have concluded that attending to mastery is an important factor in combating

anxiety. As a teacher-researcher, I wondered whether reducing a student's math anxiety through reflective journaling would contribute to a higher level of self-efficacy and reduce their math anxiety, thereby increasing their academic achievements in the short term, and potentially leading to brighter opportunities in the long term.

### **Motivation**

In addition to math anxiety, motivation is a major component of student self-efficacy, therefore it is important to uncover contributing factors of motivation. Deci (1995) has defined motivation as the strategies people use as they strive to maintain a quality of life. Students' motivation allows them to strive for a level of achievement that is acceptable to the student. Deci's research has also found that self-motivation is "at the heart of creativity, responsibility, healthy behavior, and lasting change" (1995, p. 9). Students academic motivation is often dependent upon their perceived capabilities (Zimmerman, 2000). Findings in a comprehensive study conducted by Kesici, Erdogan, and Kelesoglu (2010) concluded that math anxiety is higher in students possessing a high achievement motivation and significantly less in students with low achievement motivation. They also found that math anxiety

for students with low self-esteem is significantly higher than those with positive self-esteem.

## **Mastery**

Mastery is the interpretation and judgment of competence based on results of previous successes (Usher & Pajares, 2008). Usher's research findings indicate that mastery experiences are powerful sources of self-efficacy (2009), while Kesici and Kelesoglu's (2010) research study indicates that it is actually the student's *perceptions* of their mastery that create their sense of self-efficacy. A study conducted by Bandura, Barbaranelli, Caprara and Pastorelli (1996) found that when students have a sense of control over their own learning and "mastery of coursework, [they] achieve success in their academic pursuits" (p. 1217). Collectively, these comprehensive studies clearly indicate that mastery of mathematical content is a major factor in developing a positive self-efficacy. Students who experience high levels of achievement tend to have higher mathematics self-efficacy and students with poor achievement tend to have lower mathematics achievement (Usher, 2009). Usher and Pajares found that "mastery experiences prove particularly powerful when individuals overcome obstacles or succeed on challenging tasks" (2008, p. 752). This finding suggests that offering students opportunities to struggle through

complex problems will lead to feelings of mastery, potentially increasing their level of self-efficacy.

In the continued search for contributing factors to self-efficacy, overcoming obstacles has proven to have a positive correlation; however, conflicting research findings regarding [the influence of](#) gender differences on mastery and self-efficacy [make it impossible to suggest that gender is a significant corollary in levels of mastery or self-efficacy](#). Pajares and Miller found that in a study of 350 undergraduate students, men scored a higher average on performance tests than women, yet there was no significant difference between genders and their levels of confidence (1994). Conversely, in Swaim, Rimm-Kaufman and Merritt's study of elementary students in 24 different schools, they report that boys and girls reported similar levels of self-efficacy, and boys reported less math anxiety than girls (2013). In a later study, Pajares found that most [boys](#) are "biased toward confidence, girls were less biased in that direction, and gifted girls were biased toward underconfidence" (Pajares, 1996, p. 555). These studies imply that the need to be mindful of students who demonstrate overconfidence or under confidence in order to help them evaluate their level of understanding and accurately set goals. According to an action research project conducted by Kostos and Shin (2010), the use of reflective journal writing in a mathematics class yielded

impressive increases in students' use of content specific academic language and also resulted in significant increases in assessment scores. Their findings are consistent with previous studies conducted on the same issue (2010). Other research has indicated that academic achievement is positively correlated with higher levels of self-efficacy (Ozgen & Bindak, 2011). In addition, students who tend to set goals and are self-motivated are more likely to engage with lessons, leading to deeper understanding of content. Through reflection journals, these students are able to internalize the learning process, supporting their successes and self-efficacy (Harford, 2008).

One interesting factor to consider is the finding that the teacher's self-confidence contributes to the students' perceptions of their own abilities and competence (Stipek, Givvin, & Salmon, 2001). Teachers who have a poor self-perception of their mathematical ability, typically informed by their own past educational experiences, can have a negative impact on students' mathematical experiences, resulting in their lowered self-efficacy (Charalambous, Philippou, & Kyriakides, 2008).

### **Reflective journals**

Research has indicated that students who perform well academically have higher self-efficacy, and students with higher self-efficacy perform better academically (Ozgen & Bindak, 2011). Therefore, it is imperative that teachers



work to improve student self-efficacy in order to build student confidence – which can result in higher levels of effort, perseverance, resiliency, and

achievement. One instructional method researchers have found for increasing self-efficacy in students is the use of reflective journals.

Research over the years has confirmed the benefits of using journal writing as a tool for supporting student learning (Akin, 2011; Hamdan, 2005; Harford, 2008; Kostos, 2010; Pajares, 1996). As students communicate new ideas and concepts in their own words and illustrations, they are able to establish personal connections with the content while creating lasting associations that may be used for new, complex situations and problems (Zull, 2002). Other researchers have found that mastery in a subject increases a student's self-efficacy in that subject, thereby decreasing their sense of anxiety. Little research has been conducted that marries theories of journaling to improve academic achievement through mastery, reducing math anxiety and increasing self-efficacy. Collectively, these qualities create a cycle, much like Zull's learning cycle (2002), that promotes opportunities for academic success. This action research project will explore how reflective journal writing in a mathematics class may contribute to and help facilitate an increase in students' self-efficacy.

One way students can explore their thoughts and feelings is through reflective journaling. Self-reflection allows us to evaluate our experiences and thought processes. This evaluation process then allows us to alter our thinking and behaviors (Pajares, 1996). Research has concluded that internal dialogue and cognitive self-modeling are related to student's self-belief of their mathematical capabilities (Usher, 2009).

According to recently published study in a second grade classroom, reflective journals resulted in increased mean test scores, increased complexity of mathematical explanations, and increased use of content specific academic language (Kostos & Shin, 2010). Another research study found that when students are allowed to journal about their learning, they are able to connect to the material in a personal way, making it more relatable and memorable. Fritson's (2008) research indicated that while the type of journaling was not significant, the amount of time spent journaling was significant, positively influencing students' self-efficacy (p. 79). Through this process, which allows students to compile material in their own words, students were able to achieve a higher level of sophistication in their mathematical understanding (Hamdan, 2005). M. Harford's article on reflective journaling adds the fact that student reflective journals lead to "ah-ha moments", goal setting, and an increased ability to articulate their knowledge. In addition, teachers are able to use

reflective journaling to guide instruction, allowing the teacher to differentiate instruction as needed to accommodate specific learning needs for individual learners (Harford, 2008).

According to recent research, academic journaling “may be one means of simultaneously fostering the academic and psychological growth of students” (Fritson, 2008, p. 80). Additional benefits for academic reflective journaling, research has found that when students journal, they tend to take ownership of their learning, are able to recognize their own areas of weakness, and [are given](#) the opportunity to take responsibility for their improvement. Through journaling, students can use independent problem solving skills, set up strategies and goals for their achievement, providing growth opportunities for students’ identities (Harford, 2008). Fritson’s research found positive correlations when student journals relate life experiences or situations with the text/course material, reflect on various perspectives, and consider a perspective opposite of what the student believes (2008).

One issue that teachers need to consider is that some students feel as if they have been “journalled to death” by overuse and misuse of journal writing (Andrews, 1997). Some students’ prior experiences with journaling have left them feeling as if there is no real purpose to the task and it is a waste of their time. Andrews suggests alternatives to formal journal writing, which include

admit slips, exit slips, and creative writing, such as Cinquaines, progressive patterned poems written collaboratively.

Another issue to take into consideration, especially for marginalized students, is the fact that writing ability may limit the student's ability to explain their thinking, or list steps to solving problems through writing (Kostos & Shin, 2010). In such instances, the teacher will need to differentiate their instructions and create individual expectations that apply to the specific needs and abilities for students.

### Research Question

Given that research has found compelling evidence relating reflective journaling and self-efficacy, I wondered whether a research project utilizing this valuable insight and using it in a mathematics class might lead to improved mathematical self-efficacy for my students. This action research project explored how reflective journal writing in a mathematics class contributed to and helped facilitate an increase in students' self-efficacy. I incorporated the use of reflective journals in the math class in order to encourage students to: develop an understanding that math is not about memorizing or getting the answer quickly; explore their mathematical thinking, exercise their conceptual understanding, set goals, and use content specific academic language. This practice was intended to build student confidence through self-reflection, goal

setting and the use of multiple strategies. My overall goal was to use the math journals as one practice to increase student self-efficacy.

It is my belief that students enrolled in the KEMS class are, by nature of being assigned an intervention class, marginalized. Other marginalized students, such as those from low socioeconomic households (Fast et al., 2010), English Language Learners and those designated as learning disabled (Klassen, 2010), area also represented within the class. Such students need teachers who highlight their competencies, offer encouragement, and help students anticipate and manage their reactions (Klassen, 2010). Through reflective journaling, marginalized students can be given a voice, which they may come to understand is valued, empowering them to have an active role within the classroom and beyond. Through reflective journaling, it was my hope that students' self-efficacy would improve, thereby having a positive impact on student responsibility for their academic success and increase their overall successes.

## CHAPTER 2: METHODS AND ANALYSIS

### Participants and Setting

The principal classes featured in this action research project are located in a middle school in a middle class suburban community in the Pacific Northwest.

The student population at Totem Middle School<sup>2</sup> consisted of 2% American Indian or Alaskan Native, 8% Asian or Pacific Islander, 5% Black, 23% Hispanic, and 46% White. The school population also consisted of 48% eligible for free or reduced meals, 12% designated as Special Education, 4% transitional bilingual, and 5% Section 504 (Office of Superintendent of Public Instruction, 2012).

Some factors that influenced the population surrounding the community included its proximity to a large military base and prominence of migrant families. Consequently, there was a high level of transitory student population as students moved due to military relocations and seasonal work. As a result of the preponderance of transitory students, many students experienced gaps in their academic knowledge and tools for academic success. Due to the varied educational experiences, many students had individual and complex learning needs that created an added challenge the classroom teacher needed to address. For a math teacher, these issues were compounded by students' negative self-perception of their mathematical abilities.

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<sup>2</sup> All names in this Action Research Paper are pseudonyms.

Research has established a correlation between student self-efficacy beliefs and student aspirations, commitment to goals, level of motivation, level of perseverance, and resilience ([Ahmet et al., 2011](#); [Fast et al., 2010](#); [Martin et al., 2012b](#)). Mathematical self-efficacy influences the course choices students make and [can](#) impact their academic trajectory and future career opportunities. Improving a student's level of self-efficacy through reflective journaling may play an integral part in reducing math anxiety, raising student perception of competence, and achieving academic success ([Bandura, et al., 2001](#); [Furner, et al., 2002](#), [McTigue & Liew, 2011](#)).

In my Action Research Project, I used reflective journaling as a means of reframing my students' understanding of what it means to be good at math. I provided my students with guiding questions that allowed them an opportunity to explore a new perspective on mathematical achievement. In the beginning, students consistently shared a narrow interpretation, wherein being fast (and the first with the right answer) defined what it meant to be good at math. Through watching videos, engaging in class discussions and reflective journal writing, many students redefined their understanding and came to believe that being good at math was accessible to all, and that each of us has a unique and valuable mathematical mind. [Over the ten weeks of this study, I corresponded](#)

with students through journal writings, challenging them to see their level of effort and perseverance as a gauge of achievement, rather than speed.

Most of my students have experienced years of mathematical self-doubt, been institutionally tracked into intervention math classes, and had low expectations placed upon them by parents, teachers and administrators. Many of my students are from marginalized segments of society. They come from varied ethnic and racial backgrounds and from families in poverty where the option of obtaining tutoring outside of school is financially prohibitive. My students' parents tended to share their children's sense of math anxiety and were accepting of low levels of performance and success, which I learned through conversations with them during Parent Orientation before school started. Years of negativity surrounding math appeared to have been deemed acceptable and expected from parents and students.

After repeatedly earning low grades, failing to meet standards on standardized tests, and being labeled as "low achieving" by schools and teachers, students begin to believe that they are incapable of success in mathematics, or are "bad at math". Combined with being assigned the stigma of "failure", many students' self-beliefs are reinforced by a school system that lowers its expectations and becomes complicit in the students' future lack of achievement. As a result of multiple years of negative association with math,



many of these students developed ed low mathematical self-efficacy. It is my opinion that by the very nature of being tracked into an intervention math class, my students were marginalized. It was my hope that through my Action Research Project, my students would redefine their sense of self-efficacy and break the barriers that threatened ed their future academic and career opportunities.

I chose to concentrate on the students in my seventh grade pre-algebra classes who were also enrolled in the KEMS classes, as participants in my Action Research Project because it was my understanding that these students have endured many negative experiences with math that had d resulted in low mathematical self-efficacy. These students were assigned a second math class as an intervention measure, which sent implicit messages about students' competence in mathematics, thereby influencing their self-efficacy. I wanted to offer them an opportunity to reframe their concept of what it is to be good at math through reflective journal writing and redefine their relationship with math. Marginalized students, in particular, are vulnerable to living down to the expectations placed upon them from the institutionalized public school system. It was my hope that through this Action Research Project, my students would come to see themselves as skilled mathematicians who are capable of academic success.

I [taught](#) in two 7th grade pre-algebra classes, with a total of 50 students. Of these 50 students, 23 were also enrolled in KEMS. While I concentrated on those students enrolled in both the core and intervention math classes, I included all students in the study in order to give them the same opportunities for reframing their relationship with math. Including all students in the two classes afforded me information from a broader spectrum of students and provided more data to reflect upon and analyze. Students' participation afforded me insight into their perceptions of mathematical competence. Through data analysis, I was able to identify [relationships](#) between reflective journaling and student's level of mathematical self-efficacy.

### Teaching Practice Under Study

In order to accurately study the research question of whether reflective journaling can help increase the level of student self-efficacy, it was important to establish a framework of practice. [Students were asked to respond in their journals to both guided questions and free-writing prompts as a way of exploring new ideas, reflecting on their experiences, discovering new conceptual understandings, and having an opportunity to reframe their thinking and self-perceptions. I had originally planned to have students write in their journals three times per week. However, the realities of the classroom demands required that I adjust my expectations dramatically. Students wrote in their](#)

journals a total of five times in the ten weeks of the research project. As a way to increase journal-writing opportunities, I adjusted my plan and began having students complete their journal writing on their Daily Progress Worksheet. This allowed students to have time to do their writing without taking up class time to distribute their journals. I responded in writing directly in the journals, engaging in a conversation with the student. Students looked forward to receiving my comments and were eager to respond back to me.

### **Data Collection**

This Action Research Project is a qualitative study in which I, as the researcher, was a second year Master in Teaching student teacher in my first student teaching assignment. The research was conducted in a natural setting, the students' classroom, which allows the teacher to make improvements to the environment and/or practices (Anderson, Herr, & Sigrid Nihlen, 2007). I was the primary researcher and data collector. I was part of the process and able to record data as part of my "being" (Anderson et al., 2007).

The data was collected from four different sources: a math self-efficacy surveys, student reflective journals, teacher-researcher field notes, and assessments. Data was collected over a ten-week period, beginning the first week of school and collected in two 7th grade pre-algebra classes. The sampling logic of including both classes in this study was purposeful (Anderson

et al., 2007), to include enough participants to be able to draw correlations between individuals and their practices, as well as between the varied risk levels assigned by the school district. Conducting this research with fewer than two classes would have diminished the quality of my research

## **Questionnaire**

The first week of school, I spent time getting to know my students and established relationships with them. I asked them to complete a “Getting To Know You” student questionnaire (See Appendix A) that provided me with basic information about them, their families, any extra curricular activities they participated in, and their aspirations. This questionnaire also provided insight into students’ personal lives outside of school, including who lives in their home and what home language(s) they speak. It also asked students if they had any concerns about school this year, providing an opportunity for students to communicate directly with the teachers in a safe manner. The questionnaire was an entry point to establishing authentic relationships that would be built upon through reflective journaling.

## **Survey**

I asked students to complete a Student Self-Efficacy Survey (see Appendix B), three times throughout the quarter, in weeks one, five and nine, which helped me determine their current level of mathematical self-efficacy.

The first time students took the survey, in week one, it took about five minutes to complete and most students answered every question. I observed that students seemed to take their time contemplating the questions and answering the questions in a thoughtful manner. Some students were concerned how to answer a question when they felt as if they really fit in between, so I agreed to accept answers in the middle between the scales.

The second time students took the survey, in week five, they took the same amount of time to complete it, but more students intentionally skipped questions or missed them inadvertently. I noted in my field journal that students seemed to take this survey less seriously and were less thoughtful than the first time it was administered.

The third survey, given in week nine, was met with students grumbling about having to do the same worksheet again. I observed some students took very little time reading the questions carefully; some students seemed to answer as quickly as possible. However, I believe that the majority of students continued to answer the questions honestly, partly because they knew that their participation in the survey was important for my Action Research Project and they wanted to be supportive in my endeavor. I believe that having established authentic relationships with my students made it possible for them to feel invested in my success, as they saw me invest in their academic success.

## Reflective Journal Writing

I was curious to know if reflective journaling in a math class would help improve student self-efficacy. I provided each student with a spiral notebook and labeled the notebooks with a unique student identification number instead of using their names. My intention was that this would allow students to feel more anonymous, safer writing honestly, and protected should anyone else come across their journal entries.

I had intended for students to write in their journal three times per week. Unfortunately, given a 48-minute class period and the amount of material that was necessary to cover each day, taking time to reflectively journal was too ambitious for the realities of our classroom. Instead, I had to be purposeful in the timing set aside and the writing prompts I gave students. Some of the prompts I gave students were intended to provide insight into their thinking about themselves as mathematicians, others prompts were given in response to stress and anxiety that I perceived students were experiencing. (See Appendix C for list of journal prompts.)

Once students were given a writing prompt, they were given three minutes, which was set on a timer, to free write on that prompt. Students were instructed to continuously write, no stopping. I made it clear that I was not concerned about proper grammar, spelling and punctuation, or “pretty writing”

as I called it. Once the timer went off announcing their three minutes of writing was over, I gave students an opportunity to finish up their thought and then I collected the notebooks.

Students used the journal writing to answer the given prompt, to ask questions they had about the math we were working on, and to discuss other students in their table group, sometimes asking if they could have their seat moved. I responded to the students' journal entries on three separate occasions, after week three, week six and week nine. I promoted a growth mindset by encouraging students to continue working hard and by offering times for them to come in for extra help. I answered specific questions students posed, brought some class concerns to the group to discuss, and responded to complaints and requests. Many students looked forward to reading responses I had written in their journals, and often asked when they could journal again, eager to communicate with me. Other students didn't appreciate writing in the journals and were resistant to the process.

### Teacher-researcher field notes

I kept daily field notes, recording lesson plans, student engagement, questions students posed, student understanding and my perceptions of how students were feeling about themselves and the work we were doing. In my field notes, I often reflected on the class experience, posed questions for my

mentor teacher and I to consider and changes in strategies we wanted to address in presenting curriculum. I also noted when students' behaviors in the classroom indicated that their level of anxiety was interfering with their learning.

## Assessments

In my opinion, an effective teacher is constantly assessing her students' knowledge, understanding and application of concepts. Formative assessments should be considered as an indicator for student growth along with summative assessments. Unfortunately for the students of Totem Middle School, the district had mandated that 80% of students' grades be determined by summative assessments. For our class, this meant that 80% of student's grades would be determined by a single unit test.

I used formative assessments to determine which students needed added support in various areas and which students were able to provide their peers extra support. I was able to organize mixed skill-based groupings that allowed growth for all levels of understanding. Through group activities, we were able to communicate our belief that being good at math is not determined by a single test score or grade for the class, but rather the ability to attend to the eight standards for mathematical practice, make sense of problems and persevere in solving them; reason abstractly and quantitatively; construct viable arguments and critique the reasons of others; model with mathematics; use



appropriate tools strategically; attend to precision; look for and make use of structure; and look for and express regularity in repeated reasoning (www.corestandards.org/Math/Practice). However, per the district's strict policy on assessments, my classes were given only one summative assessment for the quarter encompassing complex mathematical concepts.

### Data Analysis

To analyze my data, I utilized a process of coding, memoing, and developing themes across my data (Anderson, 2007; Mertens, 2009). The first level of analysis was of students enrolled in both a core math class and the KEMS intervention math class; the second level was of the individual student level; the third was of the student's designated risk level as determined by their standardized test score. My hope was to understand whether reflective journaling would increase student self-efficacy.

Incorporating two classes in this study allowed me to examine and compare the influence of reflective journaling on helping students raise their level of self-efficacy. I also made adjustments during the second class to my instructions or interactions with students in order to better communicate my objectives. Table group assignments of three to four students per group were initially student selected. Throughout the quarter, I reconfigured specific groups of students as a classroom management strategy, allowing me to attend

to student status issues and provide opportunities for students to discover and use emerging smartness strategies within new groups. Allowing students to engage with new groups and to take on new roles within the group provided the students an opportunity to develop interdependence.

### Surveys

In coding the surveys, I divided the students into the district assigned categories of low risk, some risk, and high risk. I then looked for changes in their answers between the first, fifth and ninth weeks. From the survey analysis, I was able to analyze changes in students' self-perceptions of efficacy, identify apparent trends, and determine the qualitative value of students' self-efficacy. Completing the surveys over time allowed me to look for patterns of data that relate to possible themes within the findings of the research.

### Reflective Journals

In analyzing the reflective journals, I looked for key words and terms, patterns in language, tone, shifts in thinking, and overall relationship to mathematics. These data sets were analyzed for individual students, the classroom as a whole, and student risk level as designated by the district's standardized test scores.

## Teacher-Researcher Field Notes

As the teacher-researcher, I was in a unique position to examine my personal interest in this study question, to explore the current research on mathematical self-efficacy, and implement those strategies that I believed would have a positive impact on my students' level of self-efficacy. The teacher-researcher field notes offered insights into potential misconceptions that I may have held from my own personal experiences, changes in thinking, and ideas and notions to be considered for implementation. Anderson states, “when speaking from the subjective self, positionality must be emphasized to be useful to the educational community” (2007, p. 164). The teacher-researcher position offered a unique perspective that provided data on what practices impacted student self-efficacy, and those practices that do not. I recorded my journal entries on a daily basis, after the fact, in a reflective and systematic manner, clear and as unbiased manner as possible (Anderson et al., 2007). I then reported my reflections from each class in a data table on my computer. These entries included my firsthand interpretation of what happened, interesting events, my feelings about the events, and questions that emerged throughout the process. Teacher-Researcher field notes were coded for changes in thinking, ideas, and notions to be considered for implementation. The data were compared to the changes in thinking and ideas found in student reflective

writing. I was interested to see if the students reframed ideas at the same rate or in the same way as I did. If a relationship between the students shift in ideas and my shift in ideas was found, it may point to a cause and effect relationship or a symbiotic relationship between teacher and student perceptions.

## Assessments

I had originally planned to give weekly assessments as a way to monitor student progress that would provide data on changes in student achievement. However, the class curriculum, pacing and overall flow of student learning did not lend itself to weekly assessments for the purpose of my Action Research Project. In order to adjust to the realities of the classroom, I used students' progress monitoring scores and unit test scores as a way of comparing student growth. I also used assignment completion data as a factor when analyzing test scores. By analyzing student self-efficacy along with assessment scores, I was able to see whether there was a relationship between improved self-efficacy and a change in academic achievement. I identified changes in self-efficacy by noticing students increase in participation during class discussions, willingness to offer support to their peers, the increase in the number of questions asked as well as their apparent comfort level in asking questions, and in the self-assessed level of self-efficacy on the student surveys. A relationship might suggest that when we attend to improving student self-efficacy, we attend to

student achievement. These adjusted assessment measures were analyzed for student achievement on an individual basis, and on assigned risk levels. The information offered insight into whether changes in students' level of self-efficacy had an impact on their level of academic achievement. The data helped communicate the importance of attending to student self-efficacy as a way of improving student academic achievement. The data sets were compared and analyzed for individual students, the classroom as a whole and student risk level as designated by the district's standardized test scores and KEMS students.

### **Limits of Conclusions**

Teaching students to value new and different types of mathematical smartness is asking them to reframe how they view math and their own abilities. Asking students to use reflective journaling as a vehicle for understanding and adopting a new sense of self-efficacy was complicated and very challenging. The results of this study may not lend itself to the generalization of findings (Mertens, 2009) because there are many variables that will impact each individual student in unique ways. The short amount of time allotted for this study also limits the opportunities for supporting the increase in levels of student self-efficacy. In addition, the specific curriculum being taught, other district mandates, the lack of anonymity on surveys, and the timing of data collection may have influenced the results of this study; these requirements

influence the content taught and the strategies teacher's use in their instruction.

## **Credibility**

In an Action Research Project, the data are interpreted through the researcher's lens, which includes her biases, misconceptions, and personal experiences. I believe I provided detailed descriptions of the methodological framework of the study, allowing others to use this Action Research Project to develop their own research study. I used multiple methods of data collection, surveys, reflection journals, teacher-researcher field notes, and assessments in order to achieve triangulation of the findings. I cited the methodology used throughout my research, ensuring others could research and replicate my processes for future studies. My study participants, the students in my classes, knew they were part of my study and were aware of the research question I was exploring. I also engaged in member checks when I presented my findings to my mentor teacher to ensure that my findings were consistent with her own observations of the research experience. I used the data to reveal findings within this study, rather than making presumptions. I also engaged in peer review with members of my Master in Teaching cohort, all of whom were familiar with Action Research practices and had an interest in improving teaching practices, in order to ensure validity. My fellow researchers supported my

research by helping to identify trends, correlations, and connections that I could continue investigating.

Finally, I am explicitly aware (Anderson et al., 2007) that I may have impacted the results of this survey because I had low mathematical self-efficacy in middle school; I may unintentionally bias the interpretations of the data. I was a student teacher with minimal experience teaching mathematics, which may affect students' learning and sense of mastery. The limited research study time of ten weeks may have also limited the impact of reflective journaling. Collectively, each of these issues may have impacted student learning and students' level of self-efficacy.

### **Transferability**

I believe that I have presented a rich description of the study environment, including the time, place, context, culture of the community, demographics and classroom setting in which this research took place. I also provided the instructional framework and processes so others may refine future projects. Given the information provided, future researchers would be able to determine whether there are enough similarities to compare the situation presented in this Action Research Project to their own situation, which adds to the transferability of this research.

## **Dependability**

The data collected during this Action Research Project was done in a logical and systematic fashion. The findings of the data are consistent with the data collected and are reasonable given prior peer reviewed research. I was able to make connections between my findings and those listed in the Literature Review. Each set of data has an audit trail, consisting of categories and decision-making processes. I have provided a critical reflection of my Action Research Project in the Implication section of Chapter 3. Each of these aspects lend to the dependability of this research project.

## **Transformative**

During this Action Research Project, I evaluated student surveys and analyzed their reflective journal entries. The information gathered stimulated action; I made adjustments to my teaching practices, such as when I implemented the practicing of asking questions, and attended to individual student needs. As my intention for this research project was to implement a practice that would increase student self-efficacy, thereby potentially increasing their future opportunities, I believe that it supported social justice and human rights for every student who participated. Individual student's voices were heard and I responded to the diverse needs within the classroom. The process performed in the classroom was meant to be equitable and authentic to the



needs of the students. I believe that these practices contribute to the transformative nature of this Action Research Project.

### **Confirmability**

I have provided explicit detail of the process I engaged in during this Action Research Project, with a clear chain of evidence of my findings. I have given clear depiction of how the research was coded and analyzed, which allows the reader a well-defined picture of the research and findings. I attempted to remove bias from the research, and acknowledge where I felt it might have still been an issue, which may have affected the research or findings.

## CHAPTER 3: RESEARCH FINDINGS

In analyzing the data collected during the ten weeks of this Action Research Project, three distinct themes emerged: reflection journals help build authentic relationships between students and teachers; reflection journals helped me identify and address student needs; and reflection journals can be used as a means of mitigating anxiety through exposure. None of these findings prove that reflective journaling in a mathematics class is directly responsible for an increase in student's mathematical self-efficacy. However, each of the findings contribute to the reduction of math anxiety, support a growth mindset over a fixed mindset, and increase students' levels of perseverance, all of which contribute to the overall improvement of student self-efficacy. In this chapter, I will discuss the three themes found during my research.

### **Theme One: Reflection Journals Build Relationships Between the Student and the Mentor Teacher**

The first writing prompts I assigned students were intended to be an entry point for getting to know my students better. I asked them to respond to the prompt, "What kind of student are you?" As this was their first journal entry, I expected students' responses to be guarded. I did not expect the level of openness and honesty they provided. I was encouraged that they were willing to share with me through their writing.

## Mackenzie

Mackenzie (all student names are pseudonyms) represented my students who were enrolled in the core math class and had been identified as “low” risk based on standardized test scores. Although the district had designated her as low risk, I saw evidence that she had many gaps in her knowledge and understanding, displayed behaviors consistent with low self-efficacy, such as refusing to attempt challenging problems, and shrugging when I ask her a question about her understanding of the math. She shared in her journal that, “<sup>3</sup>[I] don’t like school, some days I give up, I don’t want to be here, [I’m] not motivated to do well in math because I feel like I can’t do well in math, I feel like I can’t do it, I have tried really hard to tell myself that I can do it – I love it when I have an ahha moment.”

**Connection to the theme.** From Mackenzie’s comments, I recognized her lack of confidence in her abilities and was concerned about the level of effort she would put forth given her negative feelings towards math. My perception of Mackenzies’s attitude, based on her journal reflections [and in-class observation](#), enabled me to identify her as a student whom I wanted to support with extra attention, both academic and emotional, in order to encourage her engagement in the learning process. In response to her

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<sup>3</sup> [All student writing has been transcribed exactly as it appeared in their journals.](#)

reflections, I began to give her one-on-one attention. I focused on building upon her strengths, and assigned competence for effort and strategies in order to support a growth mindset. Mackenzie shared in her journal that, “when I get stuck...I tend to either give up or start talking to table mates. Giving up is something that I have always done and I would love to have you guys’ support to keep on going. Because this is really hard for me to want to keep going.” I believe this statement is communicating Mackenzie’s level of trust we had established, as she was willing to ask for the help and support she felt she needed in order to be successful. As the student-teacher relationship grew, I noticed a dramatic increase in Mackenzie’s engagement with the content, as well as with her classmates. Mackenzie moved to the front of the class, often raised her hand to ask questions and contribute strategies, and would initiate a challenge if she did not agree with an answer. I believe she was more willing to take risks, knowing she was in a safe and supported space.

**Connection to the research question.** At the end of the ten-week quarter, Mackenzie shared in her journal reflection that, “I was a fixed mindset person trying to become a growth mindset person but sometimes I would get caught in old ways. This unit I will try a lot harder to pay attention and give it my all because this is important to me and I want to succeed.” This statement indicates that Mackenzie was engaging in a growth mindset, willing to work hard

and persevere. Mackenzie's survey results support the claim that over the course of the quarter, her level of self-efficacy increased. At the beginning of the quarter, she scored herself as "disagree[ing]" that she is good at math, but by week five she had changed her answer to "agree[ing]" that she is good at math. She also upgraded her belief that more effort leads to being better at math and that she is more likely to redo work and not give up learning when problems are difficult. One of the biggest improvements in her thinking was that she stated that she "strongly disagrees" that it is important to not make mistakes in front of the teacher. These responses support the claim that Mackenzie's self-efficacy improved, not only through reflective journal writing, which allowed me to get to know Mackenzie's personality, but through the practices I was able to employ. It would seem that because Mackenzie was able to be more open and vulnerable in her journal reflections, I was able to make a personal connection with her. This connection enabled us to work towards successes in the classroom, allowing her to shine – increasing her level of self-efficacy.

## **Derek**

Derek represents my students who were enrolled in both the core math class, pre-algebra, as well as the intervention math class KEMS, and had also been identified as low risk. I disagreed with the district's assessment of Derek

as low risk, as I had identified him as having gaps in his understanding and often displayed overconfidence in his abilities in an attempt to persuade me to believe he understood the math concepts we were learning, while his work showed otherwise. Derek shared in his reflection journal that he was, “the worst math student, not that good at math.” When I inquired with my KEMS students why they thought they were enrolled in a support math class, the students blurted out, “because I suck at math”, and “because I’m stupid.” Clearly, these students associate the assignment of an intervention math class as a negative commentary on their smartness and ability as a student.

**Connection to the theme.** Throughout the quarter, Derek and I communicated in his reflection journal. From these interactions, I was able to address Derek’s lack of confidence and confusion about certain math problems we were working on in class. While he stated in his journal that it’s important to “do hard math problems, work hard, don’t give up on yourself”, I found him to be increasingly disengaged from the lessons and his tablemates. In a journal response to Derek, I wrote, “work together on challenging problems and staying positive while we struggle to find answers.” The journal conversations we shared became a powerful tool to remind Derek of his assets to his group and our classroom community, as well as to remind him to use his peers as resources. I believe that these journal conversations strengthened our

relationship, allowing him to feel supported and cared for in a private, safe manner.

**Connection to the research question.** Derek's responses over the course of the quarter indicate that his level of self-efficacy did, in fact, increase. He went from "disagree[ing]" with the statement that he liked difficult math problems the first week, to "strongly agree[ing]" by the tenth week. He also grew in his agreement with his willingness to redo work, and indicated that it is much less important that he not make mistakes in front of the teacher. These survey results indicate that Derek was much more willing to persevere when faced with difficult math problems, willing to redo work in order to more fully understand concepts, and willing to make mistakes in front of the teacher, which I perceive as also willing to take risks. The greatest indicator of Derek's growth in self-efficacy was his positive attitude, despite poor performance on assessments and earning a D for the quarter, when he wrote in his reflections journal, "I struggled a lot, that's why I gotta D. I will try harder on the next quiz." His statement indicates his willingness to persevere and attributes his future success to the level of effort he will give going forward.

### **Alonzo**

Alonzo represents students who were enrolled in the core math class and designated as low risk. I agreed with the assessment that Alonzo was low risk,

as he seemed to have a solid foundational understanding of math concepts and was able to apply them to new contexts. I was, however, concerned that Alonzo was easily discouraged if new concepts felt challenging or if he didn't perform as well as he thought he should on an assessment. He shared that he was, "hard working, focused, participates, helpful in pointing out mistakes in problems [and] give[s] his best effort."

**Connection to the theme.** Alonzo's journal reflections informed me that he was a very confident student, and had a persona that he was proud of and worked to maintain. Getting to know Alonzo through the journal reflections, I discovered that he enjoyed catching other people's mistakes. I used this information to encourage this practice, "I can tell you are a hard worker and helpful student - I look forward to you finding my mistakes because I make plenty." Through communicating in his reflection journal, we built a playful rapport that transcended the journal into our personal interactions. I believe that through our relationship, Alonzo was more invested in his learning, and sharing his strengths within our classroom community.

**Connection to the research question.** On the surface, Alonzo was a confident student who maintained a high level of self-efficacy. However, I recognized through our journal communications, that when faced with challenges, he was susceptible to insecurity and anxiety. Through reflective



journaling, we were able to discuss strategies for persevering, such as when he wrote, “when I get stuck...I tend to stop what I'm doing and take a break.”

While Alonzo didn't believe reflective journaling benefited him, he did write that, “the journal doesn't really help but it's fun to write in.” While Alonzo doesn't explicitly recognize the benefit of reflective journaling in his math class, the surveys he completed indicate that from the first week to the tenth week of the quarter, his agreement with the statement regarding letting friends help him when he gets stuck, and the increase in agreement that he likes difficult math problems, leads me to believe that his self-efficacy has grown. He seemed more willing to take risks, and more willing to struggle through difficult math

problems and persevere, both indications of positive self-efficacy. Through shared journal writing experiences, the students and I formed deeper, more meaningful relationships that fostered a sense of trust. Students were able to share private concerns, ask questions, and tell me how they were feeling about academic, social and emotional issues. Reflective journal writing proved to enhance the level of relationship between my students and myself.

## **Theme Two: Reflection Journals Lead to Discovering and Addressing Student Needs**

The second week of school, I found an unexpected pattern emerging amongst my students while analyzing student reflection journals. Many

students who wrote about themselves as being shy or quiet, regardless of assigned risk level or whether they were enrolled in KEMS or not, also stated that they were too nervous or afraid to ask questions in class. This made me wonder how to address this issue. I wondered if exposure therapy could help in creating a safe environment where students were willing to take a risk and ask questions. I decided to make assigning competence [a priority](#) any time a student asked a question. In order to support this idea, I began asking students to practice asking questions with a partner, with their tablemates, then with the whole class. I asked each table group to have a question ready to ask the class, even if they already knew the answer to the question. This seemed to free students from the fear of appearing stupid in front of their peers. We practiced asking questions daily, and every time a student asked a question, I would assign competence, such as, “that is such a great question...who can help us navigate this great question?” or “Whoa! I need help answering that question – we’ll need to work together to figure this one out.” I wanted to build on the feeling of safety within our classroom community, and began having students seek each other out as resources. In the fifth week of school, one of my students, Emily, did not understand that  $31 \text{ was equal to } 30 \frac{8}{8}$ . In response to Emily’s question, the class laughed at her. I stopped the students from laughing and told them how proud I was of Emily, as it takes courage to share

when you don't understand something. After my brief speech, Emily was brave and came to the front of the room to talk through her misconception. With the help of other students, Emily discovered a path to understanding – and the entire class applauded her. Through these practices of encouraging questioning, I found that by exaggerating my responses to student questions and promoting a safe environment to ask questions, (as all questions are fabulous questions), my students began to independently ask questions of each other, offer help to classmates when they understood concepts, and cleared up misconceptions through collaborative discussions.

In my field notes, I made a note to make sure I praise students who raised their hands to share that they were “stuck” or “don't get it”. In practice, I thanked students for letting us, the learning community, know that they needed to stop and get clarity, because if one person didn't get it, there were probably five other students who had questions too, but were too nervous to raise their hand. If students were still “stuck”, we would address unanswered questions as a whole group.

Some students chose to use their reflection journals to ask questions about math concepts that they were still unclear about. In my field notes, I wondered if the practice of publicly acknowledging these questions as great opportunities to extend our learning, students' level of self-efficacy would

increase. In response to math questions in reflection journals, I did publicly assign competence for the great question asked, without divulging whom the question came from and reviewed the problems as a whole group. Many times the student who had written the question, would write a “thank you” note for attending to their question on that day’s reflection journal.

### **Types Of Student Needs**

Students also used their reflective journals to privately speak of issues going on in their table groups. Matthew requested that he be moved to another group because he didn’t like the silly antics of his tablemates. Kayla requested that she be moved to a table group where she knew at least one other person so she could feel more comfortable during group work. Students wrote that they appreciated being able to communicate privately, without their tablemates knowing what was being said. They felt safe. I would then be able to have a private conversation with the student and, depending on the situation, take action. This form of communication added to my ability to address and meet the unique needs of each individual student.

**Connection to the theme.** Reading student journals allowed an opportunity for students to privately express their personal insecurities. Ana, a student who had been designated as at “some risk” by the district, shared in the first week that she is “very quiet, shy, don't really like to talk”.

Once I recognized the need for my students to practice asking questions, and we began engaging in intentional practice of asking questions, Ana began to be more comfortable. In week five of the study, Ana wrote, “when I get stuck or frustrated I tend to ask my table mates after I try the problem. If my table doesn't know or understand I offer to help and figure it out together.” This statement suggests that the practice not only helped Ana increase her comfort level in asking questions, she also began to help her tablemates solve problems. In week six, Ana wrote that journal writing helped her feel better about math because, “I can think about what I’m thinking about math and write it.” I believe this indicates that the use of reflective journals in order to identify and address student needs benefits students and the classroom community.

**Connection to the research question.** While this theme may not seem explicitly connected to the research question, whether reflective journal writing increases students’ self-efficacy, I have found that when students feel as if their ideas and contributions are valued, feel safe in a learning community, and take risks by asking questions publicly, they are exhibiting a high level of self-efficacy. By giving students opportunities to practice asking questions with partners, tablemates and in whole class discussions, students became more comfortable and confident in the practice. As students’ confidence increased, so did their authentic questioning, outside of designated practice times. I

believe that when students began originating questions on their own, they were displaying an increase of self-efficacy, as they were willing to be vulnerable and take a risk in front of their peers.

### **Theme Three: Reflection Journals Allow Students to Attend to Their Math Anxiety, Reducing Anxiety Levels**

Students who have historically struggled to learn mathematical concepts, have been labeled as “low achieving” or adopted a deficit mindset often experience math anxiety, which contributes to low self-efficacy. In order to support students in a way that removes barriers to their learning, thus removing limits to their future academic and career opportunities, it is important to attend to reducing students’ math anxiety.

#### **Math Anxiety Presented As Tears**

I met Ramiah, a new student to the school, at Parent Orientation Night. She presented herself as a friendly, confident student who enjoyed music and sports. In her journal entry, she shared that she “struggles a lot...[gets] frustrated...I beat myself up, feel dumb, get anxious.” In preparation for a quiz, I allowed students to work with partners to study and clear up any last minute misconceptions. Ramiah was clearly agitated, unable to focus and teary-eyed. She was so upset that she had to leave class to go see the counselor; she needed to express her level of anxiety and inability to take the quiz. I later

spoke with the counselor, who wanted to ensure that I was aware of Ramiah's fears.

**Connection to the theme.** Ramiah's anxiety manifested itself as agitation and crying. She displayed an avoidant response to taking the quiz by leaving the class to see the counselor. [Ramiah was certainly not the only student to express math anxiety.](#)

\_\_\_\_\_ In response to Ramiah and others' anxiety, I used reflective journal writing to talk [with them](#) about their feelings about their understanding, what tools they have for coping, and the mindset they use to overcome the negative feelings. Ramiah wrote in her journal that she finds reflective journal writing as beneficial, "sometimes because writing it out is like me ranting about it on paper." Mia, another student who displayed math anxiety, wrote that reflective journaling helped her feel less anxious, "because I'm sensitive about my feelings and when I write about stuff like this it's easier to 'say' than to say." Taulio shared in her journal reflection that journal writing helped her feel less anxious because "the fact that my teacher replies to me it helps that I get feed back on what I need to work on and it calms me down."

Not all students described reflective journal writing as a benefit. Yan shared that "writing in my journal does not help," Gabriel shared, "Journal writing - no, because it doesn't change any thoughts for me," and Keyauna

wrote, “writing down what kind of student I am won't change anything.” While these students may not have identified reflective journaling as a way of combatting anxiety, the practice of being reflective allowed them an opportunity to think about their thinking and what does help them to be successful.

**Connection to the research question.** Ramiah indicated that her math anxiety was so bad, that it made her feel like she had, “math dyslexia” where all the numbers would get mixed up and she could not concentrate. The level of anxiety that she, and others, experienced was a clear barrier to their learning. Once students were given a forum to discuss their feelings and frustrations about the math and they received support through private conversations, classroom discussions and feedback I provided in writing in their journals, students seemed to be more receptive to adopting a growth mindset, freeing themselves of some of the pressure they were feeling.

Beyond the journal comments that students made about whether they believed reflective journal writing helped alleviate some of their anxiety, the Self-Efficacy Survey responses also indicated that students tended to experience an overall increase in their level of self-efficacy. Ramiah, for example, improved on the ranking of her belief that she is good at math, increased her agreement that she likes difficult math problems, increased her



belief that mistakes are good and part of the learning process, [and](#) increased her agreement that more effort leads to greater success.

In addition to her Self-Efficacy Survey results indicating that her level of self-efficacy had increased, Ramiah, for the first time, earned a B for the quarter. Her improved outlook, due in part to a reduction in anxiety, and earning a grade she was proud of, contributed to a perception of competence. When Ramiah began to realize she was a capable math student, she adopted the role of a leader in the classroom. She often asked difficult questions, presented strategies to the class, and offered academic and moral support to her peers. These actions all speak to Ramiah's increased level of self-efficacy.

[Other](#) students in the class had similar responses to addressing their math anxiety through reflective journaling and seeing an increase in self-efficacy. Allona wrote, "Writing in my journal does help me feel better about what student I am because it reminds me I'm doing better this year," Leilanni wrote, "Writing in a math journal does help me as a math student because it lets you know and myself know how I'm doing and what I know," and Aubrey wrote, "writing in journals does make me feel better about the math student I am because I can think of what I have done and accomplished." As these responses indicate, reflective journaling has had a positive impact on the level of student self-efficacy for this group.

## **Factors That May Have Influenced Student Self-Efficacy**

I believe that a student's educational experience is largely dependent upon their feeling of safety and belonging. When I consider the impact of reflective journaling in my math classes, I also had to take into account the role the implementation of Common Core State Standards and standardized test requirements had on teachers and students, as well as the role the school community plays, and the relationship between the mentor teacher and the student teacher. While perhaps not directly related to student levels of self-efficacy, they do contribute to students' perceptions of an overall educational experience.

### **Common Core and Smarter Balance**

This research study was conducted during the first year that Common Core State Standards and Smarter Balance tests were to be required for all students at Totem Middle School. In order to comply with these new standards, the school district implemented an online curriculum that was designed to directly align with the Common Core standards and provide practice questions that replicated those found on the standardized test. District math leadership developed the pacing guide for lessons and the end of unit assessments. The district provided two full day sessions of training for math teachers on the new curriculum and printed consumable workbooks for student use. The district

math leaders informed teachers that this curriculum was to be taught with fidelity.

While the district leadership was firm on the use of this new curriculum, the district math coach simultaneously offered math teachers training on teaching math lessons that incorporate multiple strategies for solving problems, looking at math problems within new contexts, and allowing students to discover understanding rather than memorizing procedures. The math coach taught evidence based practices, such as those by Jo Boaler, Professor of Mathematics Education at the Stanford University Graduate School of Education and promoter of education reform for equitable mathematics classrooms; and Ruth Parker, co-founder of Mathematics Education Collaborative which promotes quality mathematics education in schools. As the district mandate was to teach the new curriculum with fidelity, my mentor teacher and I were concerned with how to incorporate these practices that we believed to be of greater benefit for our students, in essence, teaching our *students* with fidelity rather than teaching the *curriculum* with fidelity. The district math coach suggested that we use the alternative strategies as supplemental material to the new curriculum.

My mentor teacher and I, having thoroughly investigated the curriculum and pacing guide, made a decision based on our professional judgment, to

create lesson plans that were fully engaging, cognitively demanding and consisted of group worthy tasks. We discriminately chose problems from the mandated curriculum to add as practice problems. We also made the decision to adjust the pacing of our lessons to the pace that our students were demonstrating understanding of concepts rather than the prescribed pace. The pacing adjustments resulted in our being three weeks behind the other math classes in the district who were following the curriculum and pacing with fidelity. It also resulted in higher test scores on the end of unit assessment compared to those students in classes that only used the mandated curriculum. I believe that our students had a much more complete understanding of the concepts taught because of the adjustments we made, which will allow them to build upon their mathematical understanding in the future.

### **School Community**

Totem Middle School was widely perceived to be the lowest performing school with the most student discipline issues within the district. The principal has a good reputation within the district and was thought to be a fair leader for students and teachers. The vice-principal was thought to be friendly and engaged with the students. The district had implemented a new behavior and discipline model, known as a Compassionate School, which was meant to reward positive behaviors while discouraging negative behaviors. This approach was

consistent with extrinsic motivation, where students will do what is expected if they are rewarded, rather than because they have an internal desire to do what is right. This attitude appears to be present in some student's approach to learning, as well.

The school administration had decided that all classes would be exposed to the concept of growth mindset. Over the first two weeks of school, students were shown videos, produced by Jo Boaler, which discussed the differences between having a fixed mindset and a growth mindset. Teachers led class discussions with their students as a way of inspiring students to adopt a growth mindset. It is my opinion that exposing students to the concept of growth mindset would [positively influence their](#) self-efficacy.

### **Relationship Between Teachers**

I believe that it is the teacher's responsibility to establish and maintain a nurturing classroom environment in order for students to have a positive, healthy learning experience. I was fortunate to be placed with a mentor teacher who had graduated from the same Master's program I was attending, one that is concerned with social justice and equity for all students. She was also trained to value and implement the same teaching practices as I had learned, which include providing cognitively demanding lessons within group worthy tasks and holding all students to high expectations. We respected each other's work,

learned from each other, debated strategies and practices, and enjoyed spending time together. The relationship between us was an important aspect of the classroom environment, as it explains how well our pedagogy aligned, supporting the development of a nurturing environment.

Because we worked well together and presented unified teaching strategies, a model of co-teaching was implemented. At the beginning of the quarter, the mentor teacher introduced students to the topic of discussion for the day and I actively participated by adding comments and worked directly with students. By the third week, I took over the introduction of topics and the mentor teacher offered support. Students seemed to appreciate the co-teaching model, as it allowed them more opportunities to engage in one-on-one interaction with teachers, supported their learning, and nurtured their growth.

### **Critical Reflection**

As a researcher, it is important to be critically reflective of your own work, as it allows you to identify areas of strength and weakness in your project and make appropriate recommendations for future research. Critical reflection increases the value of the research to the academic community.

## Implication For Teaching Practice

As I considered the research findings from this Action Research Project, I was convinced of the benefits of student engagement in reflective journal writing. My research findings indicated that a student's level of self-efficacy had a positive impact [on](#) their level of anxiety. My findings were substantiated by research that stated that self-efficacy "strongly influences the choices people make, the effort they expend, and how long they persevere in the face of challenge" (Pajares & Miller, 1994, p. 193). Students in my research study whose survey results indicated an increase in self-efficacy, generally also experienced an increase in effort and perseverance, as seen in their willingness to engage in questions, and exploration of strategies. Positive self-efficacy, effort and perseverance contributed my student's perception of competence. I witnessed this relationship in student journal entries, such as when students indicated that they saw the connection between hard work, better grades and feeling more confidence going into a quiz. Researchers confirm this finding, that self-efficacy is centered on perceptions of mastery (Kesici, Erdogan, & Kelesoglu, 2010).

Having witnessed the positive correlation between reflection journal writing and increased levels of student self-efficacy, I plan to use this strategy in my own classroom. I will establish a framework that allows for frequent

journal writing opportunities and will provide feedback on a regular basis, as I found the interaction between student and teacher to be invaluable for establishing authentic relationships and building a foundation of trust.

### **Questions For Future Research**

As this Action Research Project progressed, I found myself wondering about factors outside of the scope of this particular project. While I could not attend to these new wonderings, they are important questions to consider for future research. Attending to these questions may lead to further advances in finding strategies that help support the success and achievement of our students.

An important question to consider for future research is whether or not the teacher's shift in attitude happens at the same rate as students' shift in attitude. Investigating this idea would help determine whether or not there is an interdependent relationship between the teacher's and student's attitude. If such a relationship were determined, it would make sense to also attend to the teacher's positionality within the classroom as a benefit to student opportunities for success and achievement.

Other questions that came from my research project include, how can parents/guardians help support improving student's self-efficacy; can providing sentence starters as journal prompts help guide positive self-talk within journal



reflections, impacting self-efficacy; how can goal setting and fair self-assessment help improve self-efficacy; could shared journals (amongst peers) help student feel supported by their classmates; how does a cooperative classroom environment differ from a competitive learning environment in terms of supporting the growth of student self-efficacy; and, does helping improve student self-efficacy have a positive relationship with reducing student misbehavior in the classroom?

Clearly, student self-efficacy is firmly connected to many facets of a student's future opportunities and successes. It is imperative that educators recognize the importance of supporting the growth of student self-efficacy.

Through my action research, I have found reflective journaling to be an effective strategy for forming authentic relationships between students and teachers, an instrument in which teachers can discover and address student needs, and reduce student math anxiety.

## REFERENCES

- Akin, A., & Kurbanoglu, I. N. (2011). The relationship between math anxiety, math attitudes, and self-efficacy: A structural equation model. *Studia Psychologica, 53*, 263–273.
- Anderson, G. L., Herr, K., & Sigrid Nihlen, A. (2007). *Studying Your Own School: An Educator's Guide to Practitioner Action Research* (2nd ed.). Thousand Oaks, CA: Corwin.
- Andrews, S. E. (1997). Writing to learn in content area reading class. *Journal of Adolescent & Adult Literacy, 41*(2), 141.
- Bandura, A., Barbaranelli, C., Vittorio Caprara, G., & Pastorelli, C. (1996). Multifaceted impact of self-efficacy beliefs on academic functioning. *Child Development, 67*(3), 1206–1222.
- Charalambous, C. Y., Philippou, G. N., & Kyriakides, L. (2008). Tracing the development of preservice teachers' efficacy beliefs in teaching mathematics during fieldwork. *Educational Studies in Mathematics, 67*(2), 125–142.
- Craske, M. G., Treanor, M., Conway, C. C., Zbozinek, T., & Vervilet, B. (2014). Maximizing exposure therapy: An inhibitory learning approach. *Behavior Research and Therapy, 58*, 10–23.

- Deci, E. L. (1995). *Why we do what we do: Understanding self-motivation*. New York, NY: Penguin Books.
- Fast, L. A., Lewis, J. L., Bryant, M. J., Bocian, K. A., Cardullo, R. A., Rettig, M., & Hammond, K. A. (2010). Does math self-efficacy mediate the effect of the perceived classroom environment on standardized math test performance? *Journal of Educational Psychology, 102*(3), 729–740.
- Fritson, K. K. (2008). Impact of journaling on students' self-efficacy and locus of control. *Insight: A Journal of Scholarly Teaching, 3*, 75–83.
- Furner, J. M., & Duffy, M. L. (2002). Equity for all students in the new millennium: Disabling math anxiety. *Intervention in School and Clinic, 38*(2), 67–74.
- Hamdan, M. (2005). Nonlinear learning of linear algebra: Active learning through journal writing. *International Journal of Mathematical Education in Science and Technology, 36*(6), 607–615.
- Harford, M. (2008). Beginning with students: Ownership through reflection and goal setting. *The English Journal, 98*(1), 61–65.
- Jordan, L. (n.d.). Cognitive strategies. University of North Carolina, Charlotte. Retrieved from [http://www.specialconnections.ku.edu/?q=instruction/cognitive\\_strategies](http://www.specialconnections.ku.edu/?q=instruction/cognitive_strategies)

Kesici, S., Erdogan, A., & Kelesoglu, A. (2010). Mathematics anxiety according to middle school students' achievement motivation and social comparison. *Education, 131*(1), 54–63.

Klassen, R. M. (2010). Confidence to manage learning: The self-efficacy for self-regulated learning of early adolescents with learning disabilities. *Learning Disability Quarterly, 33*(1), 19–30.

Kostos, K., & Shin, E. (2010). Using math journals to enhance second graders' communication of mathematical thinking. *Early Childhood Education, 38*, 223–231.

Martin, A. J., Anderson, J., Bobis, J., Way, J., & Vellar, R. (2012a). Switching on and switching off in mathematics: An ecological study of future intent and disengagement among middle school students. *Journal of Educational Psychology, 104*(1), 1–18.

Mertens, D. M. (2009). *Research and Evaluation in Education and Psychology: Integrating Diversity With Quantitative, Qualitative, and Mixed Methods (Third Edition)*. SAGE Publications, Inc.

Ozgen, K., & Bindaka, R. (2011). Determination of Self-Efficacy Beliefs of High School Students towards Math Literacy. *Educational Sciences: Theory and Practice, 11*(2), 1085–1089.

- Pajares, F. (1996). Self-efficacy beliefs in academic settings. *American Educational Research Association, 66*(4), 543–578.
- Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept in mathematical problem solving: A path analysis. *Journal of Educational Psychology, 86*(2), 193–203.
- Stevens, T., Harris, G., Aguirre-Muoz, Z., & Cobbs, L. (2009). A case study approach to increasing teachers' mathematics knowledge for teaching and strategies for building students' maths self-efficacy. *International Journal of Mathematical Education in Science and Technology, 40*(7), 903 – 914.
- Stipek, D. J., Givvin, K. B., & Salmon, J. M. (2001). Teachers' beliefs and practices related to mathematics instruction. *Teaching and Teacher Education, 17*, 213–226.
- Stodolsky, S. S., Salk, S., & Glaessner, B. (1991). Views about learning math and social studies. *American Educational Research Journal, 28*(1), 89–116.
- Swaim Griggs, M., Rimm-Kaufman, S. E., & Merritt, E. (2013). The responsive classroom approach and fifth grade students' math and science anxiety and self-efficacy. *School Psychology Quarterly, 28*(4), 360–373.
- Usher, E. L. (2009). Sources of Middle School Students' Self-Efficacy in Mathematics: A Qualitative Investigation. *American Educational Research Association, 46*(1), 275–314.

Usher, E. L., & Pajares, F. (2008). Sources of self-efficacy in school: Critical review of the literature and future directions. *Review of Educational Research, 78*(4), 751–796.

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology, 25*, 82–91.

Zull, J. E. (2002). *The art of changing the brain: enriching teaching by exploring the biology of learning* (1st ed.). Sterling, Va: Stylus Pub.

Appendix A

# Getting To Know You!

Your name \_\_\_\_\_

Birthdate \_\_\_\_\_

Favorite song \_\_\_\_\_

Favorite food \_\_\_\_\_

Pets you have \_\_\_\_\_

Who lives in your house \_\_\_\_\_

\_\_\_\_\_

What language(s) do you speak at home \_\_\_\_\_

Job you want after you are done with school \_\_\_\_\_

\_\_\_\_\_

Favorite subject in school and why \_\_\_\_\_

\_\_\_\_\_

What do you like to do when you're not at school \_\_\_\_\_

\_\_\_\_\_

Do you like to work alone, with a partner, or in a small group \_\_\_\_\_

One word that describes you as a student \_\_\_\_\_

Who is your best friend and why \_\_\_\_\_

What does it mean to be "good at math" \_\_\_\_\_

What can I do to help support your learning in this class \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

What are you willing to do to support your learning in this class\_\_\_\_\_

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What time do you usually go to bed at night\_\_\_\_\_

If you could have a super power, what super power would you choose\_\_\_\_\_

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One thing you like best about yourself\_\_\_\_\_

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One thing other people like about you\_\_\_\_\_

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One concern you have about school this year\_\_\_\_\_

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Anything you want me to know about you\_\_\_\_\_

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## Appendix B – Student Self-Efficacy Survey

Name \_\_\_\_\_  
 Student Number \_\_\_\_\_

Period \_\_\_\_\_  
 Date \_\_\_\_\_

1. I am a good at math.

Strongly Agree	Agree	Disagree	Strongly Disagree

2. When I get stuck on a problem, I keep trying until I figure it out.

Strongly Agree	Agree	Disagree	Strongly Disagree

3. When I get stuck on a math problem, I let my classmates help me figure it out.

Strongly Agree	Agree	Disagree	Strongly Disagree

4. People are either born good at math or they are born bad at math.

Strongly Agree	Agree	Disagree	Strongly Disagree

5. I like difficult math problems.

Strongly Agree	Agree	Disagree	Strongly Disagree

6. Being good at math is about getting the right answer fast.

Strongly Agree	Agree	Disagree	Strongly Disagree

7. I believe that making mistakes is part of learning something new.

Strongly Agree	Agree	Disagree	Strongly Disagree

8. I compete against my classmates to get more answers right.

Strongly Agree	Agree	Disagree	Strongly Disagree

9. I am sure that if I put more effort into my work, I will get better at math.

Strongly Agree	Agree	Disagree	Strongly Disagree

10. I like math classes that are easy.

Strongly Agree	Agree	Disagree	Strongly Disagree

11. Getting a good grade on a math test makes me feel good about myself.

Strongly Agree	Agree	Disagree	Strongly Disagree

12. If I try really hard on an assignment and don't do well, I want to do it over until I get it right. I don't give up.

Strongly Agree	Agree	Disagree	Strongly Disagree

13. I want my classmates to think I am smart.

Strongly Agree	Agree	Disagree	Strongly Disagree

14. It is important that I don't make mistakes in front of my classmates.

Strongly Agree	Agree	Disagree	Strongly Disagree

15. It is important that I don't make mistakes in front of my teacher.

Strongly Agree	Agree	Disagree	Strongly Disagree

16. I think participating in class discussions helps me become a better math student.

Strongly Agree	Agree	Disagree	Strongly Disagree

17. I work hard because others (parents, teachers, etc.) expect me to get good grades.

Strongly Agree	Agree	Disagree	Strongly Disagree

18. I am afraid to ask questions during class.

Strongly Agree	Agree	Disagree	Strongly Disagree

19. My teacher is responsible for my learning.

Strongly Agree	Agree	Disagree	Strongly Disagree

20. Being cool is more important than being smart.

Strongly Agree	Agree	Disagree	Strongly Disagree

What helps you learn math? \_\_\_\_\_

\_\_\_\_\_

## Appendix C

### Journal Prompts

- Describe what kind of student you are.
- What are some ways we can grow our brains in this class?
- How is this class going so far? Is there something we should be doing to help your learning? Are we doing something that works for you that we should keep doing?
- Goal setting: based on teacher comments and/or mistake you found, your next goal is... In order to meet your goal, your plan of action is to...
- The unit test is next week, and I feel....
- Letter to self: write three sentences, words of encouragement for the unit test.
- Using your growth mindset techniques, write a statement about your learning that took place over this unit.
- I think I will earn a \_\_\_ grade on the unit test because...