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IDENTIFYING FACTORS COMMON AMONG STUDENTS WHO DO NOT FIT THE TYPICAL MATHEMATICS SELF-EFFICACY AND ACHIEVEMENT CORRELATION

by

Jodi H. Mantilla

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Education

Approved:

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UTAH STATE UNIVERSITY
Logan, Utah

2015

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ABSTRACT

Identifying Factors Common Among Students Who Do Not Fit the Typical Mathematics Self-Efficacy and Performance Correlation

by

Jodi H. Mantilla, Doctor of Philosophy

Utah State University, 2015

Major Professor: James Dorward, Ph.D.
Department: Teacher Education and Leadership

Previous research has shown that mathematical self-efficacy is positively correlated with mathematical performance level. However, in elementary classroom settings, teachers noticed that students with high mathematical self-efficacy had low mathematical performance level. On the other end of the spectrum, there are students who have low mathematical self-efficacy yet excel in mathematics. Discovering what factors are common among these two types of students can aid teachers in helping these students improve their self-efficacy and mathematics performance.

This explanatory mixed-methods design was conducted in a K-6 elementary school with the research participants consisting of fourth-, fifth-, and sixth-grade students. The first of two research phases included assessing students' mathematical performance level and mathematical self-efficacy. Utilizing the criteria of high or low performance in correlation to high or low self-efficacy, the students were placed into one of four categories; high performance/high self-efficacy (High P/High SE), low

performance/low self-efficacy (Low P/Low SE), high performance/low self-efficacy (High P/Low SE), and low performance/high self-efficacy (Low P/High SE). Phase II of the research included interviewing the top two students from the High P/High SE group and the bottom two from the Low P/Low SE group as well as all of the students in the High P/Low SE and the Low P/High SE groups. After the interviews were analyzed, the researcher identified the factors that are common to the High P/Low SE and Low P/High SE groups that were not found in the High P/High SE or Low P/Low SE groups. Some examples of these factors for students with High P/Low SE included feelings of jealousy, not feeling smart even when the math is easy, and not feeling encouraged by teachers and parents. Examples of these factors for students with Low P/High SE included preferring completing assignments in a group and giving up when the mathematics gets difficult. The potential implications of this research may be used in elementary classrooms to help teachers identify outlier students as well as help students better align their self-efficacy with their achievement level. The intended audience of this research was elementary mathematics teachers.

(279 pages)

PUBLIC ABSTRACT

Identifying Factors Common Among Students Who Do Not Fit the Typical Mathematics Self-Efficacy and Performance Correlation

by

Jodi H. Mantilla

A student's self-efficacy, or their belief in their ability to perform a specific behavior, has been shown to have a positive correlation with their academic achievement. In other words, if their self-efficacy is high, their academic achievement is high. If self-efficacy is low, likewise their achievement is low. Research has shown that this correlation is especially true when looking at the self-efficacy and academic achievement in a specific subject, such as mathematics. However, in a typical classroom, teachers experience students who have very high self-efficacy in their mathematics abilities yet perform mathematics tasks at a low level. They may also experience students who have low self-efficacy in mathematics yet their performance in mathematics is high. The purpose of this study was to (a) define a procedure to identify these outlier students, and (b) find commonalities among these outlier students that are not common among the nonoutlier students.

This research study used a mixed-method, two-phase model. Phase I used quantitative data from four data sources to find the students' mathematics performance level and their mathematics self-efficacy. Their self-efficacy level was compared to their performance level and students with high self-efficacy and low performance or low self-

efficacy and high performance were identified. Students with high self-efficacy and high performance or low self-efficacy and low performance were also identified as nonoutlier students. Phase II used interviews to collect qualitative data about the outlier students. Some examples of factors that were common among students with high performance and low self-efficacy included feelings of jealousy, not feeling smart even when the math is easy, and not feeling encouraged by teachers and parents. Examples of factors common among students with low performance and high self-efficacy included preferring completing assignments in a group and giving up when the mathematics gets difficult. Further research is needed to understand how these factors may influence outlier students and how teachers can more efficiently help them align their self-efficacy with their performance.

DEDICATION

I dedicate this work to the three most beautiful and loving children in the world, Madison, Makayla, and Josh. May you always follow your dreams, achieve your goals, and believe in yourself. I believe in you and know you can do anything and be anyone you set your heart to. You will do amazing things. You are my world.

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I wish to thank the faculty, administration, and families at Larsen Elementary. Appreciation also goes to my friends and coworkers who have shown me unlimited support and friendship. I thank my amazing fifth-grade students who I continue to love and who helped me become the teacher I am today. I want to especially thank Lynn Teuscher for mentoring me, sharing my brain, and being the best teacher friend anyone could ever hope for. Someday I will be like you!

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degrees. Most of all, I want to thank my three beautiful children, Madison, Makayla, and Josh, for understanding when I had to be away from them. I love you.

Jodi H. Mantilla

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CHAPTER I

INTRODUCTION

"I found the correct answer, but please don't call on me!"

"I know I got a high grade on the math test, but I still don't think that I can do math."

"I know how to do math, I don't need any help."

These are just a few of the comments that you may hear in an elementary mathematics class. Young students in third through sixth grades are trying to figure out their strengths and weaknesses, likes and dislikes, what they feel successful at and what they do not. Teaching fifth grade allowed me the opportunity to see growth not only in students' physical attributes, but also in their understanding of concepts and how they perceive themselves. I have personally witnessed 10-year-old students struggle with difficult concepts, eventually master them, but still think they are not smart. Take, for example, Marlee, a bright young girl who always had the right answer in the mathematic lessons. Her test scores in mathematics were consistently over 90% and in one-on-one interviews she showed a deep understanding for the mathematics. However, every day I would hear this comment from her, "I have the answer, but please don't call on me! I don't think I'm right." She obviously had high mathematics achievement, performance, and understanding, yet her mathematics self-efficacy, or belief in her ability, did not align with her high achievement. When Marlee saw her test scores, she would often make the second comment from above, "I know I got a high grade on the math test, but I still don't think that I can do math." What are the reasons for her to not feel good about her ability

in mathematics when she consistently shows high achievement? How is this low self-efficacy that she is experiencing in fifth grade going to affect her future mathematics experiences?

The same year that I was puzzling over Marlee, I had another student who also confused me. Daniel had extremely high self-efficacy in his mathematics abilities. However, no matter how hard he struggled or how long he worked on mathematics tasks he could never quite arrive at the correct answer. His work did not show any understanding of the concepts and he could not explain his thinking. In the entire school year Daniel did not have one test score above 70%, yet his self-efficacy never decreased. What are the reasons for Daniel to feel good about his ability in mathematics when he consistently showed low achievement? How is this over-inflated self-efficacy that he is experiencing in fifth grade going to affect his future mathematics experiences?

Background of Problem

Self-efficacy is belief in one's ability to be successful at a certain task or situation (Bandura, 1977). A person's self-efficacy affects more than just accomplishing a task. It can help, "determine the choices people make, the persistence and perseverance they display in the face of difficulties, and the degree of anxiety or serenity they experience as they engage in the myriad tasks that compromise their life" (Usher & Pajares, 2008, p. 751). Self- efficacy can be used to predict many items in an educational setting including; student academic achievement (Pajares & Urdan, 2006), high school dropout rate (Caprara et al., 2008), college success (Hall & Ponton, 2005), as well as career choices

(Brown & Lent, 2006).

Self-Efficacy and Academic Achievement

One of the most important factors that can be predicted from self-efficacy in a school setting is academic achievement (Schweinle & Mims, 2009). Bandura's (1997) theory proposed that self-efficacy is a "mediating agentic mechanism for academic achievement" (Fast et al., 2010, p. 736). Academic experiences affect self-efficacy, and this, in turn, affects student achievement. Phan (2012b) stated that any change in self-efficacy, whether an increase or decrease, "is fundamental and facilitates the predication of learning and academic achievement" (p. 98).

The relationship between self-efficacy and academic achievement was substantiated through a meta-analytic investigation of 39 articles (Multon, Brown, & Lent, 1991). The results of this analysis not only supported the positive correlation of self-efficacy and achievement, but also showed a stronger relationship between the self-efficacy and achievement of low-achieving students (.56) compared to self-efficacy and achievement of normal-achieving students (.33). The findings also showed that the strongest relationship was produced by the most specific assessment—asic mathematical tasks. The second strongest correlation was found in classroom-based performance. Finally, the weakest relationship between self-efficacy and achievement was found in standardized tests. In other words, self-efficacy corresponds most closely to performance when the task measured is discreet and specific (Multon et al., 1991).

Research shows a correlation with a student's self-efficacy and their achievement. However, there is little discussion in the research concerning the students whose self-

efficacy is substantially higher or lower than their achievement level. This is an area of self-efficacy research that needs to be considered. Further research in this area is important to not only identify these outlier students and find any factors, but to also inform classroom teachers in how to help their students better align their self-efficacy with their achievement level.

Sources of Self-Efficacy

Students' beliefs about their own efficacy can be developed through four main sources of influence. Bandura (1995) suggested that the four sources are mastery experiences, vicarious experiences, verbal persuasion, and physiological states. Although all four sources can have influence on students' self-efficacy, they do not impact self-efficacy concurrently (Phan, 2012a).

Mastery experiences. Bandura (1995) theorized that mastery experiences often have the most influence on a person's self-efficacy. Mastery experiences happen as a result of a student's own success. After students complete a task they evaluate and interpret the results obtained. When students believe they have worked hard and earned the desired outcome on a particular task or subject, their belief and confidence in themselves is raised in that subject or on a similar task. At the same time, students who work hard and do not obtain the desired outcome often have lowered self-efficacy when faced with a similar task.

Vicarious experiences. Students also form their self-efficacy beliefs through the vicarious experiences of observing others perform tasks. They use this observation to evaluate their own ability to be successful at the same or similar task. Watching a peer

succeed at a challenging mathematics problem may convince a student that they too can be successful at the same problem. A peer model with similar characteristics to those of the student can be the most influential factor in raising a student's self-efficacy through vicarious experiences (Britner & Pajares, 2006).

Verbal persuasion. Encouragement and feedback from teachers, parents, and peers is the third source of influence to a student's self-efficacy. Positive feedback, encouragement, and praise are crucial to the formation of self-beliefs. This is particularly true in a student's formative years, when they are not yet capable of assessing their own skills. Studies have also found that parent encouragement and interaction have more influence on a student than other sources of encouragement (Bleeker & Jacobs, 2004; Midgett, Ryan, Adams, & Corville-Smith, 2002).

Physiological states. The final source of influence on self-efficacy is a student's physiological state, such as mood, fatigue, anxiety, or stress. Bandura (1997) found that a student's self-efficacy is at its optimum when physiological cues are neither too high nor too low. In general, increasing a student's physical and emotional wellbeing and decreasing negative physiological states strengthen self-efficacy. Strong emotional reactions to school-related tasks can provide either feelings of success or failure to a student. If a student dreads a certain class or teacher, they may relate that negative feeling to a lack of skill in that area. Those feelings will then influence a decrease in that student's self-efficacy.

The research concerning sources of self-efficacy is able to explain where students' self-efficacy can stem from, but it does not begin to explain how or which of these

sources can cause the students' self-efficacy to be substantially different than their achievement level. It is an assumption that if mastery is the most influential on self-efficacy than students who consistently show high achievement in mathematics will also demonstrate high mathematics self-efficacy. It is another assumption that students who don't show high achievement or mastery in mathematics will have low mathematics self-efficacy. However, classroom experience has shown that this is not always the case. As indicated in the literature review, there has not been sufficient research conducted to discover why students with either high or low mathematics achievement have substantially different mathematics self-efficacy.

Increasing Student's Self-Efficacy

In the classroom, teachers can help students increase their self-efficacy, which may result in increasing their achievement levels (Pajares, 2006). Teachers can design instructional presentations and interactions that capitalize on the influence of the four self-efficacy sources (Linnenbrink & Pintrich, 2003; Margolis & McCabe, 2006; Nenni, 2009; Schukajlow et al., 2012). Siegle and McCoach (2007) gave several instructional strategies that can produce more confident students. These strategies included;

- Reviewing lesson accomplishments from the previous day.
- Posting the current lesson's objectives prior to instruction.
- Drawing attention to the lesson objectives as they are covered.
- Reviewing the lesson objectives at the end of the lesson.
- Asking students to record each day on a calendar something new they learned that day or something at which they excelled.

- Prompting students who perform poorly to attribute their failures to lack of effort and encouraging them to try harder.
- Drawing students' attention to their growth and complimenting them on their specific skills.
- Using student models to demonstrate some aspects of a lesson to remind them that other students like themselves are mastering the material.

The research mentioned above supports methods that teachers can use to help increase student's self-efficacy, which in turn, may increase their achievement. This research is based on the assumption that the student's self-efficacy and achievement are both low. There is a gap in the research on how teachers can help students with different levels of achievement and self-efficacy in mathematics. The proposed research would help fill this gap by providing teachers information to help them better identify and understand outlier students.

Purpose Statement

Previous research has shown that mathematical self-efficacy is positively correlated with mathematical performance level. However, in elementary classroom settings, teachers have noticed students who have high mathematical self-efficacy with low mathematical performance level. On the other end of the spectrum, there are students who have low mathematical self-efficacy, yet excel in mathematics. Discovering what factors are common among these two types of students can aid teachers in helping these students improve their self-efficacy and their mathematics performance.

The purpose of this study is to learn more about individual students who are considered outliers based on their mathematics self-efficacy compared to their mathematics achievement. The researcher's hope is that by learning more about the individual students; factors among the outliers will emerge, resulting in a theory of what factors are common among the students who fall outside of the typical self-efficacy/performance correlation.

Research Questions

RQ1. How can practitioners identify students who have a significant difference in mathematics self-efficacy and mathematics performance?

RQ2. What factors are common among those students who have high mathematics performance and low mathematics self-efficacy?

RQ3. What factors are common among those students who have low mathematics performance and high mathematics self-efficacy?

Significance of Study

While theories regarding student self-efficacy have generated many research studies, there are still gaps in the research. Research has shown a direct correlation between self-efficacy and achievement. Additional research shows similar correlation with specifically mathematics self-efficacy, and mathematics achievement. With this research on self-efficacy and its correlation with achievement, it is an assumption of teachers that students with high self-efficacy are also high achievers. On the flip side

students with low self-efficacy usually fall on the lower end of the achievement spectrum. However, it is possible to have a student with high self-efficacy that has lower achievement levels. There are also students with low self-efficacy, yet reach higher achievement levels. There are no established methods to identify these outlier students, or research that identifies characteristics of students with high self-efficacy/low achievement or low self-efficacy/high achievement.

Another area of self-efficacy that lacks sufficient research is the elementary age group. Joët, Usher, and Bressoux, (2011) stated that self-efficacy and its sources have been typically studied in the middle school, high school, or college. The beliefs and sources of elementary-aged students' self-efficacy have not received much attention from researchers.

In looking specifically at middle school grades, Britner and Pajares (2006) contended that influences on students' academic self-efficacy are particularly important during the transition from elementary to middle/junior high school. The transition from elementary to middle or junior high school can either be detrimental or beneficial to the growth of personal efficacy (Bandura, 2006). Students with high self-efficacy in elementary school tend to cope with the transition easier and retain a higher self-efficacy in the higher grades, whereas students "inefficacious students become even more self-doubting of their capabilities" (Bandura, 2006, p. 12). The effect of this transition is especially true in the subject of mathematics (Eccles et al., 1993; Midgley, Feldlaufer, & Eccles, 1989).

Research completed in high school mathematics classes (Lopez & Lent, 1992;

Radday, 2010) showed students' mathematics self-efficacy was heavily influenced by the students' mathematics experience in previous years. Students reflected that three main things had an influence on their current self-efficacy; the mathematics content that was taught, their own mathematical performance, and their self-efficacy through the grades (Radday, 2010). Research on self-efficacy influences and sources in elementary school students will provide valuable information needed to "support optimal development" (Britner & Pajares, 2006, p. 489) of self-efficacy in students not only in elementary grades, but also as they progress throughout their lives.

Schunk (1995) addressed needs for future research in self-efficacy. The research in self-efficacy typically uses quantitative methods; however, Schunk argued that although qualitative methods would include fewer subjects, "they would yield rich data sources" (p. 299). Schunk also called for a need for more classroom research with teachers. Such research will provide "invaluable information on the role of self-efficacy in education (Schunk, 1995, p. 300).

The proposed research addresses the following areas of self-efficacy that lack sufficient research: outliers, age group, and qualitative methods in the classroom. The first area focuses on students who either have high self-efficacy with low achievement, or low self-efficacy with high achievement. Research has been done to guide teachers to increase their students' self-efficacy, but this information would be more effective if teachers knew factors underlying low self-efficacy.

The second area addressed is age group. Studies uncovered in the review of literature did not sufficiently examine self-efficacy and mathematics achievement among

9- to 12-year-old students. Joët et al. (2011) stated that the majority of self-efficacy research has focused on middle school, high school, or higher education. However, if research can help teachers in building the self-efficacy of elementary age students, teachers in higher grades may see fewer issues with low self-efficacy. The proposed study addresses this need by examining the self-efficacy and interviewing students in an elementary school (fourth, fifth, and sixth grades.)

The final issue of self-efficacy research is classroom research as well as qualitative methods. This study utilized mathematics achievement of students according a teacher rating of each student's mathematical ability. The study also uses the students' classroom as the setting for the majority of the study (the Math and Me Survey and the mathematical task). The findings from the research will be applicable to all classroom teachers. Phase II of the study employs the use of qualitative methods through student interviews in hope of gaining rich data about factors of outlier students.

Theoretical Framework

Social Cognitive Theory

This study is based on Bandura's self-efficacy theory (Bandura, 1995), which is nested under the social cognitive theory (Bandura, 1986). Social cognitive theory is based on the perspective that people are self-organizing, proactive, self-reflecting, and self-regulating (Bandura, 2001). It is a theory of human functioning that views humans as neither completely autonomous nor simply responding mechanically to the environment. This ability to have control over thought processes, motivation, and action is a human

characteristic (Bandura, 1989). In its most general sense, social cognitive theory says that human nature has enormous potential that can be fashioned by direct and observational experience into many different forms within biological limits (Bandura, 2001). Bandura changed the name of his theory from social learning to social cognitive to separate it from other learning theories and to stress the significant role that cognition plays. This theory is also in sharp contrast to other theories of human functioning which either overemphasize the role of the environment or the influence of biological factors (Pajares, 1996). Instead, social cognitive theory views our functioning as the product of a dynamic interaction between personal, behavioral, and environmental factors known as reciprocal determinism (Bandura, 1986).

According to social cognitive theory, humans have a number of unique capabilities that define what it is to be human. They have the ability to symbolize, plan alternative strategies (i.e., forethought), learn through vicarious experience, self-regulate, and self-reflect (Bandura, 2001). The ability for humans to symbolize is essential. This is the ability to process experience through the use of symbols into cognitive models, which allows people to give meaning, form, and continuity to their experiences (Bandura, 1989).

Self-Efficacy Theory

Social cognitive theory assumes a “triadic reciprocality” (Maddux, 1995, p. 5), which states that environmental events, personal cognition, and behavior are mutually interacting influences. Nested within this triadic reciprocality model lies the self-efficacy theory. Where social cognitive theory covers all three areas of environment, cognition, and behavior, self-efficacy theory is concerned primarily with the role of personal

cognition. Therefore, self-efficacy theory stems from one branch of social cognitive theory.

Bandura believed that the capability of self-reflection is the one that is most "distinctly human" (Bandura, 1986, p. 21). It is through this use of self-reflection that individuals can distinguish between accurate and faulty thinking. By verifying one's thoughts, a person can generate ideas, act on them, or predict what might happen as a result of them (Bandura, 2001). But among all of the different self-referent thoughts, none is more central than people's belief in their efficacy to exert control over their lives. This core belief (self-efficacy) is the foundation of human agency (Bandura, 2001).

Self-efficacy beliefs play a key role in the structure of social cognitive theory because efficacy beliefs affect change through their impact on other determinants (Bandura, Barbaranelli, Caprara, & Pastorelli, 2001). If people do not believe they can produce the desired outcome by their actions, they will have little incentive to act at all or to persevere when things become difficult. Research with adults has confirmed that personal efficacy plays an influential role in the level of mastery of educational requirements as well as in the ability to predict occupational choices (Bandura et al. 2001). Research with children has also found that self-efficacy is an important variable in understanding achievement behavior of students, and students' achievement expectations affect their behavior (Schunk, 1984).

Definition of Terms

Self-Efficacy: Bandura (1977) originally defined self-efficacy as one's beliefs in

their ability to perform a specific behavior or set of behaviors required to produce an outcome. However, Bandura later expanded his definition to state that self-efficacy is "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). Perceived self-efficacy is a belief about what a person can do with a particular set of skills under a variety of conditions. This means that different people with the same level of skills may perform anywhere from poorly to extremely well depending on the variety in their beliefs of personal efficacy. This study examined students' beliefs about their abilities in mathematics. While Bandura hypothesized that self-efficacy judgments are better predictors of performance than determinants such as gender and prior experience, he also argued that constructs such as self-concept, perceived usefulness, and anxiety also influence an outcome (Pajares & Miller, 1994).

Mathematical performance: Multon et al. (1991) found that the strongest relationship between self-efficacy and performance was produced by the most specific assessment: basic mathematical tasks. The second strongest correlation was found in classroom-based performance. Finally, the weakest relationship between self-efficacy and achievement was found in standardized tests. Therefore this study used all three methods of assessment to define mathematical performance. A basic task was given, a teacher rating was used to measure classroom-based performance, and a score from the end-of-year SAGE test, a standardized test, was analyzed to determine if a student's mathematical achievement was high, average, or low.

CHAPTER II

LITERATURE REVIEW

The literature review for this study aims to serve three purposes. The first is to review the literature that is relevant to self-efficacy. A portion of this literature was presented in Chapter I, but will be discussed in further detail in this review. The second purpose is to examine the empirical studies that are relevant to self-efficacy in mathematics, and the different age groups. The final purpose of the literature review is to provide justification for the data sources used in this study.

This literature review is organized by the research literature on self-efficacy embedded with the empirical studies that have been completed in the same area (the empirical studies of the variances of self-efficacy is embedded in the same section as the research literature of variances). The final sections of the literature review contain the research literature and justification of the data sources used in this study.

Eric Resource Information Center (ERIC) via Elton B. Stephens CO (EBSCO), Education Full Text via EBSCO, Academic Search Premier, PsycINFO, and Google Scholar were used in a search to locate both research articles and empirical studies on self-efficacy. A variety of search terms were used, both singularly and in combination, including: *self-efficacy, achievement, mathematics, elementary, teacher rating, measurement of [self-efficacy],* and *sources of [self-efficacy]* (examples of combinations included *self-efficacy + achievement* and *achievement + teacher rating*).

As the literature found in the initial search was reviewed, citations and references often led to additional resources that were relevant to the study. Another search for

literature from key researchers in self-efficacy also produced relevant resources. Some resources from the initial search were deemed to be irrelevant to the questions addressed in this study. The whole set of literature was then narrowed to the literature most relevant to the topics of interest. At the conclusion of gathering data, another search for current related literature was performed utilizing the same keys words as at the initial literature review.

Self-Efficacy Theory

Bandura (1997) used the term "self-efficacy" to refer to "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3). According to Bandura, self-efficacy beliefs constitute the key factor of human agency. Bandura stated that efficacy beliefs

> Influence the courses of action people choose to pursue, how much effort they put forth in given endeavors, how long they will persevere in the face of obstacles and failures, their resilience to adversity, whether their thought patterns are self-hindering or self-aiding, how much stress and expression they experience in coping with environmental demands, and the level of accomplishments they realize. (p. 3)

A person's self-efficacy affects more than just accomplishing a task. It can help, "determine the choices people make, the persistence and perseverance they display in the face of difficulties, and the degree of anxiety or serenity they experience as they engage in the myriad tasks that compromise their life" (Usher & Pajares, 2008, p. 751). Self-efficacy can be used to predict student academic achievement (Pajares & Urdan, 2006), high school dropout rate (Caprara et al., 2008), college success (Hall & Ponton, 2005), as well as career choices (Brown & Lent, 2006).

According to Bandura (1995), humans make life decisions based on our perceived self-efficacy by choosing activities and situations that we believe are within our capabilities for success. Similarly, we choose to avoid activities and situations when we believe failure might be an option. Students who have a stronger sense of self-efficacy put forth a greater amount of effort to successfully complete a task, despite the obstacles they may face, than those students with weaker self-efficacy.

As self-efficacy beliefs begin to form, they are not stable. The beliefs can vary in strength as the individual is constantly evaluating new information. It is not until the self-efficacy beliefs have been established for a long amount of time, and are based on large amounts of information, that they become more secure and are unlikely to change.

What matters in self-efficacy is not the actual skills, but what people believe they can do with their skills applied in different situations (Bandra, 1997). In order to discriminate between self-efficacy and ability, Collins (1982) selected children with different levels of ability in mathematics ranging from low to moderate to high. She found that students' mathematical ability was positively related to mathematical achievement and mathematical self-efficacy. However, students with higher self-efficacy solved more problems correctly and reworked more problems they missed compared to students with lower self-efficacy.

Self-efficacy should not be confused with other concepts such as self-esteem or self-concept. Although these terms are sometimes used interchangeably, they are not the same. Self-efficacy is an assessment of competence to perform a specific task. Self-concept is a broader term and includes feeling of self-worth associated with the behaviors

being examined (Pajares, 1996). Self-esteem also involves judgments of self-worth. Both self-concept and self-esteem have an emotional aspect where self-efficacy is purely cognitive.

Sources of Self-Efficacy

Students' beliefs about their own efficacy can be developed through four main sources of influence. Bandura (1995) proposed that the four sources are mastery experiences, vicarious experiences, verbal persuasion, and physiological states. Although all four sources can have influence on students' self-efficacy, they do not impact self-efficacy concurrently (Phan, 2012a). The four sources may affect students differently according to age, gender, and race. These sources were briefly discussed in the introduction, they will now be considered at a deeper level.

Mastery Experiences

Bandura (1995) proposed that mastery experiences often have the most influence on a person's self-efficacy. Mastery experiences happen as a result of a student's own success. After a student completes a task they evaluate and interpret the results obtained. When students believe they have worked hard and earned the desired outcome on a particular task or subject, their belief and confidence in themselves is raised in that subject or a similar task. At the same time, students who work hard and do not obtain the desired outcome often have lowered self-efficacy when faced with a similar task.

Students' continued success in a certain subject, such as mathematics, typically lead to high self-efficacy in that subject. Consistent success in a subject or domain often

has enduring effects on one's self-efficacy. A student who finds success in mathematics and continues to get high grades in mathematics will typically have high mathematics self-efficacy for years to come (Pajares & Miller, 1994)

Self-efficacy beliefs are most likely to change and develop as students learn new skills and when they are faced with novel tasks that they have not seen before. Mastery experiences can prove to be extremely powerful in cases when the student overcomes a particularly difficult challenge (Bandura, 1997). Tasks that prove to be easy to overcome without students investing much effort tend to have less effect on the student's self-efficacy than tasks that require more effort and perseverance.

Vicarious Experiences

Students also form their self-efficacy beliefs through the vicarious experiences of observing others perform tasks. They use observations to evaluate their own ability to be successful at the same or similar task. Watching a peer succeed at a challenging mathematics problem may convince students that they too can be successful at the same problem. A peer model, with similar characteristics, can be the most influential factor in raising self-efficacy through vicarious experiences (Britner & Pajares, 2006). However, peer models can also undermine a student's self-efficacy if the model fails quickly at a task that the observer perceives as easy. It is suggested that coping models, those who struggle through problems until they reach a successful end, are more likely to boost the self-efficacy of an observer than are mastery models, those who respond to mistakes like they never make them (Schunk, 1983; Schunk & Hanson, 1988). Researchers have also suggested that models may play a more influential role during transitional periods, such

as from elementary to middle school, when students are becoming more attuned to social comparative information (Eccles, Midgley, & Adler, 1984).

Bandura (1995) found that another way a student encounters vicarious experiences is when comparing their own skills with those of others. A score means little to a student until they compare it to the scores of peers. If the peers' scores are higher, that student's self-efficacy gets lowered. On the other hand, if the peers scored lower, the self-efficacy of the student increases. Students compare themselves to other individuals, such as classmates or adults, as they make judgments about their own academic self-efficacy.

Verbal Persuasion

Encouragement and feedback from teachers, parents, and peers is the third source of influence to a student's self-efficacy. Positive feedback, encouragement, and praise are crucial to the formation of self-beliefs (Skaalvik, Federici, & Klassen, 2015). This is particularly true in a student's formative years, when they are not yet capable of assessing their own skills. Studies have also found that parent encouragement and interaction have more influence on a student than other sources of encouragement (Bleeker & Jacobs, 2004; Midgett et al., 2002).

Verbal persuasions may have a limited amount of influence to create long-lasting increases in students' self-efficacy. Researchers warn that feedback should be framed to support students' self-efficacy in order to be most effective (Schunk, 1983). Encouragement should also focus on a student's personal growth rather than triumph over others.

Physiological States

The final source of influence on self-efficacy is a student's physiological state, such as mood, fatigue, anxiety, or stress. Bandura (1997) found that a student's self-efficacy is at its optimum when physiological cues are neither too high nor too low. In general, increasing a student's physical and emotional wellbeing and decreasing negative physiological states strengthen self-efficacy. Strong emotional reactions to school-related tasks can provide either feelings of success or failure to a student. If students dread a certain class or teacher, they may relate that negative feeling to a lack of skill in that area. Those feelings will then influence a decrease in that student's self-efficacy.

Negative physiological cues may have more influence on self-efficacy as students progress through school structures. As grades become increasingly more important to measure the academic level of a student, a student's anxiety may also increase. Students may falsely relate this level of anxiety to their own incompetence or inabilities (Seligman, 1990). As students' anxiety increase, their self-efficacy decreases (Hafner, 2008). From the same study, Hafner also stated that as self-efficacy decreases as a result of anxiety, students' achievement also decreases.

Fast et al. (2010) also asked the question whether the classroom environment had an effect on students' self-efficacy. Even though classroom environment does not seem to fit under a student's physiological state, the environment can affect a student's anxiety and stress. In a positive, caring environment a student can feel safe which will lower anxiety. When the environment is not positive or safe, a student may feel anxiety when entering the classroom. Fast et al. reported that students who perceived their classroom

environment as “caring, challenging, and mastery-oriented” (p. 736) had significantly higher levels of academic self-efficacy than those students in less caring, challenging, and mastery-oriented environments. McMahon, Wernsman, and Rose (2009) had similar findings; students who felt they had a positive and supportive classroom environment as well as a sense of belonging in the school had higher self-efficacy.

Variances

Self-efficacy does not develop and strengthen in the same way for every individual. There are variances in the amount of influence one source may have on one’s self-efficacy. These variances can occur between different groups of age, gender, and race.

Age Variances

According to Pajares, Johnson, and Usher (2007), mastery experiences and physiological cues most accurately predicted the self-efficacy of students in elementary and middle school. Students’ self-efficacy in high school was more influenced by mastery experiences and social persuasions.

Gender Variances

When comparing the influences of sources on boys’ self-efficacy with girls’ self-efficacy there has been some studies that state there is no difference. The influence of all four sources are the same for the development of both boys’ and girls’ self-efficacy (Klassen, 2004; Lent, Lopez, & Bieschke, 1991; Matsui, Matsui, & Ohnishi, 1990;

Pajares et al., 2007; Stevens, Olivarez, & Hamman, 2006). There have been other studies however, that show social verbal persuasions (Lopez & Lent, 1992) and vicarious experiences (Lent, Brown, Gover, Nijjer, 1996; Lent, Lopez, Brown, & Gore 1996; Zeldin & Pajares, 2000) tend to have a stronger influence on girls than boys. While girls have a stronger influence from verbal persuasions and vicarious experiences, boys have a stronger influence from mastery experiences (Britner & Pajares, 2006; Hampton & Mason, 2003; Lent, Lopez et al., 1996).

How Self-Efficacy Can Affect Achievement

One of the most important factors that can be influenced from self-efficacy in a school setting is academic achievement (Schweinle & Mims, 2009). Bandura's (1997) theory proposes that self-efficacy is a, "mediating agentic mechanism for academic achievement" (Fast et al., 2010, p. 736). Academic experiences affect self-efficacy, and this, in turn, affects student achievement. Phan (2012b) stated that any change in self-efficacy, whether an increase or decrease, "is fundamental and facilitates the predication of learning and academic achievement" (p. 98).

The relationship between self-efficacy and academic achievement was strengthened through a meta-analytic investigation of 39 articles (Multon et al., 1991). The results of this analysis not only provided information to support the positive correlation of self-efficacy and achievement, but also showed a stronger relationship with low-achieving students compared to normal achieving students. The findings also showed that the strongest relationship was produced by the most specific assessment: basic skills

(.52). The second strongest correlation was found in classroom-based performance (.36). Finally, the weakest relationship between self-efficacy and achievement (.13) was found in standardized tests (Multon et al., 1991).

In the classroom, teachers can effectively help students increase their self-efficacy, which will also result in increasing their achievement levels. Teachers can design instructional presentations and interactions that capitalize on the influence of the four self-efficacy sources (Linnenbrink & Pintrich, 2003; Margolis & McCabe, 2006; Nenni, 2011; Schukajlow et al., 2012). Siegle and McCoach (2007) gave several instructional strategies that can produce more confident students. These strategies included:

- Reviewing lesson accomplishments from the previous day
- Posting the current lesson's objectives prior to instruction
- Drawing attention to the lesson objectives as they are covered and reviewing the lesson objectives at the end of the lesson.
- Asking students to record each day on a calendar something new they learned that day or something at which they excelled
- Prompting students who perform poorly to attribute their failures to lack of effort and encouraging them to try harder
- Drawing students' attention to their growth and complimenting them on their specific skills
- Using student models to demonstrate some aspects of a lesson to remind them that other students like themselves are mastering the material and therefore they can master it also. (Siegle & McCoach, 2007, p. 279)

Measuring Student's Self-Efficacy

Likert Scale

One of the most commonly used tools in measuring the attitudes of students is the

Likert rating scale introduced by Rensis Likert in 1932. Instruments designed using Likert-type scales present participants with statements or questions in which they respond to in terms of agreement or preference continuum. This continuum usually ranges between extremes such as disagree/agree, or dislike/like. The debate in writing such scales is whether the test is more effective with an odd or even number of categories. If the scale has an odd number of response options, the median category is always a neutral point. Some researchers argued that including a neutral point allows the respondents to be more discriminating (Cronbach, 1950; Gable & Wolf, 1993; Ory & Wise, 1981). Other researchers expressed concern that when presented with a neutral option, more respondents would choose neutral more often and be less discriminating. The researchers with this viewpoint also believed that omitting the neutral option would force the respondents to be more thoughtful; therefore, resulting in more precise ratings (Garland, 1991; Toland & Usher, 2015).

Another concern when considering the optimal number of categories is the age of the participants. Adelson and McCoach (2010) wanted to determine whether elementary-aged students could discriminate between categories on a 5-point Likert scale to the same degree as a 4-point Likert scale. Another consideration of their study was to measure how each format (5-point and 4-point) affects the structure and reliability of the scales. Their findings revealed that although the structure and reliability of the two formats were similar, the 5-point format was more favorable with the age group. The results showed that elementary-aged students could effectively use a 5-point scale and in terms psychometric properties the 5-point scale outperformed the 4-point scale with this age

group. The conclusion of this study was that a 5-point Likert-type scale is appropriate and effective for elementary-aged students.

Methods for Measuring Sources

Depending on the type of data the researcher needs, either quantitative or qualitative methods may be used to measure the influence of the self-efficacy sources; when measuring the influence of the four sources using quantitative methods, Usher and Pajares (2008, p. 756) suggested statements that were well worded can be used within a Likert scale survey to assess the influence of each source on a student's self-efficacy.

Researchers have also used qualitative methods to assess how students develop their self-efficacy (Maddux, 1995; Pajares, 1996; Schunk, 1983). Unlike the scaled quantitative answer that fails to account for the whole development of a student's self-efficacy, a semistructured interview format can enable students to elaborate on experiences that helped or hindered the development of self-efficacy.

Justification of Data Sources

To get more complete sense of the student's mathematical achievement, this study utilized three data sources—a mathematical task, a teacher rating, and the student's score from the previous school year SAGE test. The Math and Me survey was used to measure the student's self-efficacy in mathematics. The following section provides justification for each of these data sources.

An appropriate grade-level mathematical performance task will provide the first set of data. The Common Core State Standards (CCSS) places a major emphasis on

mathematical performance tasks. The Standards for Mathematical Practice within the CCSS revolve around the processes and procedures that students should attend to while problem solving. Before the CCSS was written and implemented, the National Council of Teachers of Mathematics (NCTM) also placed emphasis in problem solving, writing problem solving as one of its five strands for mathematical thinking. Problem solving is an "integral part of all mathematics learning" (NCTM, 2000, p. 52) and should involve all five content areas. Looking back even earlier in An Agenda for Action, NCTM's first recommendation states that "problem solving must be the Focus of School Mathematics in the 1980s" (NCTM, 1980). The recommendation goes on to state that the "mathematics curriculum should be organized around problem solving" (NCTM, 1980). With such a tremendous push towards problem solving, what information can be received from a problem solving performance task? Research has shown that mathematical performance tasks that focus on conceptual understanding and problem solving can be used to predict students' scores on state tests (Helwig, Anderson, & Tindal, 2002), general mathematics achievement (Foegen & Deno, 2001), and students' competence in high-level mathematics skills (Jitendra, Sczesniak, & Deatline-Buchman, 2005). Research has also shown that a student's self-efficacy most strongly correlates with specific mathematical tasks (Multon et al., 1991). Therefore, a specific mathematical task is appropriate as one data source for mathematical achievement.

SAGE Test

SAGE (Student Assessment of Growth and Excellence) is Utah's required end-of-year test to show accountability of learning and growth. The test was developed through

the American Institutes for Research (AIR) and is aligned to the state's core curriculum. AIR (2014) stated that their psychometrics team uses scientific sampling, advanced linking designs, and appropriate calibrating and equating models to ensure the best possible data and statistics. The SAGE test is an online, adaptive test with four sections, Mathematics, Language Arts, Writing, and Science, for all students in fourth through sixth grades. The scores are reported on a scale of 1-4, with 3 or 4 considered proficient and 1 or 2 considered nonproficient. This study only took into consideration the score of the mathematics section.

Math and Me Survey

The data source that was used in this study to measure the student's self-efficacy in mathematics was the Math and Me survey. Written and researched by Adelson and McCoach (2006), this survey used a 5-point Likert scale in a format that was specifically geared towards students in third through sixth grades. The entire Math and Me survey along with permission from author to use the survey in this study can be located in Appendix B.

To study the mathematical self-efficacy of elementary students, researchers often had to use instruments that were not "validated with that population" or that were "developed for the purpose of the student without published validation studies" (Adelson & McCoach, 2011, p. 228). Additional self-efficacy instruments that are frequently cited and used are the Fennema-Sherman Mathematics Attitudes Scales (Fennema & Sherman, 1976), the Attitudes Toward Mathematics Inventory (Tapia & Marsh, 2004), the Mathematics Self-Efficacy Scale (Betz & Hackett, 1993), and the Mathematics Attitude

Survey (Sandman, 1979). However, all of these instruments were written for secondary and post-secondary students. Elementary students have different cognitive and social capacities from secondary students and instrument developers must take this into account (Fuchs, 2002; Scott, 1997). Therefore, the Math and Me Survey was the appropriate instrument to use in this study given the age of the participants.

CHAPTER III

METHODOLOGY

The purpose of this study was twofold: first, to describe how educators could identify students who were outliers to the self-efficacy/mathematics performance pattern. These outliers were students who fit into one of the following groups: students with high mathematics self-efficacy and low mathematics performance or students with low mathematics self-efficacy and high mathematics performance. The second purpose of the study was to identify and describe factors that were common among these two groups of students in their mathematics self-efficacy and/or mathematics performance.

This chapter describes the research methodology used in this mixed methods study. The chapter will present the research questions, design, participants, setting, data sources and instruments, procedures, and data analysis.

Research Questions

RQ1: How can practitioners identify students who have a significant difference in mathematics self-efficacy and mathematics performance?

RQ2: What factors are common among those students who have high mathematics performance and low mathematics self-efficacy?

RQ3: What factors are common among those students who have low mathematics performance and high mathematics self-efficacy?

Research Design

According to Johnson, Onwuegbuzie, and Turner (2007), mixed methods research "involves the sequential or simultaneous use of both qualitative and quantitative data collection and/or data analysis techniques" (p. 119). Based on this definition this study is considered mixed methods research since it utilizes quantitative and qualitative data collection and data analysis in a sequential order. Collecting quantitative and qualitative data separately in two phases allowed the data from one source to enhance, elaborate, or complement data from the other source (Greene, Caracelli, & Graham, 1989; Rossman & Wilson, 1985). This model is sometimes called a two-phase model, but is more typically known as an explanatory mixed-methods design. This design consists of Phase I, collecting quantitative data and looking for extreme or outlier cases. This is followed up with Phase II, to refine, extend, or explain those findings through an in-depth qualitative exploration.

Phase I (RQ1), describing how practitioners can identify the outlier students in which their self-efficacy does not align with their mathematical achievement, was addressed by analyzing quantitative data scores from a mathematics performance task, the mathematics section of the SAGE test, a teacher rating, and the Math and Me survey. The researcher grouped data using the quartile scores from each data source.

Phase II of the research (RQ2 and RQ3), to identify factors among these outlier students, involved interpretation of qualitative data from interviews with students. The analysis of RQ2 and RQ3 focused on constant comparative qualitative coding. Table 1 shows an overview of the research questions, data sources used to answer the research

questions, and the methods of analysis.

Participants

The participating students were in a K-6 elementary school located in a small, rural community in Utah. The school was part of a large district that contained 26 elementary schools, 7 junior high schools, and 5 high schools. The Utah State Office of Education reports 48% of the students in this school receive free or reduced lunch (USOE, 2014). The school itself is one of the oldest in the district, built in 1979. Although still functional, the school lacks a lot of the technical capabilities of the newer schools. This school was chosen for the familiarity and openness to the researcher. The teachers and administration knew and trusted the researcher. The majority of students also knew the researcher, which may have resulted in more open, honest, and reliable answers in the interviews.

Table 1

Data Analysis Overview

Phase	Research question	Instrument/data source	Data analysis
1	How can practitioners identify students who have a significant difference in mathematics self-efficacy and mathematics performance?	NAEP Mathematical Task SAGE Test Teacher Rating Math and Me Survey	Comparison
2	What factors are common among those students who have high mathematics performance and low mathematics self-efficacy?	Student interviews	Constant comparative
2	What factors are common among those students who have low mathematics performance and high mathematics self-efficacy?	Student interviews	Constant comparative

The participants in this study were students in fourth through sixth grades (*N* = 188). Students in these grades ranged in age from 9 to 12 years. All of the students were enrolled in the same elementary school and were in classes of two fourth grades, three fifth grades, and two sixth grades. Each teacher instructed their own class in every core subject for the entire school day with no rotations. The gender of the students consisted of 92 female and 96 male. Race proportions were as follows: Caucasian (79%) with other ethnicities including Hispanic (14%), Pacific Islander (4%), Native American (2%) and African American (1%). Seven of the students were English language learners who received 30 minutes of English as a Second Language (ESL) services every day. Eight students were in a self-contained special education class for the first half of the school day and only received instruction in mathematics, social studies, and science from their regular education teacher. Nine students had an Individualized Education Program (IEP) in both mathematics and reading. This IEP allowed these students to participate in a special education pullout class for 30 minutes in reading and 30 minutes in mathematics each day. Eight students received speech/language services for 30 minutes weekly.

Setting

The administration of the first two instruments of the study (the Math and Me survey and the mathematics performance task) took place within a classroom environment during the normal school day hours. The classrooms were the same ones in which the participants spent the majority of the school day. The researcher's intention for using the same classroom was to make the students feel comfortable and reduce any

anxiety. Both the survey and the task were administered in two different sections so each student was allowed to complete both pieces within their own classroom and with their classmates.

The final component of the study, the student interviews, took place within the classroom settings during the normal school day hours. However, since the students' classroom had regular instruction taking place, each student was pulled from the class and the interview took place in an empty classroom in the same hallway. The students used this classroom frequently for small group instruction or one-on-one tutoring. Research has shown that interviewing students in a familiar and natural setting will make the student feel more comfortable and give a more accurate representation of their thoughts (Eder & Fingerson, 2002).

Data Sources and Instruments

The quantitative set of data for this study was derived from four main sources: a mathematical performance task, test scores from the mathematics section from the SAGE test, a teacher rating, and the Math and Me self-efficacy survey. The data from these sources were used to identify the outlier students whose self-efficacy and mathematics scores were not positively correlated.

NAEP Mathematical Task

The mathematical task (see Figure 1) was taken from the National Assessment of Educational Progress (NAEP, 2011) database. NAEP is currently the "only periodic measure of student achievement based on national probability samples, and it is the only

An amusement park has games, rides, and shows.
The total number of games, rides, and shows is 70.

There are 34 rides.
There are two times as many games as shows.

How many games are there? _____
How many shows are there? _____

Use words and/or drawings to show how you got your answer.

Figure 1. NAEP mathematical task.

method by which states can validly compare the academic progress of their students against common high standards" (U.S. Department of Education, National Center for Education Statistics, 2003, p. 1). A board of experts determined and addressed issues of validity in each of NAEP's assessments, analyses, and reports. This board, the NAEP Validity Studies (NVS) panel included experts in the following areas: educational research, psychometrics, curriculum, sampling, test fairness, state assessments, and long-term familiarity. This study was concerned only with the validity of the assessments in the subject domain. The tasks in all NAEP's assessments have been studied and found valid in two different areas of subject domain. First, what is being measured, and second, how is it being measured (U.S. Department of Education, 2003).

In order to ensure reliability of the assessments, professional raters are carefully trained and are closely monitored. A percentage of students' work is scored twice in order to maximize reliability. Cross-year reliability is also closely monitored. These quality control measures ensure that the assessments and data reported from NAEP are trustworthy and reliable (Hombo, 2003).

NAEP's assessments are designed for students in 4th, 8th, and 12th grades. The tasks on NAEP's assessments are categorized into complexity levels of easy, medium, and hard. The task that was chosen for this study is listed as fourth grade and rated as hard complexity (see Figure 1). The reasoning for choosing a hard complexity task was to make the students really think about problem solving and try different strategies in order to arrive at the answer. Students were given partial credit for the mathematical understanding they demonstrated; therefore the purpose was not to put students with low mathematical achievement at a disadvantage, but to give them an opportunity to show their level of understanding. If the task had been too difficult, the researcher would have changed the task to a medium complexity task. However, each student was engaged and working on the task, therefore the complexity was not changed.

The task had one correct answer, but offered multiple solution strategies. The students were required to show their work and encouraged to solve the task using alternative methods other than the traditional algorithm. A rubric (see Table 2) also provided from the NAEP database was used to score the task allowing for a score between 1-5 rather than correct/not correct score. The rubric used scores ranging from 1-5 with 5 (extended) representing high mathematical performance, 1 (incorrect) representing low mathematical performance, and 2 (minimal), 3 (partial), or 4 (satisfactory) representing average mathematical performance.

SAGE Mathematics Test

The second data source was the students' score from the previous year SAGE test, specifically from the mathematics section. SAGE is the state's required end of year test to

show accountability of learning and growth. The test was developed through AIR and was aligned to the state's core curriculum. AIR (2014) stated that their psychometrics team used scientific sampling, advanced linking designs, and appropriate calibrating and equating models to ensure the best possible data and statistics. The SAGE test is an online, adaptive test with four sections (mathematics, language arts, writing, and science), for all students in fourth through sixth grades. The scores are reported using a scale from 1-4; with 3 or 4 considered proficient, and 1 or 2 considered nonproficient. This study only took into consideration the score of the mathematics section. For the purpose of this study, SAGE scores were rated as 1 or 2 (low mathematical performance), and 3 or 4 (high mathematical performance).

Teacher Rating

A third data source was a rating from the student's classroom teacher. Studies show a strong correlation between a teacher's rating of a student's mathematical ability and the student's mathematical achievement level based on a standardized test (Hoge, 1983; Hoge & Coladarci, 1989). The high accuracy of the teacher judgments compared to the standardized test score provided "evidence of construct validity" in using teacher judgments as a measure of achievement (Hoge, 1983, p. 420). The strongest correlation between a teacher's rating and a student's mathematical ability occurs when the rating is indirect and less specific (Hoge & Coladarci, 1989). Therefore, for the purpose of this study, the teacher rated each student as high, average, or low in his or her classroom-based mathematical performance.

In another study, teachers were asked to provide two ratings for their students

with a 7-month gap between the ratings. A test-retest correlation of .87 was reported for the mathematics achievement ratings (Airasian, Kellaghan, Madaus, & Pedulla, 1977). This coefficient was statistically significant showing reliability for teacher judgments as a measure of achievement.

Math and Me Survey

The last data source, the Math and Me Survey developed by Adelson and McCoach, (2006) sought to measure the students' overall mathematics self-efficacy and their attitude towards mathematics. The Math and Me Survey was written for three purposes. The first purpose was to measure the students' self-perceptions in mathematics. Adelson and McCoach used Bandura's (1995) definition of perceived self-efficacy along with Fennema and Sherman's (1976) definition of confidence in learning mathematics as a basis for their conceptual definition of mathematical self-perception. The second purpose was to measure the students' enjoyment of mathematics. The final purpose was to measure the students' perceived usefulness of mathematics. These three purposes together measure a student's mathematical self-efficacy.

The Math and Me Survey has been researched and tested for content validation, reliability, and validity (Adelson & McCoach, 2011). The first study, content validation, had 14 validators included. All 14 had been teachers in the grades between third and sixth, ten validators were professors in mathematics education, and four validators were working on their Ph.D. in mathematics education. Each validator completed four tasks for each of the 42 Math and Me Survey statements: (a) the category each statement fit, (b) their certainty of the placement of each statement, (c) the relevance of the statement, and

(d) the favorability of the item with respect to the construct. After these four tasks for each statement were completed, the validators were asked to give open-ended feedback.

To gather data for a factor analysis, the Math and Me Survey (with the recommended changes from the validators) was given to 437 students in 13 different elementary schools. Criteria were set to determine whether or not survey items should be retained: (a) pattern coefficient was at least .4, (b) pattern coefficients for non-relevant factors were less than .3, and (c) pattern coefficients for non-relevant factors were at least .2 less than the pattern coefficient on the relevant factor. The number of items remaining in each category were as follows: enjoyment of mathematics (10 items), mathematical self-perceptions (10 items), and perceived usefulness of mathematics (7 items).

In order to show reliability Adelson and McCoach (2011) used Cronbach's coefficient alpha to represent the proportion of variability in each scale attributable to the true score. The acceptable level was .80 recommended by Clark and Watson (1995) and Urbina (2004). The Cronbach's alpha for each category was as follows: enjoyment of mathematics (.920), mathematical self-perceptions (.874), and perceived usefulness of mathematics (.80). The reading level for the instrument, including all directions, was a 3.4 (third grade, fourth month) level. This survey was developmentally appropriate for students in third through sixth grades. To show reliability for the survey data, a reliability coefficient was found using Cronbach's alpha reliability on SPSS.

To find the student's self-efficacy score, the answers from the 15 items on the Math and Me Survey were averaged and rounded to the nearest whole number. An average score of one indicated a low self-efficacy, 2, 3, or 4 was an average self-efficacy

score, and 5 was a high self-efficacy score (Adelson & McCoach, 2011).

After the quantitative data were analyzed and the outlier students identified, the qualitative data source, student interviews, took place. Eder and Fingerson (2002) found that interviewing could be a valuable data source with students from preschool age (Davies, 1989) through high school age (Eckert, 1989). One advantage to interviews with children was that it allows them to "give voice to their own interpretations and thoughts rather than rely solely on out adult interpretations of their lives" (Eder & Fingerson, 2002, p. 181). The interview questions were based on the four sources of self-efficacy; mastery experiences, vicarious experiences, verbal persuasion, and physiological states (see literature review). A "general interview guide approach" (Valenzuela & Shrivastava, 2008) was used. This interview approach focused on the same general questions and areas of information, but also allowed a degree of freedom and adaptability in the interviews. If more clarification was needed from a student's response, or a student chose to provide additional information about an interview question, the interviewer had the opportunity to ask additional questions. A complete list of the interview questions is in Appendix A.

Procedures

Before any research in the classroom took place, the researcher received the appropriate approval needed to complete research with students. This included approval from the university's Institutional Review Board (IRB; see Appendix E) as well as from the district's administrator over research (see Appendix F). A letter to the parents (see

Appendix D), as well as an informed consent form (see Appendix C), was sent home with each potential participant. The informed consent form signed by the students' parent was required for the student to participate.

During Phase I, students (N = 188) were invited to participate in the study. All students who returned a signed parental consent form (N = 178) were included in the quantitative data-gathering phase. In Phase II, students from each of the seven classes were chosen to interview. All of the students (N = 47) in the outlier groups (High P/Low SE, Low P/High SE) were interviewed. In order to analyze the data using the constant comparison method, several students were interviewed who represented the nonoutlier students. It was anticipated that four additional nonoutlier students from each class would be interviewed: two students from the High P/High SE group and two students from the Low P/Low SE group. However, when the interviews did not yield new information, the researcher interviewed the nonoutlier students to a level of saturation. The minimum amount of interviews for the nonoutlier students was 14, seven from High P/High SE and seven from Low P/Low SE. The maximum number of interviews for the nonoutlier students was 28, 14 from High P/High SE and 14 from Low P/Low SE.

The first step in this research was to gather scores from the first three data sources: (a) the Math and Me Survey, (b) the mathematical task, and (c) the mathematics score from the SAGE test. Three students who were absent during the survey and two who were absent during the task were given the opportunity to complete the survey or task on another day with a different class. In order to eliminate some bias, the students were not asked to miss recess, specialist, or other class activities to complete the survey

or task.

The first data source that was used in collecting the data was the Math and Me Survey. The researcher read aloud the instructions and explained what each number meant. Students were told to think about each item and mark the appropriate number that describes how they feel about the statement. The researcher also read each survey item aloud; therefore it took about 12-15 minutes for each class to complete the survey. The students completed the survey in the classroom at the beginning of the school day. The normal classroom routine taught mathematics in the afternoon so students took the survey before, not during mathematics instruction. It was the researcher's intention to not give the survey during mathematics instruction when a student may be struggling with a particular concept. This may have minimized a student's bias of mathematics based on the current day's mathematical concept.

The next set of data collected occurred on the following school day. Again, this step took place at the beginning of the school day—not during the regular mathematics period. Students were given the task on paper and had access to pencils, crayons, and mathematics manipulatives. Each student was asked to write his or her name, teacher, and classroom number on the top of the paper. They were also instructed to show any equations or pictures they used to solve the problem. The students were not given a time limit. When finished, students read silently so they were not a distraction to other students that were working.

The researcher had access to the students' SAGE score for the mathematics section from the administrator. Teacher and student numbers instead of names were used

to record the scores. The teachers also used a class list with student numbers to rate each student as high, average, or low in classroom performance.

After the data from the Math and Me Survey, the mathematical task, the teacher ratings, and the SAGE test had been collected, it was entered into an Excel spreadsheet. SAGE scores are reported from the state on a scale of 1-4 (AIR, 2014). The state considers scores of 1 or 2 as nonproficient and scores of 3 or 4 proficient. Therefore, for this study, SAGE scores that were rated as 1 or 2 received a low rating and scores of 3 or 4 received a high rating. The NAEP task scores that were scored 1 received a low rating, scores of 2, 3, or 4 received an average rating, and 5 received a high rating. The ratings from the teachers were high, average, or low. The three performance data sources were analyzed and if the same rating of high, average, or low were found in two out of the three sources, the student was given that rating for performance. For example, participant 4S1 had the following ratings: SAGE = 1 (low), Task = 1 (low), teacher rating = average. Therefore, that participant had an overall performance rating of low.

The answers from the 15 items on the Math and Me Survey were averaged for each student with the average score (rounded to the nearest whole number) indicating the student's self-efficacy. The average score was also entered into the same spreadsheet and a score of 1 indicated a low self-efficacy, 2, 3, or 4 was an average self-efficacy score, and 5 was a high self-efficacy score (Adelson & McCoach, 2011).

After all four data sources were given a rating, the performance rating and self-efficacy rating were placed side by side and analyzed for all of the participants. This data analysis placed students into different groups (i.e., high self-efficacy/high achievement,

low self-efficacy/low achievement, low self-efficacy/high achievement, and high self-efficacy/low achievement). Any students with an average rating in either performance or self-efficacy were not considered for this research purpose. When these groups had been identified, each student from the last two groups (high self-efficacy/low achievement or low self-efficacy/high achievement) were interviewed.

Data Management

The data acquired through this study were kept private and confidential by assigning each participant a number instead of using names. An electronic key linking student names with identifying number was password protected and saved on the researcher's personal computer. The quantitative data were entered into the researcher's personal computer and paper copies of the data were kept in a locked drawer. The qualitative data included videos of student interviews. These videos were transferred to a private, password protected, external hard drive which only the researcher had access to. Any personally identifiable information was deleted after the duration of the study and write up. The qualitative and quantitative data will be kept for the duration of five years and then will be deleted from the computer and external hard drive and any paper copies will be shredded.

Data Analysis

For Phase I, describing how practitioners can identify outlier students, there were two stages of data analysis: (a) scoring of the mathematical task and the Math and Me

Survey; and (b) correlating and grouping scores from the task, the SAGE test, the teacher rating, and the Math and Me survey. The data analysis for Phase II of the research, finding factors among the outlier students, included transcription of interviews, and coding and analysis of the interview responses.

To score the correctness of the task and the student's depth of understanding, the researcher used the rubric (see Table 2) provided by NAEP that is specific to the task.

Table 2

NAEP Task Scoring Rubric

Score	Level of mastery	Description
5	Extended	24 games and 12 shows with correct explanation or work.
4	Satisfactory	Has subtraction error, but has games and shows in correct ratio (2:1)
		OR
		Has 12 games and 24 shows with work
		OR
		Has 24 games and 12 shows with no work
3	Partial	Finds 36, and has a ratio of 2 to 1 (but not 24 to 12) and sum of games and shows is less than 36
		OR
		Has 36 games and 18 shows with or without work
		OR
		Has 72 games and 36 shows with or without work
		OR
		Shows a process that reflects understanding of the question, but does not find the correct ratio.
2	Minimal	Finds 36 by subtraction or adding on to 34 to get 70
		OR
		Number of games plus number of shows is 36
		OR
		Has games and shows in a two to one ratio, but nothing else is correct.
1	Incorrect	Incorrect response

The rubric used scores ranging from 1-5 with 5 (extended) representing high mathematical performance, 1 (incorrect) representing low mathematical performance, and 2 (minimal), 3 (partial), or 4 (satisfactory) representing average mathematical performance.

The completed Math and Me Surveys were scored with the following codes:

1 = Strong Disagree
2 = Disagree
3 = Neither Agree nor Disagree
4 = Agree
5 = Strongly Agree

Student's responses were scored for each item and then an average score was calculated to obtain the student's overall mathematics self-efficacy. On a scale of 1-5, an average score of 1 indicated a low self-efficacy, 2, 3, or 4 was an average self-efficacy score, and 5 was a high self-efficacy score.

The scores from the SAGE test were recorded with a score of 3 or 4 indicating high mathematics performance and a 1 or 2 indicating low mathematics performance.

After the mathematics task and the Math and Me Survey were scored and recorded, these two scores, along with the SAGE test score and the teacher rating, were listed side by side. In this way the researcher was able to match high task scores (5), high SAGE scores (3 or 4), and high teacher rating with high survey scores (5), as well as low task scores (1), low SAGE scores (1 or 2), and low teacher rating with low survey scores (1). Students with a high score from two of the three ability sources were considered high in performance. Similarly, students with a low score from two of the three ability sources were considered low in achievement.

The students with high mathematical performance scores and high survey scores fit into the first group (High P/High SE). The students with low mathematical performance scores and low survey scores fit into the second group (Low P/Low SE). Students with a high mathematical performance score and a low survey score fit into the third group (High P/Low SE) and the students with a low mathematical performance score and a high survey score made up the final group (Low P/High SE). Since the researcher was looking for the students who have high or low ratings, the students with an average rating in either the mathematical performance score or the survey were not grouped. In order to alleviate any bias, control students from each of the four groups were interviewed. In the first two groups (High P/High SE and Low P/Low SE), two High P/High SE students and two Low P/Low SE students were interviewed. In the second two groups (High P/Low SE and Low P/High SE), every student was interviewed.

The researcher coded interview responses using the constant comparative method developed by Glaser and Strauss (1967). Constant comparison is important in developing a theory that is grounded in the data. Tesch (1990) described constant comparison with this description:

> The main intellectual tool is comparison. The method of comparing and contrasting is used for practically all intellectual tasks during analysis: forming categories, establishing the boundaries of the categories, assigning the segments to categories, summarizing the content of each category, finding negative evidence, etc. The goal is to discern conceptual similarities, to refine the discriminative power of categories, and to discover patterns. (p. 96)

The constant comparison method allowed the researcher to form the categories of factors that were common among outlier students. After the categories of factors were established, the researcher was able to define the boundaries and summarize each

category. When the categories of factors were determined, each student was categorized. The most common factors should have arisen from these categories. If there were any factors found in the second two groups of students (High P/Low SE and Low P/High SE) that were not found in the first two groups (High P/High SE and Low P/Low SE), it suggested factors that may be common among students in the outlier groups.

Summary

This explanatory mixed-methods design was conducted in a K-6 elementary school with the research participants consisting of fourth-, fifth-, and sixth-grade students. The first of two research phases included assessing students' mathematical performance level as well as mathematical self-efficacy. Utilizing the criteria of high or low performance in correlation to high or low self-efficacy, the students were placed into one of four categories; high performance/high self-efficacy score, low performance/low self-efficacy score, high performance/low self-efficacy score, and low performance/high self-efficacy score. Phase II of the research included interviewing the top two students from the High P/High SE group and the bottom two from the Low P/Low SE group as well as all of the students in the High P/Low SE and the Low P/High SE groups. After the interviews were analyzed, the researcher identified factors that were common to the High P/Low SE and Low P/High SE groups that were not found in the High P/High SE or Low P/Low SE groups. These commonalities may suggest factors that are common among students who do not follow the normal trend of self-efficacy/mathematics performance. The potential implications of this research may be used in elementary

classrooms to help teachers identify outlier students as well as help students better align their self-efficacy with their achievement level. The intended audience of this research is elementary mathematics teachers.

CHAPTER IV

RESULTS

This study took place in two phases. The purpose of Phase I was to answer RQ1: How can practitioners identify students who have a significant difference in mathematics self-efficacy and mathematics performance? The purpose of Phase II was to answer RQ2 and RQ3: What factors are common among students who have high mathematics performance and low mathematics self-efficacy?; and What factors are common among students who have low mathematics performance and high mathematics self-efficacy? Chapter IV is organized by the phases of the study. The quantitative data results and analysis from Phase I will be discussed first, followed by the qualitative data results and analysis from Phase II.

Phase I

The students' mathematics performance was based on three criteria: the end-of-year test (SAGE) score from the previous school year, a mathematical task from the NAEP test, and a rating from the teacher. The students' self-efficacy was the average score from the Math and Me Survey. Scores from the SAGE test were reported from the state as scores between 1-4. For the purpose of this study, the reported scores were rated as 1 or 2 (low performance) and 4 or 5 (high performance). Scores from the task were rated as 1 (low performance), 2, 3, or 4 (average performance), and 5 (high performance). The teacher rated student's classroom performance as high, average, or low. Self-efficacy scores from the Math and Me Survey were rated as 1 (low self-efficacy), 2, 3, or 4

(average self-efficacy) and 5 (high self-efficacy).

The criteria for each rating were based on proficiency of each data source. NAEP classified the highest score (5) as extended understanding and the lowest score (1) as incorrect not even a minimal understanding. These criteria can be used in the teacher's rating of student performance. When a student consistently shows extended understanding the teacher rating would be high. When a student consistently performs below minimal understanding a low rating would be given.

Each student was entered into an Excel spreadsheet with the corresponding ratings for performance and self-efficacy. A comparison was then used to place students into one of four categories; high performance/high self-efficacy (High P/High SE), low performance/low self-efficacy (Low P/Low SE), high performance/low self-efficacy (High P/Low SE), and low performance/high self-efficacy (Low P/High SE). Any student with an average rating in either performance or self-efficacy was not placed in a category.

One hundred eighty-eight consent forms were sent home with each student in grades 4-6. Ninety-five percent of the consent forms were signed and returned, which made the total number of participants 178. The NAEP mathematical task and Math and Me Survey were given to students at the beginning of the school day, not during the regular daily mathematics instruction. To ensure consistency the researcher was the only one to administer both items. Each question on the survey was read out loud to eliminate confusion or misunderstandings.

The results of the comparison of the students' mathematical performance in one column and their mathematical self-efficacy in the next column can be viewed in

Appendix G. The students are not listed by name but by their assigned code.

Table 3 presents the total participants along with high performance/low self-efficacy (High P/Low SE) students, low performance/high self-efficacy (Low P/High SE) students, and total number of outlier students split by both grade level and class within the grade level.

There were a total of 54 fourth-grade students who participated in this study. Based on criteria outlined in Chapter III, no fourth-grade students fell into the high performance/low self-efficacy category. The only fourth-grade participants who reported

Table 3

Participants and Outlier Students

	Total participants		High P/Low SE		Low P/High SE		Total outliers	
Grade/class	*n*	%	*n*	%	*n*	%	*n*	%
4th grade								
Class 4S	29	54	0	0	8	28	8	28
Class 4W	25	46	0	0	6	24	6	24
Total 4th grade	54		0	0	14	26	14	26
5th grade								
Class 5T	26	35	4	15	3	12	7	27
Class 5B	24	32	2	8	4	17	6	25
Class 5F	24	32	3	13	4	17	7	29
Total 5th grade	74		9	12	11	15	20	27
6th grade								
Class 6S	26	52	2	8	4	15	6	23
Class 6A	24	48	3	13	4	17	7	29
Total 6th grade	50		5	10	8	16	13	26

low self-efficacy fell into the Low P/Low SE category. Overall, there were 14 students (26%) in the low performance/high self-efficacy category.

There were three fifth-grade classes, with a total of 74 participants. Of the students with low self-efficacy, nine (12%) had high performance in mathematics. The number of fifth-grade students with low performance and high self-efficacy was lower than fourth-grade students (11 or 15%)

With only two sixth-grade classes, the total number of participants was 50. The sixth-grade participants were more aligned with fifth-grade students than with fourth-grade students, with five (10%) students falling in the High P/Low SE category and 8 (16%) in the Low P/High SE category.

Although no students in fourth grade were placed into the High P/Low SE group, the total number of outliers was similar in each grade. Fourth grade had 26%, fifth grade 27%, and sixth grade 26% of total participants categorized as either high performance/ low self-efficacy or low performance/high self-efficacy. Although these data were intended to answer RQ1, it may show that age may be an influence on self-efficacy as well as the outlier groups. The implications of these differences across grade levels will be discussed in the Chapter V.

RQ1 asked how practitioners could identify students who have a difference in mathematical performance and self-efficacy. The method described in this research is practical for classroom teachers to use to identify outlier students.

Using the Math and Me Survey practitioners can first identify student's mathematical self-efficacy. Teachers may have a sense of students' self-efficacy from

comments, attitude, or behavior that is exhibited during mathematics instruction. However, using the Math and Me Survey can give teachers a more complete and accurate understanding of each student's self-efficacy. Teachers can then use the self-efficacy score to compare to student's performance in order to identify outlier students. The data sources used to rate student's performance in this study consisted of a mathematical task from NAEP, the end of year assessment, and a teacher rating based on observations.

The criteria used for performance and self-efficacy ratings were based on each data source. A rubric provided from NAEP was used to score the mathematical task. A score of 5 (extended) was rated as high performance while a score of 1 (incorrect) was rated low performance. The teachers in the study used a similar method to rate student's performance during mathematics instruction. A teacher rating of high performance was given when the teacher observed the student having consistent extended understanding and low performance when the student was observed having less than minimal understanding. The Math and Me Survey responses were averaged and rounded to the nearest whole number. A rating of high self-efficacy was given for a score of 5, and low self-efficacy for a score of 1.

Phase II

Phase II provided qualitative data through student interviews in order to identify and describe factors characteristic of outlier students in the High P/Low SE, Low P/High SE groups. All available outlier students identified were interviewed, along with two High P/High SE students from each class and two Low P/Low SE students. Several of the

outlier students, as well as, two of the students in the Low P/Low SE group were not in school any of the days that the interviews took place. Table 4 shows the number of students who were interviewed in each group split by grade.

The number of students in the High P/High SE and the Low P/Low SE groups do not represent all of the students who were categorized in that group. Only two from each of the seven classes were interviewed from those two groups. The number of students in the High P/Low SE and Low P/High SE groups represents the total number of students who were categorized into those groups.

The interviews were videotaped for later transcription and took place in an empty classroom familiar to the students. Each student was told the same three things before the interview was started. First, they were told that the interview would be videotaped. Second, that no one but the researcher would see or hear their interview (not their teacher, parents, or friends) so they could be honest with their thoughts on mathematics. Finally, they were allowed to answer as much or as little as they wanted and could skip any

Table 4

Participants Interviewed By Group and Grade

	Total participants		Fourth grade		Fifth grade		Sixth grade	
P/SE groups	*n*	%	*n*	%	*n*	%	*n*	%
High P/High SE	14	22	4	6	6	9	4	6
Low P/Low SE	12	19	3	5	6	9	3	5
High P/Low SE	13	20	0	0	8	13	5	8
Low P/High SE	25	39	10	16	9	14	6	9
Total interviews	64		17	27	29	45	18	28

question they felt they could not answer. Each interview lasted on average seven minutes; therefore the total amount of video analysis was approximately 450 minutes (7.5 hours). The average amount of time for transcription and analysis of each of the 64 interviews was approximately 20 minutes for a total of 21 hours. All interview transcripts are presented in Appendix I.

After all of the interviews were transcribed, the researcher reviewed the answers one question at a time. Using a constant comparison method, categories were derived from the students' responses for each interview question. Each question had different categories depending on the responses. Some of the categories were specific such as yes, no, or I don't know. Other questions had more general categories, such as positive and/or negative feelings.

Following the identification of categories, each one was given a number code. The interview transcripts were reviewed again, this time with each response coded according to the assigned category codes. When completed the frequency of each category could be calculated. The categories and frequencies are displayed in Appendix H.

In order to assure intercoder reliability, the transcripts along with the coded categories were given to a colleague at the university level. The second coder read the interviews and also coded each response according to the assigned codes. Using SPSS the researcher used both sets of codes to find the reliability coefficient, Cronbach's Alpha. The overall Cronbach's Alpha for all interviews was .88, above the acceptable intercoder reliability of .80.

After the categories were identified and the frequencies calculated the interview questions and responses were again categorized, this time into Bandura's four sources of self-efficacy; mastery experiences, vicarious experiences, verbal persuasion, and physiological states. Student responses and frequencies were again analyzed to look for patterns and/or discrepancies.

The remainder of the chapter will present the interview results organized by Bandura's four sources of self-efficacy. The results presented in this chapter were ones that might contribute to the difference of thinking of the outlier groups compared to the nonoutlier groups. The results for all survey questions can be found in Appendix H.

Mastery Experiences

The first of the four sources, mastery experiences, happen as a result of a student's own success. When students believe they have worked hard and earned the desired outcome on a particular task or subject, their belief and confidence in themselves is raised in that subject or on a similar task. At the same time, students who work hard and do not obtain the desired outcome often have lowered self-efficacy when faced with a similar task (Bandura, 1995). Therefore, it would be expected that when a student works hard and gets high scores or correct answers their self-efficacy would be raised. Similarly, if the student is not successful on mathematics assessments or rarely gets correct answers on tasks their self-efficacy would be lowered. The interview had five questions pertaining to mastery experiences.

- Did you feel this math problem was too hard or too easy? (Mastery)
- How do you feel when the math is too hard? (Mastery)

- How do you feel when the math is too easy? (Mastery)
- How do you feel when you get a high score on a math test? (Mastery)
- Do you always do your math homework? (Mastery)

Three questions relating to mastery experiences had similar responses between the outlier and the nonoutlier groups. Therefore, only two question responses will be displayed in Tables 5 and 6.

Table 5

Interview Question #4: How Do You Feel When the Math is Too Hard? (Mastery)

	Confused		Frustrated, stressed		Bored, unhappy		Just give up		Try harder, ask questions		Don't know	
P/SE groups	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
High P/High SE	4	29	2	14	1	7	0	0	6	43	1	7
Low P/Low SE	1	8	6	50	1	8	1	8	2	17	1	8
High P/Low SE	2	15	5	38	1	8	2	15	2	15	1	8
Low P/High SE	1	4	12	48	0	0	5	20	3	12	4	16

Table 6

Interview Question #5: How Do You Feel When the Math is Too Easy? (Mastery)

	Bored		Want harder math		Happy, confident, smart		Get it done fast		Don't know	
P/SE groups	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
High P/High SE	8	57	4	29	1	7	1	7	0	0
Low P/Low SE	0	0	1	8	9	75	1	8	1	8
High P/Low SE	6	46	2	15	0	0	5	38	0	0
Low P/High SE	2	12	2	8	16	64	3	12	1	4

When mathematics class is too hard, half of students in Low P/Low SE feel frustrated or stressed. A large percentage of students in the High P/Low SE and Low P/ High SE groups also feel this frustration. However, the percentage is a bit lower (10-12%) for those students with high performance and low self-efficacy. Typical responses for this category included the exact words of "frustrated," and "stressed" or "nervous." A high percentage (43%) of students in the High P/High SE group want to try harder and ask more questions when they feel the mathematics is too hard for them. The percentage of students who feel like giving up was higher in the outlier groups (High P/Low SE, Low P/High SE). Students in these two groups had comments such as, "I want to give up," "it makes me shut down and I can't think," "I just don't want to try," "I feel blank and can't think so I stop trying."

The majority of students with high performance (High P/High SE, 57% and High P/Low SE, 46%) feel bored when the mathematics gets too easy for them. Only one student from both groups mentioned feeling smart when the mathematics was easy. On the flip side a large majority of students with low performance, (Low P/Low SE, 75% and Low P/High SE, 64%) feel happy, smart, and/or confident when they feel the mathematics is easy.

Bandura (1995) stated that mastery experiences may have the most influence on student's self-efficacy. However, with this set of participants the outlier group with high performance and low self-efficacy does not seem to be affected by mastery experiences. These students most likely get the correct answers during mathematics class, but it does not make them feel smart or help raise their self-efficacy.

Vicarious Experiences

Student's self-efficacy may be influenced through the vicarious experiences of observing others perform tasks. They use this observation to evaluate their own ability to be successful at the same or similar task. Watching a peer succeed at a challenging mathematics problem may convince a student that they too can be successful at the same problem. A peer model with similar characteristics to those of the student can be the most influential factor in raising a student's self-efficacy through vicarious experiences (Britner & Pajares, 2006). The interview had five questions pertaining to vicarious experiences including both peer experiences as well as parent experiences.

- What do you think when another student gets finished with a math problem before you? (Vicarious)
- Do you ask your parents for help on your homework? (Vicarious)
- How does your mom feel about math? (Vicarious)
- How does your dad feel about math? (Vicarious)
- Do you like doing math problems with a partner or in a group, or by yourself? (Vicarious)

Four of the five questions had responses that showed a difference between the outlier and nonoutlier groups and will be displayed and discussed in Tables 7-10.

A high percentage of students in the High P/High SE group (79%) and the Low P/High SE group (80%) stated that they did not care if other students get finished before them. The only students that mentioned anything about being jealous or envious of those who finish before them were members of the high performance/low self-efficacy group.

Table 7

Interview Question #7: What Do You Think When Another Student Gets Finished With A Math Problem Before You? (Vicarious)

	Don't care		Try to hurry		Mad, frustrated, stressed		I'm not smart		Envious, jealous	
P/SE groups	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
High P/High SE	11	79	1	7	1	7	1	7	0	0
Low P/Low SE	3	25	2	17	6	50	1	8	0	0
High P/Low SE	6	46	2	15	0	0	1	8	4	31
Low P/High SE	20	80	0	0	4	16	1	4	0	0

Table 8

Interview Question #10: How Does Your Mom Feel About Math? (Vicarious)

	Don't know		Positive, likes it, good at it		Negative, not good, doesn't like it		In between	
P/SE groups	*n*	%	*n*	%	*n*	%	*n*	%
High P/High SE	4	29	6	43	4	29	0	0
Low P/Low SE	1	8	5	42	6	50	0	0
High P/Low SE	0	0	5	38	8	62	0	0
Low P/High SE	4	16	16	64	5	20	0	0

Table 9

Interview Question #11: How Does Your Dad Feel About Math? (Vicarious)

	Don't know		Positive, likes it, good at it		Negative, not good, doesn't like it		In between	
P/SE groups	*n*	%	*n*	%	*n*	%	*n*	%
High P/High SE	4	29	9	64	1	7	0	0
Low P/Low SE	4	33	4	33	3	25	1	8
High P/Low SE	4	31	7	54	2	15	0	0
Low P/High SE	7	28	15	60	3	12	0	0

Table 10

Interview Question #13: Do You Like Doing Math Problems With A Partner or In A Group, or by Yourself? (Vicarious)

	Partner		Group		Partner and/or group		Self		Don't care		Depends	
P/SE groups	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
High P/High SE	3	21	1	7	0	0	9	64	1	7	0	0
Low P/Low SE	6	50	4	33	2	17	0	0	0	0	0	0
High P/Low SE	0	0	1	8	1	8	7	54	0	0	4	31
Low P/High SE	5	20	3	12	10	40	5	20	0	0	2	8

The largest discrepancy in responses to this question was from students in the High P/Low SE and Low P/High SE groups. A larger percentage (62%) of students in the High P/Low SE group perceive their mother having negative feelings towards mathematics. Comments in this category included "she doesn't like math," "she's not good at math," "she did not get good grades in school," "she doesn't understand math the way we're learning it." On the flip side, a larger percentage (64%) of students in the Low P/High SE group perceive that their mother has a positive attitude towards mathematics. Comments made here included "she likes it," "she's really good at it," "she knows it's important," "she wants me to be smart in math," "if she doesn't understand something she tries really hard to get it." It appears that the students' perception of their mother's feelings coincide with their own positive or negative feelings of mathematics.

The responses from this question show differences in students' perceptions of their parents' feelings about mathematics. While the Low P/Low SE is pretty well split between the three categories (don't know, positive feelings, negative feelings) the

majority of students in the remaining three groups felt their fathers had positive feelings towards mathematics. Some of the comments made in the positive feelings category include, “he uses it every day in his job,” he’s more patient at helping me than my mom,” “he is a total math person,” “he is very supportive and wants me to be smart in math.” There is a difference between students’ perceptions of their mother’s feelings versus their father’s feelings. Students’ perception of their father’s having positive feelings towards mathematics was the most common response in all four groups.

This is one of the only questions where students in the High P/Low SE group aligned closer to students in the High P/High SE group. The majority of students with high performance stated that they prefer to work on mathematics problems alone rather than with a partner or a group. The next highest percentage of students in the High P/Low SE group replied that the choice of working alone or with others depended on if the mathematics was easy or difficult. If the mathematics was easy they preferred to work alone, but when the mathematics was difficult they preferred to work with other people in order to get extra help. A large percentage of students in the Low P/High SE group like to work with other students either in a group and/or partner.

Verbal Persuasion

Encouragement and feedback from teachers, parents, and peers is the third source of influence to a student’s self-efficacy. Positive feedback, encouragement, and praise are crucial to the formation of self-beliefs. This is particularly true in a student’s formative years, when they are not yet capable of assessing their own skills. Studies have also found that parent encouragement and interaction have more influence on a student than

other sources of encouragement (Bleeker & Jacobs, 2004; Midgett et al., 2002). Two interview questions asked about verbal persuasion, the first concerning teacher's verbal encouragement, and the second with parents' verbal encouragement.

- Does you teacher encourage you by telling you how well you do in math? (Verbal)
- Do your parents encourage you by telling you how well you do in math? (Verbal)

Both questions showed differences in responses between the outlier and nonoutlier groups and are displayed and discussed in Tables 11 and 12.

Table 11

Interview Question #15: Does You Teacher Encourage You by Telling You How Well You Do In Math? (Verbal)

	Yes		Kind of, sometimes		No, not really		Don't know	
P/SE groups	*n*	%	*n*	%	*n*	%	*n*	%
High P /High SE	10	71	3	21	1	7	0	0
Low P /Low SE	6	50	5	42	0	0	1	8
High P /Low SE	2	15	6	46	5	38	0	0
Low P /High SE	18	72	5	20	1	4	1	4

Table 12

Interview Question #16: Do Your Parents Encourage You by Telling You How Well You Do In Math? (Verbal)

	Yes		Kind of, sometimes		No, not really	
P/SE groups	*n*	%	*n*	%	*n*	%
High P/High SE	12	86	1	7	1	7
Low P/Low SE	8	67	2	17	2	17
High P/Low SE	6	46	3	23	4	31
Low P/High SE	23	92	2	8	0	0

Interview question 15 asked students if their teacher encourages them by telling them how well they do in mathematics while question 16 asks the same question, replacing teacher with parents. When thinking about whether their teacher encourages them in mathematics the majority of students in the High P/High SE and Low P/High SE groups along with half of the students in the Low P/Low SE group all said, “yes, my teacher encourages me!” This percentage drops to 15% of students in the High P/Low SE group that had a perception of teacher encouragement.

The next interview question asked students if their parents encouraged them by telling them how well they did in math. The results are similar to the previous question, but with even higher percentages in the yes category. The highest yes percentage comes from the Low P/High SE group with 92%. There were no students in this group that said no or not really. While the percentage of students in the High P/Low SE group replied yes, their parents encouraged them was almost half (46%), this group had the highest percentage of students who had the perception that their parents kind of or sometimes encouraged them (23%) or their parents encouraged them very little, or not at all (31%).

Students with low performance/high self-efficacy are the most likely of all students to feel encouraged by both teacher and parents, while students with high performance/low self-efficacy are least likely to feel encouraged. This feeling or lack of feeling of encouragement from teachers and parents may be an influence on the outlier students, especially in the High P/Low SE group.

Physiological States

The final source of influence on self-efficacy is a student’s physiological state,

such as mood, fatigue, anxiety, or stress. Bandura (1997) found that a student's self-efficacy is at its optimum when physiological cues are neither too high nor too low. In general, increasing a student's physical and emotional wellbeing and decreasing negative physiological states strengthen self-efficacy. Strong emotional reactions to school-related tasks can provide either feelings of success or failure to a student. If a student dreads a certain class or teacher, they may relate that negative feeling to a lack of skill in that area. Those feelings will then influence a decrease in that student's self-efficacy. Four interview questions pertained to physiological states with two of the questions' responses showing a difference between outlier and nonoutlier groups (see Table 13).

The majority of students in the High P/High SE group have positive feelings when it is time to start mathematics every day, while the majority of students in the Low P/Low SE group have negative feelings when starting math. This is to be expected and helps to validate the procedures used to identity the groups. Students with high performance and low self-efficacy were almost evenly split between not caring (with

Table 13

Interview Question #1: How Do You Feel When Your Teacher Says It's Time To Start Math? (Physiological)

	Positive (excited, happy, etc.)		Don't care		Bored		Negative (don't want to do it, hate math, scared, nervous, etc.)	
P/SE groups	*n*	%	*n*	%	*n*	%	*n*	%
High P/High SE	11	79	2	14	0	0	1	7
Low P/Low SE	2	17	0	0	1	8	9	75
High P/Low SE	0	0	7	54	0	0	6	46
Low P/High SE	14	56	5	20	0	0	6	24

statements such as, “it’s just another thing to do in school”) and negative feelings. Not one student in this group said they were happy or excited to start math. In this question the students in the High P/Low SE group identify more closely with the Low P/Low SE group. Students in the Low P/High SE group, however, tended to agree more with the High P/High SE group when it comes to feelings about mathematics with 56% of them having positive feelings (see Table 14).

While the majority of students who have low performance and high self-efficacy answered yes (some responses in this group were “yes, very smart”), the majority of students with high performance and low self-efficacy were not so sure. Responses in the sometimes/kind of category included, “depends on what math we are doing,” “if it is easy,” “only when I get the right answer.”

Summary

Through this explanatory mixed methods design, the researcher used quantitative data in Phase I to identify outlier cases. These outlier cases were students who did not fit the typical mathematics performance/self-efficacy tendency. Phase II incorporated

Table 14

Interview Question #12: Do you feel smart when you are doing math? (Physiological)

	Yes		Kind of, sometimes		No	
P/SE groups	*n*	%	*n*	%	*n*	%
High P/High SE	11	79	2	14	1	7
Low P/Low SE	4	33	4	33	4	33
High P/Low SE	1	8	10	77	2	15
Low P/High SE	17	68	7	28	1	4

qualitative data through student interviews in order to refine, extend, or explain the outlier cases.

Phase I looked to answer RQ1 by using three instruments and teacher ratings to measure students' self-efficacy as well as performance in mathematics. Based on the results, students were assigned ratings of high, average, or low, in performance and self-efficacy. These ratings were then used to place students into four categories: students with high performance/high self-efficacy, low performance/low self-efficacy, high performance/low self-efficacy, and low performance/high self-efficacy. This study focused on students with high performance/low self-efficacy and low performance/high self-efficacy; therefore any students with a rating of average were disregarded.

In Phase II, the students in these categories were interviewed in order to answer RQ2 and RQ3. The responses from each student were recorded and categories were formed. All of the responses from the 64 interviews were then categorized and displayed in a table showing the percentages from each group across each category. The interview questions were then organized and analyzed according to Bandura's (1995) sources of self-efficacy: mastery experiences, vicarious experiences, verbal persuasion, and physiological states.

Chapter V will discuss the implications for practitioners and researchers, the contribution of the research to instructional theory, constraints and limitations, and recommendations for further research.

CHAPTER V

DISCUSSION

Chapter IV presented both quantitative and qualitative data results in order to identify outlier students and then identify factors that distinguish them from students whose achievement and self-efficacy are positively correlated. Using constant comparative method, common responses were categorized using Bandura's (1995) four sources of self-efficacy. The responses were then coded dependent upon the factors and the frequency for each response was calculated for each of the four groups of students interviewed. The interview questions that showed differences between the outlier groups (High P/Low SE and Low P/High SE) and the nonoutlier groups (High P/High SE and Low P/Low SE) were presented and summarized.

The purpose of this chapter is to discuss the findings in relation to educational theory and practice. This chapter is divided into the following sections: a summary of the study, which will restate the problem and purpose; a discussion of the findings as they pertain to the research questions; contribution of the research to instructional theory; implications for classroom practice; constraints and limitations; and recommendations for further research.

Summary of the Study

Previous research has shown that mathematical self-efficacy is positively correlated with mathematical performance level. However, in elementary classroom settings, teachers have noticed students who have high mathematical self-efficacy with

low mathematical performance level. On the other end of the spectrum, there are students who have low mathematical self-efficacy yet, excel in mathematics. Discovering how to identify outliers, and describing factors influencing these two types of students, can aid teachers in helping these students improve their self-efficacy and mathematics performance.

The purpose of this study was to learn more about individual students who are considered outliers based on their mathematics self-efficacy compared to their mathematics performance. The researcher's hope was that by learning more about the individual students; factors among the outliers would emerge, resulting in a theory of what factors are common among students who fall outside of the typical self-efficacy/achievement correlation.

Discussion of Research Questions

Research Question 1

RQ1 asked, "How can practitioners identify students who have a significant difference in mathematics self-efficacy and mathematics performance"? Using the Math and Me Survey, practitioners can first identify student's mathematical self-efficacy. There are many ways that practitioners can know their students' achievement and performance level. This study utilized three data sources to measure the students' performance, a specific mathematical NAEP task, a teacher rating, and the end of year SAGE test score. Using the data from the Math and Me survey combined with the data from the students' performance, practitioners can identify which students have

misaligned self-efficacy and performance.

The criteria used for performance and self-efficacy ratings were based on each data source. A rubric provided from NAEP was used to score the mathematical task. A score of 5 (extended) was rated as high performance while a score of 1 (incorrect) was rated low performance. The teachers in the study used a similar method to rate student's performance during mathematics instruction. A teacher rating of high performance was given when the teacher observed the student having consistent extended understanding and low performance when the student was observed having minimal understanding. The Math and Me Survey responses were averaged and a rating of high self-efficacy was given for a score of 5, and low self-efficacy for a score of 1.

One observation about the participants in this study is how grade level may influence the relationship. Overall there were very few students in fourth grade reporting low self-efficacy on the survey. The number (or percentage) of students in the older two grades who reported low self-efficacy nearly doubled from fourth grade. This research showed a decline of self-efficacy as grade level increased. This is consistent with research that was reported by Pintrich and Schunk (1996). Because of this decline in self-efficacy, there were no fourth-grade students who fell into the outlier group of high performance/low self-efficacy. All of the fourth-grade participants with low self-efficacy also had low performance. It is not until the fifth and sixth grade that students start having low self-efficacy, even when their performance is high.

There may be other contributing factors that affect self-efficacy between students in fourth and fifth grades, including different teaching styles or changes in curriculum.

The teaching styles between fourth and fifth grades may differ in grading policies, expectations, and/or more independent work. These differences in teaching styles may influence student self-efficacy (Pintrich & Schunk, 1996). Mathematics curriculum gets more difficult as students progress through grades, and students may perceive their productive struggle as negative, which may influence a lower self-efficacy. However, even with no fourth-grade students falling into the High P/Low SE group, the percentage of outlier students remains similar between grades and classes with an average of 26% of students categorized in an outlier group.

Other variances of self-efficacy include gender and ethnicity. The data in this study did not show any significant differences in gender which validates previous research which state that the influence of all four sources are the same for the development of both boys' and girls' self-efficacy (Klassen, 2004; Lent et al., 1991; Matsui et al., 1990; Pajares et al. 2007; Stevens et al., 2006). There was not enough diversity among the participants to make any conclusions about variances in ethnicity.

Research Question 2

RQ2 asked, "What factors are common among students who have high mathematics performance and low mathematics self-efficacy"? The interview responses from students in this outlier group (High P/Low SE) showed differences from the nonoutlier groups in all four self-efficacy sources, based on responses from six questions. Some of these differences in responses may point to some factors of the High P/Low SE outlier group.

Mastery experiences. The question relating to mastery experiences that showed a

difference in responses asked, “How do you feel when the mathematics is too easy”? While the Low P/Low SE and the Low P/High SE group had the highest percentage of students feeling happy, confident, and/or smart, not one student in the High P/Low SE reported these feelings. The responses for this group were almost split between having feelings of boredom and just getting through the mathematics quickly. When a student feels mathematics is easy, it should make them feel accomplished and/or successful. According to Bandura (1995), mastery experiences such as these often have the most influence on self-efficacy. However, the students in the High P/Low SE group do not perceive ‘easy math’ as experiences that they are mastering.

There may be other explanations for these students with high performance to feel bored or want to get through the mathematics quickly, such as not feeling challenged or accomplished. However, Bandura (1995) theorized that when students have mastery experiences, which should happen when the mathematics is easy and high performers are getting the correct answers, the student’s self-efficacy should increase. Students in the High P/Low SE group are experiencing these mastery experiences without increasing their self-efficacy to the level of their performance.

Vicarious experiences. Interview question 7 pertained to vicarious experiences and results showed a difference in responses for the High P/Low SE group of outliers. This question asked students how they felt when someone else in the class got done with their mathematics assignment before them. While the majority (46%) of the High P/Low SE group stated that it didn’t bother them if other students finished first, this group was the only group where students mentioned that they felt envious and/or jealous of students

who finished before them. No other groups had students mention these feelings. When students see other students being successful on mathematics tasks it may raise their own self-efficacy. However, students in the High P/Low SE group may see peer's success as negative and feel jealous. These envious or jealous feelings may be an influence on student's self-efficacy in the High P/Low SE group.

Physiological states. The first question relating to students physiological states that showed a noticeable difference in responses was question one, how do you feel when your teacher says it's time to start math? No students in the High P/Low SE group responded with positive feelings. The other three groups all had students who responded with positive feelings towards starting math. The majority of this group mentioned feelings of not caring. They gave responses such as, "math is just another thing I have to do," and "I just want to get it over with." These responses suggest that this group of outlier students may not engage in mathematics lessons.

A large percentage of students (77%) in the High P/Low SE group stated that they only feel smart some of the time while doing math. This response connects back to question five where students were asked how they felt when the mathematics was too easy. Not one student in the High P/Low SE group said they felt smart when the mathematics was easy. The negative feeling of not being smart may play a major role in these students' low self-efficacy.

Bandura (1997) found that a student's self-efficacy is at its optimum when physiological cues are neither too high nor too low. In general, increasing a student's physical and emotional wellbeing, and decreasing negative physiological states,

strengthens self-efficacy. Strong emotional reactions to school-related tasks can provide either feelings of success or failure to a student. If students dread a certain class or teacher, they may relate that negative feeling to a lack of skill in that area. Those feelings will then influence a decrease in that student's self-efficacy. Negative physiological cues may have more influence on self-efficacy as students progress through school structures (Seligman, 1990). The negative responses given in interview questions one and twelve may have an influence on student's self-efficacy.

Verbal persuasion. The final two interview questions aligned with the self-efficacy source of verbal experiences. The questions asked the students if they are encouraged in mathematics by their teacher (question 15) and their parents (question 16). Only 15% of students in the High P/Low SE group believe their teacher encouraged them and 46% believe their parents encouraged them. These are drastically lower than the other groups. Students in the High P/Low SE group also had the highest percentage of students who said no, their teacher and/or parents did not encourage them at all (38% for teacher, 31% for parents).

Positive feedback, encouragement, and praise are crucial to the formation of self-beliefs. This is particularly true in a student's formative years, when they are not yet capable of assessing their own skills. Studies have also found that parent encouragement and interaction have more influence on a student than other sources of encouragement (Bleeker & Jacobs, 2004; Midgett et al., 2002).

Considering all four sources of self-efficacy, the largest difference between the High P/Low SE group and the nonoutlier groups was in verbal persuasion. Students in

this group were either not receiving encouragement or not perceiving that they were receiving it. Teachers and parents can use this information by first giving specific encouragement and also helping their students to positively interpret the encouragement. Verbal persuasion may be the most influential factor of self-efficacy in students with high performance and low self-efficacy.

Students who were categorized into the high performance, low self-efficacy group are likely to receive high scores on mathematics tests, complete difficult mathematics tasks, and perform well during mathematics class. Some factors that arose from the interview responses were mastery (not utilizing mastery experiences when the mathematics is easy, to raise self-efficacy); physiological states (not looking forward to doing mathematics, not feeling smart during mathematics); vicarious experiences (get jealous when other students finish first); and verbal persuasions (don't feel encouraged by teachers, nor parents). This research provided evidence that all four sources of self-efficacy may have influence on outlier students with high mathematics performance and low mathematics self-efficacy.

Research Question 3

RQ3 asked, "What factors are common among students who have low mathematics performance and high mathematics self-efficacy"? The interview responses from students in this outlier group (Low P/High SE) showed very few differences from the nonoutlier groups. The students in the Low P/High SE group aligned closely to the High P/High SE group on some questions and with the Low P/Low SE group on other questions. The discussion on the Low P/High SE group will focus on three sources of

self-efficacy as a result of responses from four interview questions.

Mastery experiences. The interview question for mastery experiences is Question 4, “How do you feel when the mathematics is too hard”? The Low P/High SE group had the highest percentage out of the four groups that stated they just give up when the mathematics is too hard for them. This response is unexpected from students with high self-efficacy. Usher and Pajares, (2008) stated that self-efficacy could help with the persistence and perseverance that students display in the face of difficulties. Therefore, it would be expected that students with high self-efficacy would be less likely to give up when the mathematics is difficult for them. The fact that more students in the Low P/High SE group said they give up may be a factor in their low performance. In the introduction a student, Daniel, was presented. Daniel, similar to other Low P/High SE outlier students, struggled doing mathematics problems, but rarely showed perseverance in completing the problem. He would often give up and provide unreasonable answers without showing any work or thoughts when arriving at the given response. This was different than Marlee, a High P/Low SE outlier student. Marlee would often show a productive struggle, eventually arriving at the correct answer.

Vicarious experiences. The interview question related to vicarious experiences asked students if they prefer to do mathematics with other people (in partners or groups) or by their self. Despite their high self-efficacy, only a few students (20%) in the Low P/High SE group responded that they would prefer to do mathematics on their own. The majority of students in this group said they would rather do mathematics with a partner (20%), a group (12%), or either (40%). The typical response from students in these two

groups was that they liked doing mathematics problems with other people in case they needed help or could help other students with the mathematics.

Students in the Low P/High SE group may be influenced through vicarious experiences of observing others perform tasks. They may use observations to evaluate their own ability to be successful at the same or similar task. Watching a peer succeed at a challenging mathematics problem may convince students that they too can be successful at the same problem. A peer model, with similar characteristics, can be the most influential factor in raising self-efficacy through vicarious experiences (Britner & Pajares, 2006).

Verbal persuasion. As in the previous section, this section will also include discussion on the final two interview questions concerning verbal persuasion through encouragement from teachers and parents. The students in the Low P/High SE group had the highest percentage of students out of the four groups who felt encouragement from both their teachers (72%) and parents (92%). These percentages were even slightly higher than the High P/High SE group.

Students with low performance and high self-efficacy in mathematics tended to agree with students in the High P/High SE group in some areas (feeling smart when doing mathematics), yet agreed with Low P/Low SE group in other areas (prefer doing mathematics with other people). Students in the Low P/High SE group were more likely to be influenced by mastery experiences (give up easier when the mathematics gets hard); vicarious experiences (observing peers being successful at mathematics); and verbal persuasion (feeling encouraged by teachers and parents). This research provided evidence

that three sources of self-efficacy (mastery experiences, vicarious experiences, and verbal persuasion) may have influence on outlier students with low mathematics performance and high mathematics self-efficacy.

Contribution of the Research to Instructional Theory

This study was based on Bandura's Self-Efficacy Theory (Bandura, 1995), which is nested under the social cognitive theory (Bandura, 1986). Social cognitive theory is based on the perspective that people are self-organizing, proactive, self-reflecting, and self-regulating (Bandura, 2001). Social cognitive theory posited that environmental events, personal cognition, and behavior are mutually interacting influences. Nested within this model lies the self-efficacy theory. Where social cognitive theory covers all three areas of environment, cognition, and behavior, self-efficacy theory is concerned primarily with the role of personal cognition.

Humans have a number of unique capabilities that define what it is to be human. The ability to symbolize, plan alternative strategies, learn through vicarious experience, self-regulate, and self-reflect are all abilities that Bandura (1989) classified as personal cognition. Mathematics is one content area where all of these abilities can and should be utilized. Student work from the NAEP task showed that students in the High P/High SE group were the only students who found one strategy and then checked answers by using a different strategy. They were also able to self-reflect at a deeper level by explaining their thought process through their chosen strategies. This study generated evidence from students with high self-efficacy who, according to the self-efficacy theory, would be

demonstrating similarly to the students in the High P/High SE group. However, students in this Low P/High SE group have low performance, and are not demonstrating the same personal cognitive abilities as students with high self-efficacy and high performance.

Bandura believed that the capability of self-reflection is the one that is most "distinctly human" (Bandura, 1986, p. 21). It is through this use of self-reflection that individuals can distinguish between accurate and faulty thinking. The two groups of outliers in this study (high performance/low self-efficacy and low performance/high self-efficacy) both displayed faulty thinking in their self-assessment of doing mathematics. Students in the High P/Low SE group believed they performed poorly in mathematics when in actuality they performed high. Alternatively, students in the Low P/High SE group believed they performed high in mathematics, yet did not. This faulty thinking may stem from a lack of self-reflection. Perhaps these outlier students had not been taught how to self-reflect or choose not to self-reflect.

The results from RQ1 identified students whose self-efficacy did not align with their self-efficacy. Previous research has shown a positive correlation between self-efficacy and student achievement and performance (Bandura, 1997; Fast et al., 2010; Multon et al., 1991; Phan, 2012b; Schweinle & Mims, 2009). This study contributes to this research by providing evidence that there are outlier students who demonstrate high mathematical performance and low mathematical self-efficacy or low mathematical performance and high mathematical self-efficacy. It also suggests a practical method for teachers to identify these outlier students in their classroom.

The data collected to answer RQ2 and RQ3 contributes to research on self-

efficacy by considering Bandura's four sources of self-efficacy and how they may be related to the achievement of outlier students.

Implications for Teachers

It is important for teachers to not only be skilled in content and pedagogy, but also to know their students (Collinson, 1996). The implication of this study for classroom teachers is to know the students, not only their performance level, but also their self-efficacy level. It is important for teachers to recognize when a student's performance and self-efficacy do not align. When a teacher is able to identify outlier students, the teacher is then able to help High P/Low SE students increase their self-efficacy to align with their performance, and Low P/High SE students to increase their performance to match their self-efficacy. It is feasible for classroom teachers, using approximately 30-40 minutes of extra classroom time, to utilize this method of identifying outlier students. Teachers should have access to their students' end of year assessment scores from the previous year. The rating for this data source may differ depending on how the district or state reports and describes scores. Teachers typically gain knowledge of students' performance during mathematics class through observations of the students. Approximately 15-20 minutes of instruction time would be needed to administer each the Math and Me Survey and the NAEP task. The teacher would also need to score and rate each data source based on the criteria described in this study. Although extra time and effort would be required it is the recommendation of the researcher for practitioners to identify students with low performance/high self-efficacy and high self-efficacy/low performance to try to help

them better align their performance and self-efficacy.

As students get older, their self-efficacy may begin to decline (Pintrich & Schunk, 1996). Teachers can be aware of this trend and use strategies given from Siegle and McCoach (2007) to help keep students' self-efficacy high (see Chapter I). Results from interview responses showed that verbal persuasions were a factor for both High P/Low SE and Low P/High SE outlier groups; therefore, two of the strategies from Siegle and McCoach may have more influence on helping the self-efficacy of outlier students. These two strategies were:

- Prompting students who perform poorly to attribute their failures to lack of effort and encouraging them to try harder.
- Drawing students' attention to their growth and complimenting them on their specific skills.

Teachers also have an influence on classroom environment. Even though classroom environment does not seem to fit under a student's physiological state, the environment can affect a student's anxiety and stress. In a positive, caring environment a student can feel safe which will lower anxiety. When the environment is not positive or safe, a student may feel anxiety when entering the classroom. Fast et al. (2010) reported that students who perceived their classroom environment as "caring, challenging, and mastery-oriented" (p. 736) had significantly higher levels of academic self-efficacy than those students in less caring, challenging, and mastery-oriented environments. McMahon, et al. (2009) had similar findings; students who felt they had a positive and supportive classroom environment as well as a sense of belonging in the school had higher self-

efficacy.

A final implication for classroom teachers is in regards to verbal persuasions and ensuring each student receives verbal encouragement. Encouragement should focus on a student's personal growth rather than triumph over others (Schunk, 1983). While focusing on a positive and supportive classroom environment, teachers can provide opportunities for students to learn how to give encouragement to their peers. These opportunities may allow students to develop a better recognition of encouragement (Kamps, Barbetta, Leonard, & Delquadri, 1994). Students in the High P/Low SE outlier group receiving and recognizing verbal encouragement may have an increase in self-efficacy. Teachers can also be aware of personal cognition (the ability to symbolize, plan alternative strategies, learn through vicarious experiences, self-regulation, and self-reflection) and help students develop these abilities as well as provide them opportunities to practice the abilities.

Verbal persuasions in the form of encouragement can also be an implication for parents. Positive feedback, encouragement, and praise are crucial to the formation of self-beliefs. This is particularly true in a student's formative years, when they are not yet capable of assessing their own skills. Studies have found that parent encouragement and interaction have more influence on a student than other sources of encouragement (Bleeker & Jacobs, 2004; Midgett et al., 2002).

Recommendation for Further Research

This study first identified outlier students in the subject of mathematics. A

recommendation for further research is to apply the same idea of performance/self-efficacy to other subjects. The same method of comparing performance and self-efficacy could be used to identify outlier students in other subjects such as science or language arts. The performance level would still be calculated using a performance task, a teacher rating, and the end of year test. Either a different source or changing the Math and Me Survey would be needed to find the student's self-efficacy. Once outlier students were identified in two or even three different content areas any overlapping outlier students from different content areas may give additional insight into factors that are common among the outlier students.

A second recommendation is using different indicators of student performance to test alternatives to the model described in this study. Different indicators could give practitioners a better understanding of students' understanding of mathematics and not just their performance level.

A third recommendation is a longitudinal study utilizing outlier students identified in elementary school age and following them through junior high, high school, and possibly into college or careers. A longitudinal study as described would be able to characterize these outlier students further and also observe if the students always remain outliers, or if their performance and self-efficacy eventually align.

The second purpose of this study used interview responses to establish factors of outlier students. The factors discussed are common among outlier students, not factors that influence students. To more deeply understand these outlier students and find ways to help them these factors need to be examined to see if and how they influence these

students. The self-efficacy source with the largest difference was verbal persuasion. Therefore, questions should be asked about how and what verbal persuasions influence outlier students. For example, does the parents' mathematical content knowledge or level of mathematical anxiety influence students that are outliers in a different way than students who are not outliers (Malony, Ramirez, Gunderson, Levine, & Beilock, 2015)? Do outlier students have a different mindset than nonoutlier students? Perhaps verbal persuasions influence different mindsets differently (Dweck, Walton, & Cohen, 2014). Another factor observed by the researcher, but not noted was that outlier students seemed to have more introvert traits while nonoutlier students seemed to have more extrovert traits during the interviews. This is another question for future research. To learn more about these commonalities among outlier students and how they may also influence these students, it is recommended that more in depth qualitative data be gathered, such as classroom observations, teacher interviews, and home interviews. Data from these sources could include observations on adult/student interactions, frequency of encouragement and or praise given, the teacher's self-efficacy of doing and/or teaching mathematics, and the teacher's and/or parent attitude toward mathematics.

Assumptions and Limitations

One assumption of this study is that the students answered the Math and Me survey questions honestly. Another assumption is that, regardless of the outcomes, variables other than self-efficacy may contribute to the data results. For example, factors such as parents' level of education and socioeconomic status may be related to

experiences and performance in mathematics (Bleeker & Jacobs, 2004). The assumption that these variables have a causal relationship is based on social cognitive theory and previous experimental studies.

A limitation to this study is that the use of surveys may not always yield accurate data. Participants may attempt to portray themselves in either a positive or negative manner. Students at the elementary level may answer the questions how they think the teacher wants them to answer. Finally, because of the the relatively small sample size, and the fact that the study used a convenience sample with descriptive analyses, generalization is not recommended.

A limitation of the data gathering was the amount of time that passed between the quantitative data and the qualitative data. Due to the researcher having to score all of the NAEP tasks and Math and Me surveys, as well as working around field trips and school assemblies, there was a 2-week gap between the task/survey and the interviews. Therefore, when asked about the NAEP task, quite a few of the students did not remember how they felt during the task. This may have limited the themes that arose when looking at specific tasks.

Conclusion

The quantitative data gathered in Phase I was able to answer RQ1 by demonstrating how outlier students can be identified. Practitioners can use data sources such as the Math and Me Survey, assessment scores, performance tasks, to compare students' self-efficacy with their performance level. With the participants in this study the

percentage of outlier students was found to be consistent across the fourth, fifth, and sixth grades. However, the outliers in the youngest grade were all low performance/high self-efficacy. Results supported prior research indicating that the frequency of students with low self-efficacy increases with age. Outlier students in the fifth and sixth grades fell into both outlier groups (High P/Low SE, Low P/High SE). A study with a larger population would be needed to generalize these findings.

Through analyzing student interview responses, factors nested under Bandura's four self-efficacy sources emerged that may influence students with high performance/ low self-efficacy. Bandura's source of physiological state may include feelings of stress, anxiety, or emotional reactions to school-related courses or teachers. Students' emotional feelings towards mathematics may be a factor. Students in this outlier group reported more apathetic feelings of not caring about mathematics. Another factor in physiological states that may influence this group is their feelings when the mathematics is easy for them. Instead of making the students in this group feel smart, easy mathematics makes them bored and they want to finish it quickly. Student responses from the High P/Low SE group indicated that these outlier students don't always feel smart when doing mathematics. The majority of this outlier group had feelings of smartness only some of the time during math. Vicarious experiences through feelings of jealousy towards classmates who finish mathematics assignments quickly may be the next factor. The students in the High P/Low SE group were the only ones who mentioned feelings of envy or jealousy towards other students. The final factor that emerged from the High P/Low SE outlier group is the verbal source of encouragement from teachers and parents. A low

percentage of these students are sensing encouragement from their parents, and an even lower percentage senses it from teachers.

However, the verbal source of encouragement from teachers and parents had the largest difference between the High P/Low SE group and both the other outlier group as well as the nonoutlier groups. The highest percentage of students who do feel encouraged by teachers and parents came from the Low P/High SE group. Even though these students have low performance, encouragement may be a factor influencing their high self-efficacy. It is for this reason that the researcher believes this is the most influencing factor for the students with high performance and low self-efficacy.

The analysis of the responses from the Low P/High SE group provided only factors from two sources different than the nonoutlier groups that may have an influence on them. The first is mastery experiences when the student feels the mathematics is too difficult. It would be expected that students with high self-efficacy would have more persistence and perseverance in solving mathematics problems (Usher & Pajares, 2008). However, the Low P/High SE group had the highest percentage of students stating they give up when the mathematics is difficult for them. Vicarious experiences may be the second factor that influences this group by preferring to do mathematics assignments with other people, rather than working on them by themselves. Students in this group stated that they preferred doing mathematics with a partner or a group in order to receive or give help to peers. Allowing students to work with other students, but also teaching them how to work alone, may help this group of outlier students.

It is recommended that teachers know their students by analyzing both

performance level and self-efficacy level. Teachers can also focus on creating a caring, challenging, and mastery-oriented classroom environment, which may increase students' self-efficacy (Fast et al., 2010). The final implication for classroom teachers is to place an emphasis on verbal encouragement that focus on students' personal growth in mathematics.

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APPENDICES

Appendix A

Interview Questions

Interview Questions

- How do you feel when your teacher says it's time for math? (Physiological)
- How did you feel when you started this math problem? (Physiological)
- Did you feel this math problem was too hard or too easy? (Mastery)
- How do you feel when the math is too hard? (Mastery)
- How do you feel when the math is too easy? (Mastery)
- How do you feel when you get a high score on a math test? (Mastery)
- What do you think when another student gets finished with a math problem before you? (Vicarious)
- Do you always do your math homework? (Mastery)
- Do you ask your parents for help on your homework? (Vicarious)
- How does your mom feel about math? (Vicarious)
- How does your dad feel about math? (Vicarious)
- Do you feel smart when you are doing math? (Physiological)
- Do you like doing math problems with a partner or in a group, or by yourself? (Vicarious)
- Do you like math more when it is in the morning or afternoon? (Physiological)
- Does you teacher encourage you by telling you how well you do in math? (Verbal)
- Do your parents encourage you by telling you how well you do in math? (Verbal)

All questions are based on Bandura's (1995) four sources of self-efficacy.

Appendix B

Permission Letter and Math and Me Survey

Jill Adelson <jill.adelson@louisville.edu> 10/1/12

to me

Dear Jodi,

Congratulations on being at the dissertation stage of your program! You absolutely can use M&Ms. I've attached a copy of it. I assume you have access to articles on its development and psychometric properties. If you have any questions at all, please let me know.

I would love to read your study once it is done.

Sincerely,
Jill

MATH and Me Survey

© Jill L. Adelson, 2006

Please circle ONE response for each question. Be sure to answer ALL the questions. Remember that there are no "right" or "wrong" answers. These are about how *you* feel about math. You do not have to write your name on this survey.

SD = strongly disagree **D** = disagree **N** = neither agree nor disagree
A = agree **SA** = strongly agree

Statement	*How I Feel*				
1. I am really good at math.	SD	D	N	A	SA
2. I love math.	SD	D	N	A	SA
3. I understand math.	SD	D	N	A	SA
4. Math is boring.	SD	D	N	A	SA
5. I can solve difficult math problems.	SD	D	N	A	SA
6. I enjoy doing math puzzles.	SD	D	N	A	SA
7. Math is very hard for me.	SD	D	N	A	SA
8. I do math problems on my own "just for fun."	SD	D	N	A	SA
9. Math is confusing to me.	SD	D	N	A	SA
10. Math is fun.	SD	D	N	A	SA
11. I look forward to learning new math.	SD	D	N	A	SA
12. Math comes easily to me.	SD	D	N	A	SA

SD = strongly disagree **D** = disagree **N** = neither agree nor disagree
A = agree **SA** = strongly agree

Statement	*How I Feel*				
13. I hate math.	SD	D	N	A	SA
14. I enjoy playing math games.	SD	D	N	A	SA
15. I can tell if my answers in math make sense.	SD	D	N	A	SA
16. I enjoy studying math.	SD	D	N	A	SA
17. Doing math is easy for me.	SD	D	N	A	SA
18. Solving math problems is fun.	SD	D	N	A	SA

About you:

- Are you a boy or girl? _____
- Please circle which grade you are in: **3rd** **4th** **5th** **6th**
- Please circle your ethnicity (you may circle more than one)

  Asian or Pacific Islander

  Black

  Hispanic

  Native American or Alaska Native

  White

Thank you for completing the survey!

Appendix C

Informed Consent Form

UtahState University
Department of Teacher Education and Leadership
2805 Old Main Hill
Logan UT 84322-2805
Telephone: (435) 797-0372

INFORMED CONSENT

Self-Efficacy and Mathematics Achievement

Introduction/ Purpose

Graduate student researcher Jodi Mantilla, under the supervision of Dr. Jim Dorward in the Department of Teacher Education and Leadership at Utah State University, is conducting a research study to find out more about students' self-efficacy and how it relates to their mathematical achievement. Your child has been asked to take part because this research seeks to include students at Larsen Elementary in grades 4-6. There will be approximately 170-188 total participants in this research.

Procedures

If you agree to allow your student to be in this research study, your student will take a survey, which will ask them questions about how they feel about their math abilities. This will be compared to their actual achievement in mathematics. The mathematical achievement will come from the student's end of year SAGE test score (from the previous school year), a mathematical problem-solving task, as well as a teacher rating.

After comparing their self –efficacy and achievement, ten to twelve students in each grade will be interviewed. This interview will ask students questions about math, including questions about how they feel during math, how they feel if the math is too difficult or too easy, math homework, if they like working alone or in a group during math, and if they feel encouraged by their teacher or parent in math. You may review the list of questions if you would like before your student is interviewed. The interview will be conducted during the school day and will be videotaped for analysis. The survey and math task will be given on different days and will take about 10 minutes as part of the regular school day instruction. The interviews will also be done during the regular school day instruction, on a one-on-one basis, and will also take about 10 minutes. Jodi Mantilla will be conducting the interviews in an empty classroom at Larsen Elementary.

Risks

There is a small risk of loss of confidentiality but we will take steps to reduce this risk. All student data will be coded with numbers instead of names. The key document linking student names to their assigned number will be password protected and saved in a secure Box online account. Jodi and Dr. Dorward will be the only people with access to this information. Any paper copies of student work as well as the recorded interviews will be stored in a locked drawer in Jodi's office at BYU.

Benefits

This research study will have no direct benefits to the participants. Instead, the data gathered will serve to help classroom teachers identify self-efficacy and use it to help future students in mathematics.

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INFORMED CONSENT
Self-Efficacy and Mathematics Achievement

Explanation & offer to answer questions
Jodi Mantilla, through this form, has explained this research study to you and answered your questions. If you have other questions or research-related problems, you may reach Jodi at (801) 422-4079 or jodi_mantilla@byu.edu. You can reach Dr. Dorward at (435) 797-1471 or Jim.Dorward@usu.edu. A translator is available by contacting Jodi Mantilla.

Voluntary nature of participation and right to withdraw without consequence
Participation in research is entirely voluntary. You may refuse to allow your child to participate or withdraw him or her at any time without consequence or loss of benefits.

Confidentiality
Research records will be kept confidential, consistent with federal and state regulations. Only the student researcher (Jodi) and the principal investigator (Dr. Dorward) will have access to the data which will be kept in a locked file cabinet in Jodi's office at BYU, or on a password protected Box online storage account. To protect your privacy, personal, identifiable information will be removed from study documents and replaced with a study identifier. Identifying information will be stored separately from data. Any personal identifiable information will be deleted or destroyed at the conclusion of the study, but no later than January 2016. Non-personal identifiable information will be stored for the length of 5 years. After the recorded interviews are transcribed and coded with identifier numbers, the recordings will be deleted and destroyed, no later than September 2015.

IRB Approval Statement The Institutional Review Board for the protection of human participants at Utah State University has approved this research study. If you have any questions or concerns about your rights or a research-related injury and would like to contact someone other than the research team, you may contact the IRB Director at (435) 797-0567 or email irb@usu.edu to obtain information or to offer input.

Copy of consent You have been given two copies of this Informed Consent. Please sign both copies and keep one copy for your files.

Investigator Statement "I certify that the research study has been explained to the individual, by me or my research staff, and that the individual understands the nature and purpose, the possible risks and benefits associated with taking part in this research study. Any questions that have been raised have been answered."

UtahState University
Department of Teacher Education and Leadership
2805 Old Main Hill
Logan UT 84322-2805
Telephone: (435) 797-0372

INFORMED CONSENT
Self-Efficacy and Mathematics Achievement

Signature of Researcher(s)

Jim Dorward
Principal Investigator
(435) 797-1471
Jim.Dorward@usu.edu

Joel Mantilla
Student Researcher
(801) 422-4079
joel.mantilla@byu.edu

Signature of Parent/Legal Guardian By signing below, I agree to allow my child to participate.

Parent/Legal Guardian Signature _____ Date _____

Parent/Legal Guardian Printed Name _____ Relationship to Student _____

FERPA Waiver: The Family Educational Rights and Privacy Act (FERPA) of 1974, is a federal law that establishes the rights of students with regard to education records, and ensures students of the right to privacy and confidentiality with respect to those records. By signing below, I agree to allow my student's test scores to be viewed by the student researcher.

Parent/Legal Guardian Signature _____ Date _____

Student Assent: I understand that my parent(s) or guardian(s) are aware of this research study and that they have given permission for me to participate. I understand that it is up to me to participate even if they say yes. If I do not want to be in this study, I do not have to and no one will be upset if I don't want to participate or if I change my mind later and want to stop. I can ask any questions that I have about this study now or later. By signing below, I agree to participate.

Name/Signature _____ Date _____

Appendix D

Letter to Parents

Dear parents of students in 4th – 6th grade,

Many of you may remember me as a 5th grade teacher here at Larsen Elementary. This year I received the opportunity to teach at BYU while finishing up my degree through Utah State University (I root for both blue teams!) I am now at the stage where I am ready to do research for my dissertation and I want to do it at the school I love with the students I miss dearly! I would like to explain my research to you and get your permission to complete this research with your student. Every student who returns the consent form will receive a piece of candy, even if you decline to participate. Please send back the consent form with your signed consent or write a note that states you do not give permission to have your student participate.

My research focuses on students' self-efficacy (or confidence) in their math ability and compares it to their math performance. I will give each student a math problem-solving task, use their math SAGE test score, as well as ask the teacher about the student's performance during math lessons. I will also give each student a survey, which will measure his or her math self-efficacy. From that data I will choose a few students from each class to interview and ask questions about how they feel during math. These interviews will be recorded, but I will be the only person listening to the interviews, they will not be public in any way. If requested I can send you a copy of the survey and/or interview questions.

As you can see in the consent form, I will take steps to protect your child's identity. Each student will be assigned a number and names will be removed from all data. All data will be stored on my personal laptop and will be password protected. All of the research will be done during the school day, but I will make sure that your student does not miss out on class activities, specialists, or recess.

I am so excited to learn more about how students feel during math and I hope that you will consider giving your student permission to participate in this research with me.

Thank you,

Jodi Mantilla
jodi_mantilla@byu.edu
801-422-4079

Appendix E

Institutional Review Board Approval

UtahState University
OFFICE OF RESEARCH AND GRADUATE STUDIES

Institutional Review Board
USU Assurance: FWA#00003308

Expedite #7

Letter of Approval

FROM:

Melanie Domenech Rodriguez, IRB Chair

Nicole Vouvalis, IRB Administrator

Nicole Vouvalis

To:	James Dorward, Jodi Mantilla
Date:	April 28, 2015
Protocol #:	6557
Title:	Identifying Factors That Influence Students Who Do Not Fit The Typical Mathematics Self-Efficacy And Achievement Correlation
Risk:	Minimal risk

Your proposal has been reviewed by the Institutional Review Board and is approved under expedite procedure #7 (based on the Department of Health and Human Services (DHHS) regulations for the protection of human research subjects, 45 CFR Part 46, as amended to include provisions of the Federal Policy for the Protection of Human Subjects, November 9, 1998):

Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.This approval applies only to the proposal currently on file for the period of one year. If your study extends beyond this approval period, you must contact this office to request an annual review of this research. Any change affecting human subjects must be approved by the Board prior to implementation. Injuries or any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Institutional Review Board.

This approval applies only to the proposal currently on file for the period of one year. If your study extends beyond this approval period, you must contact this office to request an annual review of this research. Any change affecting human subjects must be approved by the Board prior to implementation. Injuries or any unanticipated problems involving risk to subjects or to others must be reported immediately to the Chair of the Institutional Review Board.

Prior to involving human subjects, properly executed informed consent must be obtained from each subject or from an authorized representative, and documentation of informed consent must be kept on file for at least three years after the project ends. Each subject must be furnished with a copy of the informed consent document for their personal records.

Appendix F

School District Approval

NEBO SCHOOL DISTRICT
...your partner in education

OFFICE OF ADMINISTRATION
350 SOUTH MAIN STREET □ SPANISH FORK, UTAH 84660
PHONE (801) 354-7400 □ FAX (801) 798-4010

BOARD OF EDUCATION
Randy Boothe
Shannon Acor
R. Dean Rowley
K. L. Tischner
Christine Riley
Kristen Betts
Rick Ainge

SUPERINTENDENT
Rick Nielsen

BUSINESS ADMINISTRATOR
Tracy D Olsen

March 18, 2015

Jodi Mantilla
768 South 180 West
Salem, Utah 84653

Dear Jodi Mantilla:

We received your research proposal, "*Identifying Factors that Influence Students Who Do Not Fit the Typical Mathematics Self-Efficacy and Achievement Correlation*." Nebo School District's Curriculum/Staff Committee has reviewed your proposal and has approved the research/survey to be administered within the District.

Since this authorization is at the District level only, each individual administrator has the option as to whether or not his/her particular school will participate. It is also recommended that a copy of this letter be given to the school's administrator prior to further discussions of research implementation at the school level.

Following committee approval, there should be no changes in methodology or instrumentation unless approved by the Curriculum/Staff Committee. We also remind you of the $100 refundable fee.

Please call me if you have any questions regarding your research in Nebo School District. 801-354-7424

Sincerely,

Everett Kelepolo, Ed.D.
Coordinator of Student Services

Appendix G

Rating Comparison Results

Class 4S				Class 4W		
	Math Performance	Self-Efficacy			Math Performance	Self-Efficacy
4S1	Low	High		4W1	Average	Average
4S2	Average	Average		4W2	High	High
4S3	High	Average		4W3	Low	Low
4S4	Low	Average		4W4	Average	Average
4S5	Average	Average		4W5	High	High
4S6	Low	Average		4W6	High	High
4S7	Low	Low		4W7	Low	High
4S8	Low	Average		4W8	Average	Average
4S9	Average	High		4W9	Low	Low
4S10	Low	Low		4W11	Low	Average
4S11	Low	High		4W12	Low	High
4S12	Low	High		4W13	Low	Low
4S13	High	High		4W14	Average	Average
4S14	Low	High		4W15	High	High
4S15	Low	Low		4W16	Low	High
4S16	Low	Average		4W17	High	High
4S17	Low	Average		4W19	Low	Average
4S18	Low	Low		4W21	Low	Average
4S19	High	Average		4W22	Low	High
4S21	Low	High		4W25	Low	Low
4S22	Low	High		4W26	High	High
4S23	Average	Average		4W27	Low	High
4S24	Low	Average		4W28	High	High
4S25	Low	Average		4W29	Average	Average
4S26	High	High		4W30	Low	High
4S27	Low	Average				
4S28	Low	High				
4S29	High	High				
4S30	Low	Average				

Class 5T				Class 5B		
	Math Performance	Self-Efficacy			Math Performance	Self-Efficacy
5T1	Average	Low		5B1	High	Average
5T2	Average	Average		5B2	Average	Low
5T3	Low	High		5B3	Low	High
5T4	High	High		5B4	Low	Low
5T5	High	Low		5B5	High	Average
5T6	Low	Low		5B6	High	High
5T7	High	Low		5B7	Average	Average
5T8	Average	Average		5B8	Low	Low
5T9	High	High		5B9	High	High
5T10	Low	Low		5B10	Average	Average
5T11	Average	Low		5B11	High	High
5T12	Average	Low		5B12	Low	Average
5T13	Average	Average		5B13	Average	Average
5T14	Average	Average		5B14	Low	High
5T15	High	High		5B15	High	Low
5T16	High	Low		5B17	Low	Average
5T17	Average	Average		5B18	Low	High
5T18	Low	High		5B19	Average	Average
5T19	Low	High		5B20	High	Low
5T20	Average	High		5B21	High	High
5T21	Low	Average		5B22	Average	high
5T22	High	High		5B23	Average	Low
5T23	Average	High		5B24	Low	High
5T24	High	Low		5B25	High	High
5T25	Low	Low		5B26	Average	High

Class 5F		
	Math Performance	Self-Efficacy
5F1	Low	Low
5F2	Low	High
5F3	Low	High
5F4	High	Low
5F5	Average	Average
5F6	Low	High
5F7	Average	Average
5F8	Low	Average
5F9	Low	High
5F10	Low	Average
5F11	Low	Low
5F12	Average	Average
5F13	High	High
5F14	Average	Low
5F15	Low	Low
5F16	Average	Average
5F17	High	Low
5F18	High	Low
5F19	Low	Average
5F20	Low	Low
5F21	Low	Average
5F22	Average	Average
5F23	High	High
5F24	Low	Average

Class 6S				Class 6A		
	Math Performance	Self-Efficacy			Math Performance	Self-Efficacy
6S1	High	Low		6A1	High	High
6S2	Low	Low		6A2	High	Low
6S3	High	High		6A3	Low	Low
6S4	Low	Average		6A4	Average	Average
6S6	Low	Low		6A5	Low	Low
6S7	Low	Low		6A7	High	Average
6S8	Average	Average		6A8	Low	High
6S9	High	High		6A10	High	Low
6S10	Low	Low		6A11	High	High
6S11	Average	Average		6A12	Low	High
6S12	Average	Average		6A13	Low	Low
6S13	Low	High		6A14	Average	High
6S14	Low	High		6A15	High	High
6S15	Average	Average		6A16	Low	Average
6S17	Average	Low		6A17	Average	Average
6S18	Low	Low		6A18	Low	High
6S19	Low	Average		6A19	Average	High
6S20	High	Average		6A21	Average	Average
6S21	High	Low		6A22	Low	High
6S22	Low	High		6A23	Low	Low
6S23	Low	High		6A24	Average	Average
6S24	Low	Average		6A25	Low	Low
6S25	Low	Low		6A26	Average	Average
6S26	Low	Low		6A27	High	Low
6S27	Average	Average				
6S28	High	Average				

Appendix H

Interview Question Results

Table H1

Interview Question #1: How Do You Feel When Your Teacher Says It's Time To Start Math? (Physiological)

P/SE groups	Positive (excited, happy, etc.) (%)	Don't care (%)	Bored (%)	Negative (Don't want to do it, hate math, scared, nervous, etc.) (%)
High P/High SE	79	14	0	7
Low P/Low SE	17	0	8	75
High P/Low SE	0	54	0	46
Low P/High SE	56	20	0	24

Table H2

Interview Question #2: How Did You Feel When You Started This Math Problem? (Physiological)

P/SE groups	Confused	Frustrated, stressed, or nervous	Hard at first, but got easy	Easy	Don't remember
High P/High SE	21	14	21	21	21
Low P/Low SE	33	8	0	0	58
High P/Low SE	31	23	8	8	31
Low P/High SE	32	20	12	12	24

Table H3

Interview Question #3: Did You Feel This Math Problem Was Too Hard Or Too Easy? (Mastery)

P/SE groups	Easy (%)	Hard (%)	Middle (%)	Don't remember (%)
High P/High SE	36	0	50	14
Low P/Low SE	8	25	17	50
High P/Low SE	23	8	46	23
Low P/High SE	12	16	44	28

Table H4

Interview Question #4: How Do You Feel When The Math Is Too Hard? (Mastery)

P/SE groups	Confused (%)	Frustrated, stressed (%)	Bored, unhappy (%)	Just give up (%)	Try harder, ask questions (%)	Don't know (%)
High P/High SE	29	14	7	0	43	7
Low P/Low SE	8	50	8	8	17	8
High P/Low SE	15	38	8	15	15	8
Low P/High SE	4	48	0	20	12	16

Table H5

Interview Question #5: How Do You Feel When The Math Is Too Easy? (Mastery)

P/SE groups	Bored (%)	Want harder math (%)	Happy, confident, smart (%)	Get it done fast (%)	Don't know (%)
High P/High SE	57	29	7	7	0
Low P/Low SE	0	8	75	8	8
High P/Low SE	46	15	0	38	0
Low P/High SE	12	8	64	12	4

Table H6

Interview Question #6: How Do You Feel When You Get A High Score On A Math Test? (Mastery)

P/SE groups	Happy, excited (%)	Proud (%)	Studying paid off (%)	Don't know (%)	Doesn't ever happen (%)
High P /High SE	79	7	14	0	0
Low P /Low SE	75	0	0	8	17
High P /Low SE	92	0	0	8	0
Low P /High SE	88	12	0	0	0

Table H7

Interview Question #7: What Do You Think When Another Student Gets Finished With A Math Problem Before You? (Vicarious)

P/SE groups	Don't Care (%)	Try to hurry (%)	Mad, frustrated, stressed (%)	I'm not smart (%)	Envious, jealous (%)
High P/High SE	79	7	7	7	0
Low P/Low SE	25	17	50	8	0
High P/Low SE	46	15	0	8	31
Low P/High SE	80	0	16	4	0

Table H8

Interview Question #8: Do You Always Do Your Math Homework? (Mastery)

P/SE Groups	Yes (%)	Usually, mostly (%)	Sometimes (%)	No (%)
High P/High SE	79	14	7	0
Low P/Low SE	58	8	25	8
High P/Low SE	69	23	8	0
Low P/High SE	52	20	28	0

Table H9

Interview Question #9: Do You Ask Your Parents For Help On Your Homework? (Vicarious)

P/SE groups	Yes (%)	Usually, mostly (%)	Sometimes (%)	No (%)	NA (%)
High P/High SE	29	0	43	29	0
Low P/Low SE	75	0	17	0	8
High P/Low SE	54	0	31	15	0
Low P/High SE	40	0	40	20	0

Table H10

Additional Information: Who Usually Helps With Your Homework?

P/SE groups	Mom (%)	Dad (%)	Both (%)	Sibling (%)	Other (grandparent, teacher) (%)	NA (%)
High P/High SE	29	21	0	14	0	36
Low P/Low SE	58	8	17	8	0	8
High P/Low SE	23	15	0	8	15	38
Low P/High SE	32	20	8	8	0	32

Table H11

Interview Question #10: How Does Your Mom Feel About Math? (Vicarious)

P/SE groups	Don't know (%)	Positive, likes it, good at it (%)	Negative, not good, doesn't like it (%)	In between (%)
High P/High SE	29	43	29	0
Low P/Low SE	8	42	50	0
High P/Low SE	0	38	62	0
Low P/High SE	16	64	20	0

Table H12

Interview Question #11: How Does Your Dad Feel About Math? (Vicarious)

P/SE groups	Don't know (%)	Positive, likes it, good at it (%)	Negative, not good, doesn't like it (%)	In between (%)
High P/High SE	29	64	7	0
Low P/Low SE	33	33	25	8
High P/Low SE	31	54	15	0
Low P/High SE	28	60	12	0

Table H13

Interview Question #12: Do You Feel Smart When You Are Doing Math? (Physiological)

P/SE groups	Yes (%)	Sometimes, kind of (%)	No (%)
High P/High SE	79	14	7
Low P/Low SE	33	33	33
High P/Low SE	8	77	15
Low P/High SE	68	28	4

Table H14

Interview Question #13: Do You Like Doing Math Problems With A Partner Or In A Group, Or By Yourself? (Vicarious)

P/SE groups	Partner	Group (%)	Partner and/or group (%)	Self (%)	Don't Care (%)	Depends (%)
High P/High SE	21	7	0	64	7	0
Low P/Low SE	50	33	17	0	0	0
High P/Low SE	0	8	8	54	0	31
Low P/High SE	20	12	40	20	0	8

Table H15

Interview Question #14: Do You Like Math More When It Is In The Morning Or Afternoon? (Physiological)

P/SE groups	Morning (%)	Afternoon (%)	Don't care (%)
High P/High SE	64	21	14
Low P/Low SE	42	50	8
High P/Low SE	54	31	15
Low P/High SE	44	44	12

Table H16

Interview Question #15: Does You Teacher Encourage You By Telling You How Well You Do In Math? (Verbal)

P/SE groups	Yes (%)	Kind of, sometimes (%)	No, not really (%)y	Don't know (%)
High P/High SE	71	21	7	0
Low P/Low SE	50	42	0	8
High P/Low SE	15	46	38	0
Low P/High SE	72	20	4	4

Table H17

Interview Question #16: Do You Parents Encourage You By Telling You How Well You Do In Math? (Verbal)

P/SE groups	Yes (%)	Kind of, sometimes (%)	No, not really (%)
High P/High SE	86	7	7
Low P/Low SE	67	17	17
High P/Low SE	46	23	31
Low P/High SE	92	8	0

Appendix I

Interview Transcripts

5T10 – Low P/Low SE

- How do you feel when your teacher says it's time for math?

  I like learning about new stuff but not because I know a lot of stuff

- How did you feel when you started this math problem?

  NA

- Did you feel this math problem was too hard or too easy?

  NA

- How do you feel when the math is too hard?

  Stress because I don't know it and he (the teacher) expects us to know it

- How do you feel when the math is too easy?

  This is so easy so I just pull out a book to read.

- How do you feel when you get a high score on a math test?

  Really excited and happy because I usually don't and my mom gets excited too

- What do you think when another student gets finished with a math problem before you?

  Kind of sad because they can do it a lot faster than me, but I don't really worry because I can take my time

- Do you always do your math homework?

  Kind of…it's hard because my mom is always gone

- Do you ask your parents for help on your homework?
- How does your mom feel about math?

  I'm pretty sure she's good at it

- How does your dad feel about math?

  I don't live with my dad so I don't know

- Do you feel smart when you are doing math?

  Kind of, but I don't feel like I'm one of those smart ones that can get done in like two seconds

- Do you like doing math problems with a partner or in a group?

In a partnership because then we can share our answers and see what we did wrong and they can help me learn it and I can help them learn it.

- Do you like math more when it is in the morning or afternoon?

  Afternoon because in the morning I just woke up and got went to school and I'm still tired.

- Does you teacher encourage you by telling you how well you do in math?

  Yes, because if he (the teacher) says I get a low grade then I want to do better and get a higher grade for when I go to college

- Do your parents tell you that you do well in math?

  Kind of

  Is there anything else about math you want to tell me?

4S22 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Sometimes I feel excited and sometimes I feel kind of nervous. Because I'm not super good at

2. How did you feel when you started this math problem?

   It made me think a lot. It took a while for me to figure out

3. Did you feel this math problem was too hard or too easy?

   It wasn't too hard or too easy…kind of in the middle

4. How do you feel when the math is too hard?

   I don't know

5. How do you feel when the math is too easy?

   Sometimes I get kind of bored

6. How do you feel when you get a high score on a math test?

   Happy

7. What do you think when another student gets finished with a math problem before you?

   Sometimes I'm ok with it, but sometimes if I've been on it for awhile it makes me want to go faster

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Sometimes

   Who do you usually ask?

   Mom or dad

10. How does your mom feel about math?

    She's good at it

11. How does your dad feel about math?

    Math isn't his favorite thing, but he's good at it

12. Do you feel smart when you are doing math?

Yes

13. Do you like doing math problems with a partner or in a group?

    Doing it with groups because then I can help other people and if I struggle I have other people to help me

14. Do you like math more when it is in the morning or afternoon?

    Morning because then I'm not as tired.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

Is there anything else about math you want to tell me?

5B25 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   Excited, I've always loved math

2. How did you feel when you started this math problem?

   It was a little hard and then I figured it out

3. Did you feel this math problem was too hard or too easy?

   In between

4. How do you feel when the math is too hard?

   I feel like this is going to be really hard, but I can figure it out

5. How do you feel when the math is too easy?

   I feel like why is she giving me this really easy math?

6. How do you feel when you get a high score on a math test?

   Really great

7. What do you think when another student gets finished with a math problem before you?

   I feel fine, I am taking my time

8. Do you always do your math homework?

   Yes, but sometimes I get it in late

9. Do you ask your parents for help on your homework?

   Yes

10. How does your mom feel about math?

    She doesn't really love it and she wants to go back and learn it

    If you ask for help on your homework, do you usually ask your mom or your dad?

    Brother

11. How does your dad feel about math?

    I don't really know because he never helps me with my math

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    Sometimes,

    What's a good thing about doing it in the group.

    When I don't really get it, like story problems.

    When would you want to do it on your own?

    When it's just independent practice problems

14. Do you like math more when it is in the morning or afternoon?

    I like it in the morning because I'm more awake for it

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

4W27 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Excited to learn new things

2. How did you feel when you started this math problem?

   Nervous

   Why were you nervous

   Because I thought it was going to change my grade in class

3. Did you feel this math problem was too hard or too easy?

   Too hard

4. How do you feel when the math is too hard?

   Kind of sad to know that I didn't learn that

5. How do you feel when the math is too easy?

   Happy so that I can teach other kids

6. How do you feel when you get a high score on a math test?

   Happy too

7. What do you think when another student gets finished with a math problem before you?

   I wouldn't care because that doesn't mean he's smarter than me…everyone is the same.

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   sometimes

10. How does your mom feel about math?

    She likes it and she's good at it

11. How does your dad feel about math?

    Not so much…he doesn't really tell me anything when I ask him

12. Do you feel smart when you are doing math?

    Nods yes

13. Do you like doing math problems with a partner or in a group?

    In a group so that if they didn't know it and I did I could help them

14. Do you like math more when it is in the morning or afternoon?

    I don't really care.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Kind of

    Is there anything else about math you want to tell me?

6S13 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   I don't feel like I hate it, I just feel like I'm going to learn something

2. How did you feel when you started this math problem?

   I felt confused like I couldn't understand it like I couldn't finish it, but then I got it and I think I did good and got it right.

3. Did you feel this math problem was too hard or too easy?

   I think it was right in the middle

4. How do you feel when the math is too hard?

   It makes me feel weird and then I ask the teacher questions and he answers them.

   So when the math is hard you like to ask questions?

   Yes

5. How do you feel when the math is too easy?

   Makes me feel like I'm too smart

6. How do you feel when you get a high score on a math test?

   It makes me feel awesome like I've gotten better in math

7. What do you think when another student gets finished with a math problem before you?

   It wouldn't make me feel like anything it would just make me feel like they went faster and rushed through it and I took my time.

8. Do you always do your math homework?

   As much as I can

9. Do you ask your parents for help on your homework?

   Yes, always

   Who do you usually ask?

   My mom

10. How does your mom feel about math?

    I think she feels pretty good at it. Some things she doesn't know so I have to teach her so she

can teach me more so she understands it more than me when I teach her things.

Do you think she likes it?

Yes, I think she likes it because she teaches me shortcuts through things, like how to add, subtract and multiply.

11. How does your dad feel about math?

    Probably half way there. He doesn't really feel that good in math, but he feels really good about other subjects like science.

12. Do you feel smart when you are doing math?

    Yes, once I get it and it starts getting easy then I feel smart.

13. Do you like doing math problems with a partner or in a group?

    I like to do it with partners or groups because I like either having them help me understand it or me help them understand it.

14. Do you like math more when it is in the morning or afternoon?

    Probably the morning, because then I get more tired and I'll get more energized during math

15. Does you teacher encourage you by telling you how well you do in math?

    Um…ya, yes he does. When we get answers right and we're doing good he has us stand up and everyone claps for us and it feels good.

16. Do your parents tell you that you do well in math?

    Yes, I come home with math tests and tell them I have like 95% and they say, "you're so smart, you did so good!"

    Is there anything else about math you want to tell me?

5B20 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   Kind of happy, kind of not.

   Why does it make you happy?

   Because I get to learn something new

   Why does it make you not happy?

   Because I kind of don't like math, but I kind of do.

2. How did you feel when you started this math problem?

   Kind of frustrated.

3. Did you feel this math problem was too hard or too easy?

   In the middle

4. How do you feel when the math is too hard?

   Really frustrated like I'm not understanding it at all

5. How do you feel when the math is too easy?

   This is too easy, why don't we do something harder

6. How do you feel when you get a high score on a math test?

   Happy

7. What do you think when another student gets finished with a math problem before you?

   Kind of lower

   What do you mean by lower?

   Like not as good as them

8. Do you always do your math homework?

   Mostly

9. Do you ask your parents for help on your homework?

   Yes

10. How does your mom feel about math?

    I think she thinks she's not really good at it because she can't do a lot of it in her head

If you ask for help on your homework, do you usually ask your mom or your dad?

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

    sometimes

13. Do you like doing math problems with a partner or in a group?

    No, I usually like doing it by myself

14. Do you like math more when it is in the morning or afternoon?

    Morning, just because I can think better about it

15. Does you teacher encourage you by telling you how well you do in math?

    sometimes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

6S1 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   Well sometimes I'm not like I hate math, this is the worst thing ever like other kids…I'm like ok whatever, I don't really care.

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   Gets me a little frustrated and if I can't figure it out then I look examples in the book or on the board and that usually helps and if I still can't figure it out then I will ask a friend who understands it.

5. How do you feel when the math is too easy?

I'm usually flying through it but sometimes I make simple mistakes because I'm going so fast

6. How do you feel when you get a high score on a math test?

   I feel pretty good. One time on our homework there was a problem that I didn't understand and it made me get like a 10 but then I worked through the example and I figured it out and I got like an 88.

   How did that make you feel?

   Pretty good

7. What do you think when another student gets finished with a math problem before you?

   Doesn't make me feel bad because usually when you finish first you are flying through it and you're not really getting it and usually when you finish first your problems are mostly wrong.

8. Do you always do your math homework?

   Sometimes I forget, but I usually do it.

9. Do you ask your parents for help on your homework?

   It's usually (sister)

10. How does your mom feel about math?

    I don't really know…usually she understands it but not all the time because she didn't finish high school.

11. How does your dad feel about math?

    My dad he's okay with it, he only had two years to finish high school, but then he dropped out.

    Do you think they use it at all in their job?

    My dad does insulation and construction so he measures a lot.

12. Do you feel smart when you are doing math?

    I feel just a little bit over average. There are some things that I understand, but there are other things I don't understand

13. Do you like doing math problems with a partner or in a group?

    It depends on who is in the partner or the group and what type of problems we are working on. I usually like to work by myself because when I have to work in a group they usually make all the smarter ones do all the work and they just copy it.

14. Do you like math more when it is in the morning or afternoon?

    Afternoon, because in the morning I can't really concentrate because I'm still tired or I didn't eat enough breakfast

15. Does you teacher encourage you by telling you how well you do in math?

    Ya, I guess

16. Do your parents tell you that you do well in math?

    (Nods yes)

    Is there anything else about math you want to tell me?

6S1 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   I'd say very…not…having lots of fun because I hate it as much as…actually most of my family hates it. There are only two people in my family that like math, my parents.

2. How did you feel when you started this math problem?

   I felt confused because I didn't feel like I had enough information

3. Did you feel this math problem was too hard or too easy?

   About in the middle because it was pretty hard, but I solved the first part pretty easily

4. How do you feel when the math is too hard?

   Confused

5. How do you feel when the math is too easy?

   Like I can get it done in 30 seconds or less.

   Are you bored, or happy that's easy?

   I'm happy that its easy, but then when I finish I'm like, what do I do next, you didn't say anything to do afterwards so I guess I'll just read a book.

6. How do you feel when you get a high score on a math test?

   Amazed and wanting to do better if I can

7. What do you think when another student gets finished with a math problem before you?

   I wouldn't be very disappointed because my dad says once you finish a test in college you can leave so I would say if he finished first he probably didn't check his work like I did.

8. Do you always do your math homework?

   Sometimes, I'd say about ¾ of the time

9. Do you ask your parents for help on your homework?

   Almost always

   Who do you usually ask?

   My grandpa…they also live with my family. He doesn't like math, but he's willing to help. Actually sometimes my grandma if grandpa isn't back from work.

10. How does your mom feel about math?

    She uses math in the job she has so I guess she likes it or else she would have figured a different job

11. How does your dad feel about math?

    He doesn't use it that often in his work, but he does like math a lot. He says it was his first favorite subject because he would always get straight A's.

12. Do you feel smart when you are doing math?

    Sometimes, but other times I just feel bored.

13. Do you like doing math problems with a partner or in a group?

    It depends on how big the group is and how many people in the group are good at math. If it's not a good group than I'd rather do it on my own.

14. Do you like math more when it is in the morning or afternoon?

    Morning, because then I don't really have to listen because I'm way too tired.

15. Does you teacher encourage you by telling you how well you do in math?

    He hasn't told anyone how well they do in math so I guess I can't really answer that question.

16. Do your parents tell you that you do well in math?

    They do when I get questions right and they are like all good.

    Is there anything else about math you want to tell me?

4W2 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   Kind of excited, kind of bored.

2. How did you feel when you started this math problem?

   I don't know. This is going to be easy.

3. Did you feel this math problem was too hard or too easy?

   Easy

4. How do you feel when the math is too hard?

   Confused

5. How do you feel when the math is too easy?

   I don't know. I kind of feel a little bit bored.

6. How do you feel when you get a high score on a math test?

   Happy

7. What do you think when another student gets finished with a math problem before you?

   I don't really care

8. Do you always do your math homework?

   Ya

9. Do you ask your parents for help on your homework?

   Sometimes

10. How does your mom feel about math?

    I don't know.

    If you ask for help on your homework, do you usually ask your mom or your dad?

    Mom

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

    Sometimes

When would be an example of when you feel smart?

I don't know

Is there any times you don't feel smart?

I don't know

13. Do you like doing math problems with a partner or in a group?

    Not really in a group. By myself.

14. Do you like math more when it is in the morning or afternoon?

    Morning

    Is there a reason for that?

    I don't know

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

    A lot or a little bit?

    A little bit

16. Do your parents tell you that you do well in math?

    Kind of

5F9 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Kind of mad but happy

   Why would you feel mad?

   Because sometimes it's boring

   Okay, why would you feel happy?

   Because I can get it done fast

2. How did you feel when you started this math problem?

   Kind of confusing but then when I started to focus and then I started to get it

3. Did you feel this math problem was too hard or too easy?

   Middle

4. How do you feel when the math is too hard?

   Frustrated and happy. I'd be frustrated when I start it but happy when I finish.

5. How do you feel when the math is too easy?

   Happy because I already know it

6. How do you feel when you get a high score on a math test?

   Happy and then I show it to my mom

7. What do you think when another student gets finished with a math problem before you?

   I don't really care, they're just a little bit better at it than me

8. Do you always do your math homework?

   Sometimes

9. Do you ask your parents for help on your homework?

   Sometimes when it's difficult

   Who do you usually ask?

   My mom or my sisters

10. How does your mom feel about math?

    When she was a kid she didn't like math

11. How does your dad feel about math?

    He likes it

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    It depends on my mood. Most of the time I like to be with a partner so we can check answers to see if we are right

14. Do you like math more when it is in the morning or afternoon?

    Afternoon so I can get all of my energy out.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

5F2 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Happy because I like math

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   I don't really know, that mostly never happens

5. How do you feel when the math is too easy?

   Feels like I should get 6th grade math

6. How do you feel when you get a high score on a math test?

   happy

7. What do you think when another student gets finished with a math problem before you?

   I don't really care

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   No

   Who do you usually ask?

10. How does your mom feel about math?

    She always asks me math questions so I don't think she's good at it

11. How does your dad feel about math?

    I don't know…he doesn't live with us

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

I like to do both, depends on what type of problems

14. Do you like math more when it is in the morning or afternoon?

Morning, to get it over with

15. Does you teacher encourage you by telling you how well you do in math?

I don't really know

16. Do your parents tell you that you do well in math?

Yes

Is there anything else about math you want to tell me?

5T18 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   I feel excited to learn new things

2. How did you feel when you started this math problem?

   It was easy

3. Did you feel this math problem was too hard or too easy?

   Too easy

4. How do you feel when the math is too hard?

   Sometimes it feels overwhelming and I just try to work it out and he helps us.

5. How do you feel when the math is too easy?

   Like we need to learn something harder

6. How do you feel when you get a high score on a math test?

   I feel excited and my mom puts it on the fridge

7. What do you think when another student gets finished with a math problem before you?

   Like they didn't think through the problems and they might have just guessed.

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   No

   Who do you usually ask?

10. How does your mom feel about math?

    She likes it because she kind of has a job in math.

11. How does your dad feel about math?

    Same as my mom

12. Do you feel smart when you are doing math?

    (nods yes)

13. Do you like doing math problems with a partner or in a group?

By myself…I like doing it by myself because I can do it in different ways and get it done faster

14. Do you like math more when it is in the morning or afternoon?

    Morning because it's earlier

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

Is there anything else about math you want to tell me?

6A10 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   I feel like punching him in the face because he teaches math horribly.

   So what about in 5th grade?

   It's just boring, like every 6 months we'll do something fun.

   But most of the time math is boring?

   Yes, like he'll just go on and on and repeat everything we've learned like 5 times and I'm just waiting to go on

2. How did you feel when you started this math problem?

   Like it was super easy and I could have done it in like 2 minutes

3. Did you feel this math problem was too hard or too easy?

   Easy

4. How do you feel when the math is too hard?

   Just confused because I usually understand so I just grab a friend and ask them to help me!

5. How do you feel when the math is too easy?

   Bored

6. How do you feel when you get a high score on a math test?

   Fantastic

7. What do you think when another student gets finished with a math problem before you?

   Envious that I don't have their skills

8. Do you always do your math homework?

   Always

9. Do you ask your parents for help on your homework?

   No, because I'm never at my dad's house and my mom doesn't know anything above second grade math

10. How does your mom feel about math?

    She likes it, she wants me to know it…but no one's like go into a field of being a

mathematician

11. How does your dad feel about math?

    He's like really intense about it…like if you don't know even one little part of it he gets frustrated

12. Do you feel smart when you are doing math?

    Most of the time, unless I don't understand the problem and then I wonder what's wrong with me.

13. Do you like doing math problems with a partner or in a group?

    I'd rather do it on my own because I don't like being with people who don't even know what 2+2 is.

14. Do you like math more when it is in the morning or afternoon?

    Early morning so we can get it over with and I don't have to look forward to it all day

15. Does you teacher encourage you by telling you how well you do in math?

    No

16. Do your parents tell you that you do well in math?

    No

    Is there anything else about math you want to tell me?

5T6 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   Bored

2. How did you feel when you started this math problem?

   Confused

3. Did you feel this math problem was too hard or too easy?

   Kind of easy

4. How do you feel when the math is too hard?

   Bored

5. How do you feel when the math is too easy?

   I just get it all done

6. How do you feel when you get a high score on a math test?

   Awesome

7. What do you think when another student gets finished with a math problem before you?

   Worried

   Why worried?

   Because if it's a timed test and everyone gets done then I get worried.

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   They kind of help me

   Who do you usually ask?

   Mom because my dad always works

10. How does your mom feel about math?

    For me?

    Well, for her, do you think she likes it?

    Ya, kind of

11. How does your dad feel about math?

    He likes it, he's a therapist

12. Do you feel smart when you are doing math?

    Yes, Kind of

13. Do you like doing math problems with a partner or in a group?

    In a partnership because I like being with friends

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because I don't have to do it in the morning

15. Does you teacher encourage you by telling you how well you do in math?

    Kind of

16. Do your parents tell you that you do well in math?

    Nods yes

    Is there anything else about math you want to tell me?

5F20 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   Sometimes I just don't want to do math and sometimes I want to do it if I know she (the teacher) has something fun planned

   So if you know ahead of time it will be fun then you are excited?

   Yes

   Do you usually like math?

   No not really, but I'm good at it. My mom says I'm good at it.

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   Well I don't want to give up because if I give up I'll never get it so I just raise my hand and ask Miss (teacher) for help and sometimes when she helps me I get it and sometimes I don't

5. How do you feel when the math is too easy?

   Like I can help everybody

6. How do you feel when you get a high score on a math test?

   NA

7. What do you think when another student gets finished with a math problem before you?

   Rushed

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   My mom

10. How does your mom feel about math?

    Annoyed…she doesn't like helping me with math. We learn it differently so I don't really know

11. How does your dad feel about math?

    He's a genius

12. Do you feel smart when you are doing math?

    Not always…If I don't get the problem then I don't feel smart

13. Do you like doing math problems with a partner or in a group?

    Some math problems are easier by myself but some math problems I like getting help from others

14. Do you like math more when it is in the morning or afternoon?

    Morning so I can get it over with

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

4W12 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   I feel good.

   Do you like math?

   Yes

   Is it one of your favorite subjects?

   Yes

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

NA

4. How do you feel when the math is too hard?

   I just feel like my mind is blank and I can't think

5. How do you feel when the math is too easy?

   Yay, I can do this fast

6. How do you feel when you get a high score on a math test?

   Really good

   Do you get a lot of high scores on your math tests?

   Yes, I do

7. What do you think when another student gets finished with a math problem before you?

   So what, they finished their math first and they hurried through it and they might have gotten some wrong.

8. Do you always do your math homework?

   Usually

9. Do you ask your parents for help on your homework?

   No, I don't

10. How does your mom feel about math?

    She's pretty good at it…

11. How does your dad feel about math?

    He's pretty good at it too

12. Do you feel smart when you are doing math?

    Yes, I do

13. Do you like doing math problems with a partner or in a group?

    I like doing it both ways

    Why would you want to it with other people?

    Because it helps me think better because I'm not that good with division.

14. Do you like math more when it is in the morning or afternoon?

Both, I don't care

15. Does you teacher encourage you by telling you how well you do in math?

She does

16. Do your parents tell you that you do well in math?

Yes

Is there anything else about math you want to tell me?

5F18 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   I don't know…really just more stuff to do

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   Sometimes like, I really don't understand this like the teacher should be more thorough when explaining it

5. How do you feel when the math is too easy?

   Just go through it fast and see if anyone else needs help

6. How do you feel when you get a high score on a math test?

   Pretty happy

7. What do you think when another student gets finished with a math problem before you?

   I don't really care if they get done before me, I'm not really competitive

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Sometimes

   Who do you usually ask?

   My dad

10. How does your mom feel about math?

    I don't know…she doesn't understand a lot of math in English, but sometimes she can help me

11. How does your dad feel about math?

    He knows a lot about math…sometimes he teaches me things that the teachers teach me later

12. Do you feel smart when you are doing math?

    Sometimes, unless it's really hard

13. Do you like doing math problems with a partner or in a group?

    Either a partner or group because then we can all come up with ideas then check our answer with each other

14. Do you like math more when it is in the morning or afternoon?

    Afternoon. In the morning I'm more tired and when I'm tired I yawn.

15. Does you teacher encourage you by telling you how well you do in math?

    I don't really know, I don't think so really

16. Do your parents tell you that you do well in math?

    Sometimes

    Is there anything else about math you want to tell me?

6S3 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   Kinda happy…I kind of like math

2. How did you feel when you started this math problem?

   I started that problem like, "wait, what is this" but then I got it.

   So maybe a little bit confused at first?

   Ya, a little bit

3. Did you feel this math problem was too hard or too easy?

   I thought it was too easy

4. How do you feel when the math is too hard?

   I get really confused because I get a part, but then another part I don't get overrules the part that I do get and I get confused.

5. How do you feel when the math is too easy?

   Just like…really? Can we go on? We've already done this like 9 billion times.

6. How do you feel when you get a high score on a math test?

   Really happy

7. What do you think when another student gets finished with a math problem before you?

   It just kind of reminds me to hurry up a little bit, I might be going a bit too slow

8. Do you always do your math homework?

   Yes, I pretty much always do

9. Do you ask your parents for help on your homework?

   Not really, maybe once or twice

10. How does your mom feel about math?

    I think she knows it's important because we do math every single day in our life. She was a teacher so I think she knows it's important. It's not her favorite thing though.

11. How does your dad feel about math?

    I think he wants me to be smart and be good so he tries to make it so I know that math is

good for me.

12. Do you feel smart when you are doing math?

    Yes, I feel very smart

13. Do you like doing math problems with a partner or in a group?

    Alone

    Why's that?

    Because when I'm with a partner I'm usually the only doing it so it's like I'm doing it alone, but someone else is getting my answers. Only once or twice does the partner ever help.

14. Do you like math more when it is in the morning or afternoon?

    I like it in the morning, just get it done

15. Does you teacher encourage you by telling you how well you do in math?

    Kind of, kind of not

16. Do your parents tell you that you do well in math?

    Yes, when I show them a math test they are like, "good job!" and sometimes they put it on the fridge.

    Is there anything else about math you want to tell me?

5F3 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   I feel kind of excited.

   Do you like math?

   Yes

2. How did you feel when you started this math problem?

   A little nervous because it was kind of challenging

3. Did you feel this math problem was too hard or too easy?

   In the middle

4. How do you feel when the math is too hard?

   Kind of stressed

5. How do you feel when the math is too easy?

   Calm, just calm and relaxed

6. How do you feel when you get a high score on a math test?

   Excited, I feel really excited

7. What do you think when another student gets finished with a math problem before you?

   I don't really know…I just take my time, I don't really care

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Sometimes

   Who do you usually ask?

   My dad because he knows most of the stuff that we are learning

10. How does your mom feel about math?

    She likes it, but she's not really good at it

11. How does your dad feel about math?

    He is really good at it and he really likes it

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    I would rather do it with a group because they will help me read through the question and help me solve it

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because my brain is all running

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

4W5 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   Depends on what subject we are learning. If it's a fun one like geometry or if it's a boring one like multiplication.

   What if it was geometry, how would you feel?

   A tiny bit excited I guess.

   What if it was multiplication?

   Uh, ok…what's the next subject…

2. How did you feel when you started this math problem?

   It was a little confusing because I read it wrong, but then I was like "oh, it means that" then I think I got it right.

3. Did you feel this math problem was too hard or too easy?

   Kind of in the middle.

4. How do you feel when the math is too hard?

   Um…

   Does that ever happen?

   Sometimes

   How does that make you feel?

   Kind of like, where did this math come from, mars or pluto?

   So would you say it's confusing?

   Ya, pretty much

5. How do you feel when the math is too easy?

   Like 3 minutes after she's done talking I'm done

6. How do you feel when you get a high score on a math test?

   Happy, then I won't have to go to summer school

7. What do you think when another student gets finished with a math problem before you?

   I would be frustrated

8. Do you always do your math homework?

   Ya, unless I'm not here

9. Do you ask your parents for help on your homework?

   No

10. How does your mom feel about math?

    My dad is better at math than my mom

    If you ask for help on your homework, do you usually ask your mom or your dad?

    Dad

11. How does your dad feel about math?

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    Not usually because, not to brag or anything, but I'm one of the smarter kids I guess, and then they're always like, I know the answer is this answer. So I usually don't like doing it with other people, but other people like it.

14. Do you like math more when it is in the morning or afternoon?

    Usually in the morning, if she puts all the fun stuff in the morning then by the time she gets to math in the afternoon then everyone is all crazy.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

5F4 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   I'm usually kind of bummed because my day is going pretty well and then we have to do math.

   So do you like math?

   No

   Would you say it's one of your least favorite subjects?

   Yes

   Why do you think it's one of your least favorite subjects?

   It's just confusing most of the time and it's hard to do

2. How did you feel when you started this math problem?

   Very confusing

3. Did you feel this math problem was too hard or too easy?

   Too hard

4. How do you feel when the math is too hard?

   Makes me shut down because I know I can't do it…so I just put my head down and know I can't do it

5. How do you feel when the math is too easy?

   I just get it done really fast

6. How do you feel when you get a high score on a math test?

   Happy

   Do you usually get high scores?

   Yes

7. What do you think when another student gets finished with a math problem before you?

   It's fine unless there's a lot of people getting done and I'm one of the last ones finished…then I feel discouraged.

8. Do you always do your math homework?

Yes

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   My mom

10. How does your mom feel about math?

    She forgets about stuff and we have the new program we are doing so she doesn't really understand it.

    Do you think she likes it?

    I don't think she likes it but she knows it's good for later on in life

11. How does your dad feel about math?

    My dad's really good at math so I think he likes it

12. Do you feel smart when you are doing math?

    Sometimes, it depends on the problem.

13. Do you like doing math problems with a partner or in a group?

    On my own because if your partner isn't really caught up…you don't usually choose someone on the same level as you, you choose your friend and if your friend isn't caught up it's just easier to do it on your own.

14. Do you like math more when it is in the morning or afternoon?

    Morning because I just woke up and I'm refreshed and ready to start the day so it's just easier.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

5B15 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   Kind of happy, kind of not.

   Why does it make you happy?

   Because I get to learn something new

   Why does it make you not happy?

   Because I kind of don't like math, but I kind of do.

2. How did you feel when you started this math problem?

   Kind of frustrated.

3. Did you feel this math problem was too hard or too easy?

   In the middle

4. How do you feel when the math is too hard?

   Really frustrated like I'm not understanding it at all

5. How do you feel when the math is too easy?

   This is too easy, why don't we do something harder

6. How do you feel when you get a high score on a math test?

   Happy

7. What do you think when another student gets finished with a math problem before you?

   Kind of lower

   What do you mean by lower?

   Like not as good as them

8. Do you always do your math homework?

   Mostly

9. Do you ask your parents for help on your homework?

   Yes

10. How does your mom feel about math?

    I think she thinks she's not really good at it because she can't do a lot of it in her head

If you ask for help on your homework, do you usually ask your mom or your dad?

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

    Sometimes

13. Do you like doing math problems with a partner or in a group?

    No, I usually like doing it by myself

14. Do you like math more when it is in the morning or afternoon?

    Morning, just because I can think better about it

15. Does you teacher encourage you by telling you how well you do in math?

    Sometimes

16. Do your parents tell you that you do well in math?

    Yes

Is there anything else about math you want to tell me?

5F13 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   Sometimes I feel really happy and sometimes I feel bored

2. How did you feel when you started this math problem?

   At first a little frustrated, but then when I got it I didn't feel frustrated

3. Did you feel this math problem was too hard or too easy?

   Middle

4. How do you feel when the math is too hard?

   Sometimes I feel frustrated and sometimes I just go along with it

5. How do you feel when the math is too easy?

   Like I need to do something harder

6. How do you feel when you get a high score on a math test?

   Really really happy

7. What do you think when another student gets finished with a math problem before you?

   I don't really care

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Sometimes when I need help

   Who do you usually ask?

   Mom

10. How does your mom feel about math?

    She doesn't understand how we do it

11. How does your dad feel about math?

    I'm not sure

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    With a partner, because if you don't understand it and they understand it a little bit more than you can get a little bit more understanding from them

14. Do you like math more when it is in the morning or afternoon?

    Morning because I'm awake and ready to learn

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

5B4 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   Kind of sad or like annoyed

   Why sad or annoyed

   Because sometimes math is really hard or boring

2. How did you feel when you started this math problem?

   Kind of frustrated because it was really hard

3. Did you feel this math problem was too hard or too easy?

   Hard

4. How do you feel when the math is too hard?

   Kind of frustrated and that's pretty much it

5. How do you feel when the math is too easy?

   It's awesome because I can just get it done

6. How do you feel when you get a high score on a math test?

   happy

7. What do you think when another student gets finished with a math problem before you?

   Kind of sad I guess

8. Do you always do your math homework?

   Yes, I try to every day

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   My mom

10. How does your mom feel about math?

    Really, really, really, really, good.

    So she loves it and she's really good at it?

    Yes

11. How does your dad feel about math?

    In between I guess

12. Do you feel smart when you are doing math?

    Sort of yes

13. Do you like doing math problems with a partner or in a group?

    In a partner or group

    Why's that?

    Because in a partner or a group you can check your answers and go over stuff that you don't understand.

14. Do you like math more when it is in the morning or afternoon?

    Morning because in the afternoon you have recess and stuff and then you remember that you have to go in and do math and in the morning it seems to go by faster and in the afternoon it drags on.

15. Does you teacher encourage you by telling you how well you do in math?

    I don't really know

16. Do your parents tell you that you do well in math?

    Not really

    Is there anything else about math you want to tell me?

6A15 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   I don't really care

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   It seemed a little easy

4. How do you feel when the math is too hard?

   I don't know

5. How do you feel when the math is too easy?

   It's really boring

6. How do you feel when you get a high score on a math test?

   Excited

7. What do you think when another student gets finished with a math problem before you?

   I don't care

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Sometimes

   Who do you usually ask?

   My mom

10. How does your mom feel about math?

    Some of the stuff she has no idea what it even is. So I'll ask her about things and she doesn't know about it.

11. How does your dad feel about math?

    He's not home when I do math

12. Do you feel smart when you are doing math?

No

How do you feel when you're doing math?

Normal

13. Do you like doing math problems with a partner or in a group?

Probably by myself

Why's that?

Because there are a lot of people who are annoying.

So you don't want to do math with annoying people?

Yes

14. Do you like math more when it is in the morning or afternoon?

I've never been able to tell a difference

15. Does you teacher encourage you by telling you how well you do in math?

No

16. Do your parents tell you that you do well in math?

Yes

Is there anything else about math you want to tell me?

6A27 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   Not Happy

   Why?

   Because I don't like math

2. How did you feel when you started this math problem?

   Very confused

3. Did you feel this math problem was too hard or too easy?

   I think it wasn't too easy or too hard, kind of in the middle

4. How do you feel when the math is too hard?

   Kind of frustrating and sometimes I want to try to understand it more so I can do my homework and stuff.

5. How do you feel when the math is too easy?

   Really really bored because then you have to listen to Mr. (teacher) lecture about it for hours when I already know it.

6. How do you feel when you get a high score on a math test?

   Happy, like my work had finally paid off

7. What do you think when another student gets finished with a math problem before you?

   Amazed that they could do it so fast

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Yes, but not too much

10. How does your mom feel about math?

    She really loves it

    Do you think she's good at it?

    Yes

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

    Sometimes

13. Do you like doing math problems with a partner or in a group?

    It depends on who I'm with. If the person isn't as good and it's frustrating to explain it over and over. I like it when I'm with really smart people

14. Do you like math more when it is in the morning or afternoon?

    In the morning so I can get it over with

15. Does you teacher encourage you by telling you how well you do in math?

    yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

5B8 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   I feel kind of good, but I'm not really ready for math. I just stare at the paper like the time tests and I see everyone getting finished and I'm just looking at the multiplication chart but it's subtraction that I'm stuck on and I just can't do it.

   So are the timed tests one of your least favorite things about math?

   Yes

   Are there any things about math that you do like?

   The shape math how you measure and then sometimes you add up the sides. That's my favorite.

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   Makes me feel like I want to quit and give up

5. How do you feel when the math is too easy?

   I rush through it and then she (teacher) says to check it and I never check it.

6. How do you feel when you get a high score on a math test?

   I don't really know. I've only gotten a high score like once so I don't know what it feels like

7. What do you think when another student gets finished with a math problem before you?

   Like I'm not smart and that they're rushing through it too fast.

8. Do you always do your math homework?

   Not always

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

My mom or dad or brother or sister

10. How does your mom feel about math?

    I think she hates it because she forgot a little bit about it. She's like "what is this" and I'm like, "don't worry about it mom, I've got it." And then I'm like, "dang, I forgot this step" and my dad is like "I hate math, I just hate it, I can't do it"

    So do you think both parents hate math?

    Yes

11. How does your dad feel about math?

    Hates it

12. Do you feel smart when you are doing math?

    No, not really

13. Do you like doing math problems with a partner or in a group?

    In a partnership

    Why's that?

    Because if you don't know a problem they can help you and if you are alone and you don't know it then you just skip the problem and you end up skipping a lot of problems when you partner could help you

14. Do you like math more when it is in the morning or afternoon?

    Morning because in the afternoon you are all tired and wimpy…and when she (the teacher) says sit up straight and you want to slouch and lay your head on the desk.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes, it makes me feel good

16. Do your parents tell you that you do well in math?

    I don't know, my parents never say

    Is there anything else about math you want to tell me?

6A2 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   I don't really like math at all

2. How did you feel when you started this math problem?

   I didn't really have a problem with it, but I did mess up on it

3. Did you feel this math problem was too hard or too easy?

   Normal

4. How do you feel when the math is too hard?

   Bored because I can't do it so I just sit there

5. How do you feel when the math is too easy?

   Bored

6. How do you feel when you get a high score on a math test?

   Excited, I don't usually get high scores though

7. What do you think when another student gets finished with a math problem before you?

   Doesn't really bother me at all

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Sometimes when they give us homework that we haven't learned yet

   Who do you usually ask?

   I usually email Mr. (teacher)

10. How does your mom feel about math?

    She's about on the same level I am

    Do you think she likes it?

    No

11. How does your dad feel about math?

    Don't know my dad

12. Do you feel smart when you are doing math?

    No

13. Do you like doing math problems with a partner or in a group?

    Groups more because you have more people to help you and if you don't know one part maybe they know it and can help you

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because then I'm not sleepy

15. Does you teacher encourage you by telling you how well you do in math?

    Sometimes

16. Do your parents tell you that you do well in math?

    Sometimes

    Is there anything else about math you want to tell me?

4S1 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   I actually like math, I don't mind it

2. How did you feel when you started this math problem?

   I got confused but then I broke into pieces

3. Did you feel this math problem was too hard or too easy?

   A little hard

4. How do you feel when the math is too hard?

   Frustrated

5. How do you feel when the math is too easy?

   It's okay

6. How do you feel when you get a high score on a math test?

   Proud of myself

7. What do you think when another student gets finished with a math problem before you?

   I don't really care about that

8. Do you always do your math homework?

   Sometimes, most of the time

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   Brother or mom

10. How does your mom feel about math?

    I don't know

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

    Yes, I actually do

13. Do you like doing math problems with a partner or in a group?

    With a partner because if I have a question they can help me or if they have a question I can help them

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because I'm more awake

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

4S12 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Happy, I really like math

2. How did you feel when you started this math problem?

   It was kind of hard, but I finished it.

3. Did you feel this math problem was too hard or too easy?

   middle

4. How do you feel when the math is too hard?

   Stressed out

5. How do you feel when the math is too easy?

   I don't really know

6. How do you feel when you get a high score on a math test?

   Happy

7. What do you think when another student gets finished with a math problem before you?

   I don't know, I wouldn't really care

8. Do you always do your math homework?

   Sometimes I don't, but sometimes I do

9. Do you ask your parents for help on your homework?

   No not really

   Who do you usually ask?

10. How does your mom feel about math?

    I think she likes it

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

    Kind of

13. Do you like doing math problems with a partner or in a group?

By self because sometimes when I work in a partnership people just tell me the answer and I'd rather figure it out myself

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because I'm tired in the morning

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

Is there anything else about math you want to tell me?

5T3 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   I feel like it's a normal thing to do. It's not like I hate it, but I don't like it.

2. How did you feel when you started this math problem?

   I didn't really understand it very much

3. Did you feel this math problem was too hard or too easy?

   Kinda hard

4. How do you feel when the math is too hard?

   I feel like I kinda need the teacher to reteach it to me

5. How do you feel when the math is too easy?

   I can just do it all on my own

6. How do you feel when you get a high score on a math test?

   Awesome

7. What do you think when another student gets finished with a math problem before you?

   Maybe they were just going through it too fast or maybe they studied a little bit more

8. Do you always do your math homework?

   Nods yes

9. Do you ask your parents for help on your homework?

   Sometimes

   Who do you usually ask?

   Mom

10. How does your mom feel about math?

    Feels ok

    Does she like it a lot?

    Just okay

11. How does your dad feel about math?

    He likes it

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    By self because…well, if I don't get it I'd rather do it with a group so they can help me understand it

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because I know I can just get it done

15. Does you teacher encourage you by telling you how well you do in math?

    Nods yes

16. Do your parents tell you that you do well in math?

    Nods yes

    Is there anything else about math you want to tell me?

6S22 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Normal

2. How did you feel when you started this math problem?

   A little anxious

3. Did you feel this math problem was too hard or too easy?

   I don't know

4. How do you feel when the math is too hard?

   I just simply try my best to understand it

5. How do you feel when the math is too easy?

   Excited when I have the test

6. How do you feel when you get a high score on a math test?

   It makes me feel really good because I was working for it

7. What do you think when another student gets finished with a math problem before you?

   Mr. (teacher) always says the first isn't always the best so I just think that I might get a better score.

8. Do you always do your math homework?

   Ya

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   My dad

10. How does your mom feel about math?

    She really doesn't use math

11. How does your dad feel about math?

    He's ok with it.

    Do you think he likes it?

(Nods yes)

12. Do you feel smart when you are doing math?

    When I understand it

13. Do you like doing math problems with a partner or in a group?

    I really wouldn't care

14. Do you like math more when it is in the morning or afternoon?

    Morning because I feel like I got it done and I can do whatever else I want to do

15. Does you teacher encourage you by telling you how well you do in math?

    Ya

16. Do your parents tell you that you do well in math?

    (Nods yes)

Is there anything else about math you want to tell me?

5F17 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   I don't really like math so I'm not exactly happy, but I don't really hate, hate it.

2. How did you feel when you started this math problem?

   At first I was confused, but then when I started thinking about it harder it was fairly easy

3. Did you feel this math problem was too hard or too easy?

   Easy

4. How do you feel when the math is too hard?

   Depressed and makes me hard for me to focus and gives me headaches

5. How do you feel when the math is too easy?

   Like I'm not challenged enough

6. How do you feel when you get a high score on a math test?

   Good

7. What do you think when another student gets finished with a math problem before you?

   They may have rushed it

8. Do you always do your math homework?

   Yes, but I have trouble turning it in.

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   My dad

10. How does your mom feel about math?

    She's probably like normal standard for a grown up

11. How does your dad feel about math?

    I don't know exactly, but he's really good at it

12. Do you feel smart when you are doing math?

    It depends on what kind of math…if it's easier math than I feel smarter, if it's hard math

sometimes I feel smart and sometimes I don't

13. Do you like doing math problems with a partner or in a group?

    It depends on the kind of math…If it's harder math I like to have people help me

14. Do you like math more when it is in the morning or afternoon?

    Afternoon. I have trouble doing math in the morning because I'm not awake yet

15. Does you teacher encourage you by telling you how well you do in math?

    Not necessarily… she likes to keep the scores not loud so people don't feel bad if they get a bad score

16. Do your parents tell you that you do well in math?

    Not necessarily either

    Is there anything else about math you want to tell me?

4S21 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   I kind of feel excited

2. How did you feel when you started this math problem?

   It wasn't too hard, but it was different.

3. Did you feel this math problem was too hard or too easy?

   Right in the middle

4. How do you feel when the math is too hard?

   Makes me feel like I don't get it or it's just too hard. I feel like I have to try to work harder

5. How do you feel when the math is too easy?

   Like I can go through it really fast and it doesn't take me a lot of time

6. How do you feel when you get a high score on a math test?

   Happy and excited

7. What do you think when another student gets finished with a math problem before you?

   It wouldn't matter to me. When I take my time I have better chances at getting a better score

8. Do you always do your math homework?

   Yes, I'm really good at that

9. Do you ask your parents for help on your homework?

   Sometimes

   Who do you usually ask?

   Mom or dad

10. How does your mom feel about math?

    She's good at it

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

Yes

13. Do you like doing math problems with a partner or in a group?

    By myself because I like to figure it out by myself

14. Do you like math more when it is in the morning or afternoon?

    Afternoon after we've done everything else

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

Is there anything else about math you want to tell me?

6A5 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   Mad because I don't like math

   Is it your least favorite subject?

   Yes

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   Nervous

5. How do you feel when the math is too easy?

   Happy

   Do you like it when it is easy?

   Yes

   Is it only your least favorite subject when it is too hard?

   Yes

6. How do you feel when you get a high score on a math test?

   Happy

   Why?

   Because I got a high score and I usually don't ever get high score.

7. What do you think when another student gets finished with a math problem before you?

   Slower than everyone else

   Would it make you feel bad?

   Yes

8. Do you always do your math homework?

   No, sometimes, depends on my mood

9. Do you ask your parents for help on your homework?

   Yes

   Who usually helps you?

   Dad, because my mom isn't the pro at math my dad is…and my dad isn't the pro at reading.

   So if I need help with reading I ask my mom and if I need help in math I ask my dad.

10. How does your mom feel about math?

    Better at reading

11. How does your dad feel about math?

    Pro at math

12. Do you feel smart when you are doing math?

    Not really

    Do you feel smart when the math is too easy?

    Yes

13. Do you like doing math problems with a partner or in a group?

    In a partner or group

    Why?

    Because there are more people to help

    More people to help you, or for you to help them

    To help me

    Do you like when your friends are able to help you?

    Yes

14. Do you like math more when it is in the morning or afternoon?

    Afternoon, because when I wake up I don't think as well as I do after a few hours.

    So you think better after lunch?

    Yes

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

6S6 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   Not very excited, like not wanting to do it.

2. How did you feel when you started this math problem?

   Don't remember

3. Did you feel this math problem was too hard or too easy?

   It seemed a little bit hard, but not too hard

4. How do you feel when the math is too hard?

   Kind of makes me feel like I'm not understanding it, I need to study more, do more stuff at my house

5. How do you feel when the math is too easy?

   Makes me feel kinda smart, like I know this, I don't need to do it

6. How do you feel when you get a high score on a math test?

   Makes me feel good

7. What do you think when another student gets finished with a math problem before you?

   It makes me realize that I'm running out of time and lots of people are finishing

8. Do you always do your math homework?

   Yes, I try

9. Do you ask your parents for help on your homework?

   Sometimes

   Who do you usually ask?

   My mom

10. How does your mom feel about math?

    Pretty comfortable, she knows this stuff

11. How does your dad feel about math?

    Same as my mom I guess…he knows what he is doing

12. Do you feel smart when you are doing math?

Maybe a little bit

13. Do you like doing math problems with a partner or in a group?

    I feel more comfortable doing it with other people so I can check my answers and see if I'm doing it right

14. Do you like math more when it is in the morning or afternoon?

    Afternoon I guess, because I'm more waked up in the afternoon and more focused

15. Does you teacher encourage you by telling you how well you do in math?

    Ya, a few times

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

5T15 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   I feel, well sometimes I feel excited if it's something I'm good at, but sometimes nervous if it's something I'm not good at.

2. How did you feel when you started this math problem?

   At first I felt confused, but then I reread it and figured it out

3. Did you feel this math problem was too hard or too easy?

   It wasn't that hard, but kind of hard. Kind of in between

4. How do you feel when the math is too hard?

   Makes me feel nervous, but then I ask the teacher questions and he can help me out

5. How do you feel when the math is too easy?

   If it's too easy I feel a little bored and I already know this

6. How do you feel when you get a high score on a math test?

   Really happy and excited and glad that I studied for it

7. What do you think when another student gets finished with a math problem before you?

   I don't really think about it, but I'm happy for them and if I don't get it done maybe I can ask them for help.

8. Do you always do your math homework?

   Yes, as much as I can

9. Do you ask your parents for help on your homework?

   Sometimes

   Who do you usually ask for help?

10. How does your mom feel about math?

    I think she really likes math, but since it's changed she's like, "what is this?" Since it's changed since she was in school. It's really funny when she says that. Last year we were learning a different way to times and she was like, "I don't get this."

11. How does your dad feel about math?

I think he likes it, but I'm not really sure

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    On my own so I can get it done fast and I don't have to explain it to them

14. Do you like math more when it is in the morning or afternoon?

    I don't really care

15. Does you teacher encourage you by telling you how well you do in math?

    Yes,

16. Do your parents tell you that you do well in math?

    Yes

Is there anything else about math you want to tell me?

5F11 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   Not excited, I don't like math

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   I don't know

5. How do you feel when the math is too easy?

   Happy

6. How do you feel when you get a high score on a math test?

   Good

7. What do you think when another student gets finished with a math problem before you?

   I don't know…mad because I wanted to win

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   yes

   Who do you usually ask?

   My mom

10. How does your mom feel about math?

    I don't know

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    Partner….I don't like a group because they go too fast and I don't like by myself because I can't get finished

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because in the morning my brain doesn't really function.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

4S19 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   Sort of excited almost

   Do you like math?

   Sometimes…it depends on the activities we do

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   Really frustrated and I just ask for help. I try not to give up

5. How do you feel when the math is too easy?

   I feel pretty good like I can do anything if it's easy for me

6. How do you feel when you get a high score on a math test?

   Really excited because I want to make parents proud

7. What do you think when another student gets finished with a math problem before you?

   I feel like I'm not smart, but I just keep trying to get it in my head

8. Do you always do your math homework?

   Sometimes

9. Do you ask your parents for help on your homework?

   No, not really

   Who do you usually ask?

10. How does your mom feel about math?

    She's really okay with it, she really likes math. I don't know, she just always tries to help me when I don't need it.

11. How does your dad feel about math?

    Not so well…my mom is better at it

12. Do you feel smart when you are doing math?

    Sometimes

13. Do you like doing math problems with a partner or in a group?

    With a group so I can see their ideas and see where they're going with it.

14. Do you like math more when it is in the morning or afternoon?

    Morning because I want to get my brain fresh…so in case there's a test in the afternoon

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Not really

    Is there anything else about math you want to tell me?

    I really like teaching math but sometimes I get nervous when I'm up in front of the crowd.

6S14 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Kind of like…I don't want to do this

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   Well it makes me want to ask questions or just be done for the day.

5. How do you feel when the math is too easy?

   Bored because you get done too fast and I don't want to read

6. How do you feel when you get a high score on a math test?

   Really good, and then I go put it on my fridge.

7. What do you think when another student gets finished with a math problem before you?

   Like really? This is hard for me…how did they get that?

   So maybe a bit frustrated?

   Yes

8. Do you always do your math homework?

   Sometimes, but that's only when I have other things.

   So sometimes you have other things that get in the way?

   Yes

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   I ask my mom first and if she doesn't know then I go to my dad and if he doesn't know then I'll go to my brother because he just got out of 6th grade.

10. How does your mom feel about math?

If it's too hard she just gives up, kind of like I do, but she tries a lot longer than me.

11. How does your dad feel about math?

    He will try to do it and if he doesn't get it then he will stay up all night trying to figure it out.

12. Do you feel smart when you are doing math?

    Sometimes…it depends on the subject of math.

    Maybe if it seems easy or hard?

    Yes

13. Do you like doing math problems with a partner or in a group?

    That also depends on the problem…if I don't get it but my friend does then I will ask her for help so she can help me understand it.

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because then I actually pay attention more because in the morning I just woke up but after lunch and recess I'm more awake.

15. Does you teacher encourage you by telling you how well you do in math?

    Sometimes, ya

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

6S23 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Like, oh shoot…I'm going to have a lot of questions

2. How did you feel when you started this math problem?

   It was kind of easy, but then I was like maybe I should try to do it again to make sure I got the right answer

3. Did you feel this math problem was too hard or too easy?

   Kind of easy, but kinda in the middle

4. How do you feel when the math is too hard?

   Like, why are we doing this because I don't want to do it

5. How do you feel when the math is too easy?

   Usually I'm like OH, I can do this easy peasy

6. How do you feel when you get a high score on a math test?

   Pretty good

7. What do you think when another student gets finished with a math problem before you?

   I feel like they're smarter, but maybe they'll miss a lot of questions

8. Do you always do your math homework?

   Most times

9. Do you ask your parents for help on your homework?

   If I don't understand it

   Who do you usually ask?

   My mom, or my dad if its like about fencing

10. How does your mom feel about math?

    She feels good because she's taking school right now

11. How does your dad feel about math?

    He uses it every day so he likes it

12. Do you feel smart when you are doing math?

Ya, if I get a question right and my mom gets it wrong.

13. Do you like doing math problems with a partner or in a group?

    Depends on if it's easy I'd rather do it by myself, but if it's harder I'd rather do it in a group that understands it.

14. Do you like math more when it is in the morning or afternoon?

    Morning so I can get it over with

15. Does you teacher encourage you by telling you how well you do in math?

    A couple of times

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

4W7 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Fine, I like math and I'm usually ready to go

2. How did you feel when you started this math problem?

   Fine

3. Did you feel this math problem was too hard or too easy?

   Too easy

4. How do you feel when the math is too hard?

   Like, um…what does that mean? I'm just going to reread this.

5. How do you feel when the math is too easy?

   Do do do (singing)

   So would that be bored?

   No, just staring, having fun with it and doing random ones in my head

6. How do you feel when you get a high score on a math test?

   Happy

7. What do you think when another student gets finished with a math problem before you?

   Good job neighbor…I don't really care…I'm happy for them

8. Do you always do your math homework?

   Sometimes

9. Do you ask your parents for help on your homework?

   Sometimes, but mostly my brother because my dad is watching tv and my mom is at work.

   Who do you usually ask for help?

   Brother

10. How does your mom feel about math?

    I don't know

11. How does your dad feel about math?

    He would probably need to get (older brother)

12. Do you feel smart when you are doing math?

    No, I usually just think about random stuff…

13. Do you like doing math problems with a partner or in a group?

    Probably a partner, by myself, or with a group…I like them all.

    Is there any reason why you like doing it in a group?

    Because they can help me understand and I can help them understand and it's just an understanding group

14. Do you like math more when it is in the morning or afternoon?

    Probably both. In the morning you usually have to do math

    Would you rather do it in the afternoon?

    I don't care…either one, just not at night

15. Does you teacher encourage you by telling you how well you do in math?

    Um…Sure

16. Do your parents tell you that you do well in math?

    Sure, but my parents say it in weird ways.

    Like what?

    They kinda say (sister) is the one that is good at reading out loud because I'm not good at reading out loud. Then when (sister) has a question about math, my dad says, "go get (4W7), he's the one that's good at math…or (brother) if he can't figure it out."

    Is there anything else about math you want to tell me?

4W7 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Fine, I like math and I'm usually ready to go

2. How did you feel when you started this math problem?

   Fine

3. Did you feel this math problem was too hard or too easy?

   Too easy

4. How do you feel when the math is too hard?

   Like, um…what does that mean? I'm just going to reread this.

5. How do you feel when the math is too easy?

   Do do do (singing)

   So would that be bored?

   No, just staring, having fun with it and doing random ones in my head

6. How do you feel when you get a high score on a math test?

   Happy

7. What do you think when another student gets finished with a math problem before you?

   Good job neighbor…I don't really care…I'm happy for them

8. Do you always do your math homework?

   Sometimes

9. Do you ask your parents for help on your homework?

   Sometimes, but mostly my brother because my dad is watching tv and my mom is at work.

   Who do you usually ask for help?

   Brother

10. How does your mom feel about math?

    I don't know

11. How does your dad feel about math?

    He would probably need to get (older brother)

12. Do you feel smart when you are doing math?

    No, I usually just think about random stuff…

13. Do you like doing math problems with a partner or in a group?

    Probably a partner, by myself, or with a group…I like them all.

    Is there any reason why you like doing it in a group?

    Because they can help me understand and I can help them understand and it's just an understanding group

14. Do you like math more when it is in the morning or afternoon?

    Probably both. In the morning you usually have to do math

    Would you rather do it in the afternoon?

    I don't care…either one, just not at night

15. Does you teacher encourage you by telling you how well you do in math?

    Um…Sure

16. Do your parents tell you that you do well in math?

    Sure, but my parents say it in weird ways.

    Like what?

    They kinda say (sister) is the one that is good at reading out loud because I'm not good at reading out loud. Then when (sister) has a question about math, my dad says, "go get (4W7), he's the one that's good at math…or (brother) if he can't figure it out."

    Is there anything else about math you want to tell me?

4S28 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Excited. Because I like learning new stuff about math

2. How did you feel when you started this math problem?

   A little confused

3. Did you feel this math problem was too hard or too easy?

   In between

4. How do you feel when the math is too hard?

   Kind of get mad, but I still try to do it

5. How do you feel when the math is too easy?

   I get excited

6. How do you feel when you get a high score on a math test?

   Really happy

7. What do you think when another student gets finished with a math problem before you?

   I don't care

8. Do you always do your math homework?

   Yes, I haven't missed one math homework at all

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   Mom

10. How does your mom feel about math?

    I don't know

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

    Yes, when I get it

13. Do you like doing math problems with a partner or in a group?

    In partners or by self because sometimes if I don't understand something I can ask my partner for help, but sometimes I just like doing it by myself

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because I'm more awake

15. Does you teacher encourage you by telling you how well you do in math?

    She's never really said how I do in math

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

4W25 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Kind of nervous because I might not know what it is.

2. How did you feel when you started this math problem?

3. Did you feel this math problem was too hard or too easy?

4. How do you feel when the math is too hard?

   Kind of mad because I don't know what to do

5. How do you feel when the math is too easy?

   Kind of happy because I get to know what it is

6. How do you feel when you get a high score on a math test?

   Very happy because I didn't know I would get that high of a score

7. What do you think when another student gets finished with a math problem before you?

   I don't feel anything at all because I'm still working and they just finish

8. Do you always do your math homework?

   Usually, but I have soccer and sometimes I don't get it done

9. Do you ask your parents for help on your homework?

   Sometimes if I don't get it or if I don't get one they are saying

10. How does your mom feel about math?

    I don't know

    If you ask for help on your homework, do you usually ask your mom or your dad?

    Dad, he's older than my mom and he got done faster than she did

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    In a partner or a group, because they like know most of the things that I don't know

14. Do you like math more when it is in the morning or afternoon?

    Probably in the afternoon because we have more energy and if we do it in the morning we are still sleeping.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

4S7 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   I get nervous because I need help in math

2. How did you feel when you started this math problem?

   I felt like it was hard, but you just had to do what it was asking

3. Did you feel this math problem was too hard or too easy?

   Medium

4. How do you feel when the math is too hard?

   I just keep trying

5. How do you feel when the math is too easy?

   I don't know

6. How do you feel when you get a high score on a math test?

   Excited

7. What do you think when another student gets finished with a math problem before you?

   I don't care

8. Do you always do your math homework?

   Not always, but most of the time

9. Do you ask your parents for help on your homework?

   yes

   Who do you usually ask?

   Mom or dad

10. How does your mom feel about math?

    She likes math but she says she's not good at it

11. How does your dad feel about math?

    Kind of like my mom

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    With a partner because if I mess up they can find my mistake

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because in the morning I'm not awake as much

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

    Fractions and decimals are hard for me.

6A1 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   Happy

   Why happy?

   I like math and figuring out problems

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   Unhappy, sort of

5. How do you feel when the math is too easy?

   Bored

6. How do you feel when you get a high score on a math test?

   Happy

7. What do you think when another student gets finished with a math problem before you?

   I don't really care

8. Do you always do your math homework?

   Not always

   Do you usually try?

   Yes

9. Do you ask your parents for help on your homework?

   Occasionally, mostly my sister because she remembers it

10. How does your mom feel about math?

    I don't know

    Do you know if she likes it or if she thinks she's good at it?

    I don't know

Do you think she's good at it?

Yes

11. How does your dad feel about math?

    He's good at it

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    By myself

    Why's that?

    Sometimes I get frustrated when other people don't get it so I just like to do it myself.

14. Do you like math more when it is in the morning or afternoon?

    Morning

    Why

    I'm just more of a morning person

15. Does you teacher encourage you by telling you how well you do in math?

    Sort of

16. Do your parents tell you that you do well in math?

    Eh…(unsure)

    Is there anything else about math you want to tell me?

5T19 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   I feel excited to learn new things

2. How did you feel when you started this math problem?

   It was easy

3. Did you feel this math problem was too hard or too easy?

   Too easy

4. How do you feel when the math is too hard?

   Sometimes it feels overwhelming and I just try to work it out and he helps us.

5. How do you feel when the math is too easy?

   Like we need to learn something harder

6. How do you feel when you get a high score on a math test?

   I feel excited and my mom puts it on the fridge

7. What do you think when another student gets finished with a math problem before you?

   Like they didn't think through the problems and they might have just guessed.

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   No

   Who do you usually ask?

10. How does your mom feel about math?

    She likes it because she kind of has a job in math.

11. How does your dad feel about math?

    Same as my mom

12. Do you feel smart when you are doing math?

    (nods yes)

13. Do you like doing math problems with a partner or in a group?

By myself…I like doing it by myself because I can do it in different ways and get it done faster

14. Do you like math more when it is in the morning or afternoon?

    Morning because it's earlier

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

Is there anything else about math you want to tell me?

6A8 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Not excited, but not…I don't really care, it's just another thing

2. How did you feel when you started this math problem?

   It was going to be pretty easy and it was

3. Did you feel this math problem was too hard or too easy?

   Easy

4. How do you feel when the math is too hard?

   I just start not listening so I just do it at home by myself because I understand different things.

   Why is it easier for you to do it at home on your own?

   Because there's not as many distractions and not as much pressure either.

   So if you stop listening in class and do it on your own do you feel like you are teaching yourself?

   No

   So you are just taking what your teacher taught you but just doing it at home?

   Yes, just figuring it out on my own

5. How do you feel when the math is too easy?

   Bored

6. How do you feel when you get a high score on a math test?

   Happy

7. What do you think when another student gets finished with a math problem before you?

   I don't really care

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Yes

10. How does your mom feel about math?

    She uses it a lot at work. She works at a salon and has to mix things a lot. I think she feels like it is needed.

11. How does your dad feel about math?

    He uses it a lot too so I feel like he likes it too…he's really smart

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    I prefer on my own, but I like to do it with a partner sometimes…it depends on what it is.

    So when would you like to do it with a partner?

    When it's harder so I can see their opinion on it.

14. Do you like math more when it is in the morning or afternoon?

    Morning

    Is there a reason for that?

    Just because all of our energy isn't out…and to get it over with

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

4W3 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   Really excited, I like math

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   I feel really confused and I feel really weird and I get headaches

5. How do you feel when the math is too easy?

   I can solve this and I hurry and solve it

6. How do you feel when you get a high score on a math test?

   Really excited

   Do you get a lot of high scores?

   Not really

7. What do you think when another student gets finished with a math problem before you?

   I would feel pretty good, it wouldn't bother me

8. Do you always do your math homework?

   Usually

9. Do you ask your parents for help on your homework?

   Yes, from my mom and my dad

10. How does your mom feel about math?

    She struggles

11. How does your dad feel about math?

    He's feels really good and helps me a lot, more than my mom

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    Partner because you can have some help

14. Do you like math more when it is in the morning or afternoon?

    Morning because after you do math you can play outside for recess

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

5T5 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   I feel not excited, but not bored, it's just school, just one more thing

2. How did you feel when you started this math problem?

   Overwhelmed, I didn't know how you figured it out and then with a little help, a little clue, then I figured it out in my head and then on paper

3. Did you feel this math problem was too hard or too easy?

   It wasn't easy, it wasn't hard, maybe medium

4. How do you feel when the math is too hard?

   I just try to pay attention more, just like pay attention, pay attention, pay attention. I just focus to all of the mini details and then I put all the details together and see what happens. Or I just go home and read the book on my own.

5. How do you feel when the math is too easy?

   When they say I have to show my work I'm like why…I would rather do it in my head. I feel frustrated when they make me show my work.

6. How do you feel when you get a high score on a math test?

   Yes!

7. What do you think when another student gets finished with a math problem before you?

   If that happens then I feel like I have to hurry and then I have to slow down because I'll probably get a better score then them. I have to slow down and focus, maybe that person is just guessing and I don't know if I want to speed up with them. It's ok if you are the last person

8. Do you always do your math homework?

   Most of the time, yes. If something happens or it's a special occasion then I just forget. Most of the time I try to get it done

9. Do you ask your parents for help on your homework?

   If I don't get one problem I just skip it and then ask them about all of the problems I don't

know

Who do you usually ask for help?

10. How does your mom feel about math?

    She teaches it, she teaches 3rd grade so she's like, "how do 5th graders do this?" Sometimes she's confused so my dad comes and helps because he's a math problem.

11. How does your dad feel about math?

    He doesn't do math for his job, but he has a lot of steps and has a good memory so he goes step by step and is patient. My mom is less patient

12. Do you feel smart when you are doing math?

    Most of the time yes, but when it's a hard problem I'm like, "why, why"

13. Do you like doing math problems with a partner or in a group?

    It depends on what it is, if it's hard. It depends on who is in the group…if it's with my friends or with smart people I would want to. If it's with people I never talk to then I wonder why we have to do group work.

14. Do you like math more when it is in the morning or afternoon?

    Morning so we can get it over with so you don't have to worry about it all day. I like science and writing so if they are in the afternoon I like it better.

15. Does you teacher encourage you by telling you how well you do in math?

    When you finish a test and they say I'm proud of you then I think "yes, I'm going to do this more."

16. Do your parents tell you that you do well in math?

    Usually they don't really know about the math homework, but they always ask if my math homework is done and I say yes, so they don't really know.

    Is there anything else about math you want to tell me?

5T24 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   It depends on who is teaching it. If it's the student teacher I'm like kind of yay. If it's Mr. (teacher) I'm like uh…it's not my favorite subject.

   So do you like it more when your student teacher teaches it or when Mr. (teacher) teaches it?

   I like it more when the student teacher teaches it because she makes it more exciting. Mr. (teacher) just reads it out of the book.

2. How did you feel when you started this math problem?

   A little frustrated at first, but then I thought through it.

3. Did you feel this math problem was too hard or too easy?

   It was easy after I thought through it, but at first it was hard.

4. How do you feel when the math is too hard?

   I kind of give up, I just sit there and watch…I'm usually in the back of the class so I don't really try any more but then I go home and just ask my mom because she loves math…it's like her life.

5. How do you feel when the math is too easy?

   I zone out, I just sit there…or I think of faster ways to do it.

6. How do you feel when you get a high score on a math test?

   I'm pretty happy because I kind of did really bad in math this year.

   Do you think you did worse in 5th grade math than in 4th grade math?

   Definitely… well actually…math is like, I don't really like it at all so I don't ask questions at all so I don't get it so I guess it's kind of my fault.

7. What do you think when another student gets finished with a math problem before you?

   I

8. Do you always do your math homework?

   Yes, I always do it

9. Do you ask your parents for help on your homework?

I do, but then my mom totally gets off subject…like she wants to give me different ways to do it.

Who do you usually ask?

10. How does your mom feel about math?

    Loves it.

11. How does your dad feel about math?

    He's supportive, but he also works a lot so when I do ask him about math he says he didn't do very well in school because he had dyslexia. So he tries as hard as he can to help us and support us but most of the time he's just there for moral support.

12. Do you feel smart when you are doing math?

    No, never…

13. Do you like doing math problems with a partner or in a group?

    Yes, it's a lot more fun and easier and makes sense.

14. Do you like math more when it is in the morning or afternoon?

    Morning because when it's in the afternoon I dread it all through lunch

15. Does you teacher encourage you by telling you how well you do in math?

    No

16. Do your parents tell you that you do well in math?

    Um, ya, I guess

    Is there anything else about math you want to tell me?

    I don't like math…that's about it

4S15 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   It depends on what we are working on. Sometimes I don't want to learn about it

2. How did you feel when you started this math problem?

   I felt kind of confused. I knew kind of what to do you, but then I didn't know how to finish

3. Did you feel this math problem was too hard or too easy?

   Middle

4. How do you feel when the math is too hard?

   Like I'm struggling and need more help and I need Mrs. (teacher) to teach me more about it

5. How do you feel when the math is too easy?

   Like she (teacher) should teach us sometime different

6. How do you feel when you get a high score on a math test?

   Happy and I listened and did what I was supposed to do

7. What do you think when another student gets finished with a math problem before you?

   It's ok with me because we are all on different levels of learning.

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   Mom

10. How does your mom feel about math?

    She's good at it, I think she likes it

11. How does your dad feel about math?

    My dad says he's not good at math

12. Do you feel smart when you are doing math?

Yes, I usually feel like I know what I'm doing

13. Do you like doing math problems with a partner or in a group?

    Sometimes I like to do it in a group because I don't know what to do and they can help me but if I know how to do it and I think it's easy I'd rather do it by myself

14. Do you like math more when it is in the morning or afternoon?

    Morning because in the afternoon I'm tired of school

15. Does you teacher encourage you by telling you how well you do in math?

    Yes, usually

16. Do your parents tell you that you do well in math?

    Yes, sometimes I don't get the problem and they say "I know you're smarter than that and you should have known the answer."

    Is there anything else about math you want to tell me?

    Fractions and decimals are hard for me.

5B24 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Happy

   Why?

   Because then you get to learn new things about math and later on in life it will help you

2. How did you feel when you started this math problem?

   Well, at first I was like I can figure this out, but then I wasn't able to figure it out.

3. Did you feel this math problem was too hard or too easy?

   Medium

4. How do you feel when the math is too hard?

   Just keep trying…keep doing it

5. How do you feel when the math is too easy?

   If I get done then I just go help another person

6. How do you feel when you get a high score on a math test?

   good

7. What do you think when another student gets finished with a math problem before you?

   Doesn't really matter to me, I just want to get it done

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   My dad

10. How does your mom feel about math?

    Kinda…she graduated in biology so she uses math

11. How does your dad feel about math?

    He's good at it because he used to be an architect.

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    In a partner or group because then you can figure it out easier

14. Do you like math more when it is in the morning or afternoon?

    Morning because then you have more time to do other stuff

15. Does you teacher encourage you by telling you how well you do in math?

    Sometimes, yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

    I'm really good at my times tables

5B9 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   Excited because I love math

2. How did you feel when you started this math problem?

   Just came easily to me and I figured it out easy

3. Did you feel this math problem was too hard or too easy?

   Easy

4. How do you feel when the math is too hard?

   I just learn it and then it comes easy,

   It's like you don't know what to do, so you just keep trying and trying

5. How do you feel when the math is too easy?

   Sometimes fun to get easy and hard questions, the easy ones go quick and you can do them fast, but the hard ones you can take more time on them and work harder on them

6. How do you feel when you get a high score on a math test?

   Really great because I know I would have studied hard for it.

7. What do you think when another student gets finished with a math problem before you?

   I don't really care because it's not about how fast you do it, it's about how you are doing in math

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Every once in awhile if it's something we haven't learned yet.

10. How does your mom feel about math?

    I feel like she really likes math and likes helping her kids with it because she knows that her parents didn't really help her as much with her math so she wants to help her children with it

    If you ask for help on your homework, do you usually ask your mom or your dad?

11. How does your dad feel about math?

    He loves it because he always helps my sisters, even if they don't understand it he finds a nice way to talk about it and help them through it.

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    I usually like doing it single because in a group you have to take more time and you have to wait for them, but it's fun to do it in a group because you can help them with it.

    So if you had your choice would you do your assignment first by yourself and then go and help others?

    Yes

14. Do you like math more when it is in the morning or afternoon?

    I like it in the morning because you are all ready to do it because your fresh and you haven't been out playing.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

    I just love math!

6S9 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   Sometimes I'm like, ugh I don't want to do this…but other times I'm like ok, because that means we are done with reading and I hate reading.

2. How did you feel when you started this math problem?

   I felt it was really hard, but then when I started thinking about it and figured it out then it was easier

3. Did you feel this math problem was too hard or too easy?

   At the beginning it was hard, but after I figured it out it was easy…so kind of in between

4. How do you feel when the math is too hard?

   I'll try to figure it out as much as I possibly can and if I don't get it I will get frustrated and just quit, but I like to try to figure it out and do it

5. How do you feel when the math is too easy?

   I want something harder, I like challenging myself and with the easier stuff I can get it done fast.

6. How do you feel when you get a high score on a math test?

   Pretty good, but I get high math scores pretty much all of the time so it's nothing new, but when I get a low math score I wouldn't be happy.

7. What do you think when another student gets finished with a math problem before you?

   Maybe it means that they rushed through it and not taking their time, or they just did it faster because maybe it was more challenging for me.

8. Do you always do your math homework?

   No, but most of the time

9. Do you ask your parents for help on your homework?

   Yes

   Who do you usually ask?

   Dad

10. How does your mom feel about math?

    My mom is a field consultant for 7-11 so she does math a lot. I wouldn't say she necessary loves doing math, but she doesn't hate it.

11. How does your dad feel about math?

    He does concrete so he does math a lot and he likes it so he's the one that usually helps me because he likes it and he understands it.

12. Do you feel smart when you are doing math?

    Ya

13. Do you like doing math problems with a partner or in a group?

    Partners, just knowing that someone else is doing it too…and maybe they are having a hard time or an easy time or in the middle. It just helps to know that I'm not the only one having a hard or easy time.

14. Do you like math more when it is in the morning or afternoon?

    Morning, get it done and over with and you can do the funner stuff in the afternoon

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

4S11 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   It depends on what mood I'm in, I'm either happy or sad

2. How did you feel when you started this math problem?

   Confused

3. Did you feel this math problem was too hard or too easy?

   In between

4. How do you feel when the math is too hard?

   I don't know

5. How do you feel when the math is too easy?

   Like I can go through it fast

6. How do you feel when you get a high score on a math test?

   Happy

7. What do you think when another student gets finished with a math problem before you?

   Normal, it kind of tells me to hurry, but then I might get problems wrong because I hurried so I try not to worry about it

8. Do you always do your math homework?

   Sometimes

9. Do you ask your parents for help on your homework?

   Sometimes

   Who do you usually ask?

   Mom or sister

10. How does your mom feel about math?

    My mom's good at it

11. How does your dad feel about math?

    I don't know

12. Do you feel smart when you are doing math?

Yes

13. Do you like doing math problems with a partner or in a group?

    By self because it's not as long. When you are around a lot of people you just talk

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because I'm more awake

15. Does you teacher encourage you by telling you how well you do in math?

    I don't know, sometimes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

5F6 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Excited

   Do you like it?

   Yes

   Is it one of your favorite subjects?

   Yes

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   I don't know

5. How do you feel when the math is too easy?

   Get through it fast

6. How do you feel when you get a high score on a math test?

   Good

7. What do you think when another student gets finished with a math problem before you?

   I don't care

8. Do you always do your math homework?

   Sometimes

9. Do you ask your parents for help on your homework?

   Sometimes

   Who do you usually ask?

   My dad

10. How does your mom feel about math?

    She's pretty good at it and she likes it

11. How does your dad feel about math?

    He likes it and he's good at it

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    Self because I can get it done faster

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because in the morning you are still tired and in the afternoon you are wired up.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

5T7 – High P/Low SE

1. How do you feel when your teacher says it's time for math?

   Usually I go like…ugh, this is going to be too easy

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   Like I need help.

5. How do you feel when the math is too easy?

   Just finish and start reading

6. How do you feel when you get a high score on a math test?

   obviously

7. What do you think when another student gets finished with a math problem before you?

   I feel jealous…like I should have beat that person

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   No

   Who do you usually ask?

10. How does your mom feel about math?

    I think she's kind of good at math, but she's better at writing.

11. How does your dad feel about math?

    My dad or step dad?

    Which one do you want to answer?

    My step dad is more into technology and my dad is more of a football guy.

12. Do you feel smart when you are doing math?

yes

13. Do you like doing math problems with a partner or in a group?

    By myself

14. Do you like math more when it is in the morning or afternoon?

    I don't know, either one

15. Does you teacher encourage you by telling you how well you do in math?

    Well, sort of.

16. Do your parents tell you that you do well in math?

    Yes, like when they see a report card they say awesome job!

    Is there anything else about math you want to tell me?

    Well, I'm usually pretty fast at getting my math done and I'm not really that popular, but the popular boys usually need my help but they won't admit it.

6A12 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   It's not my favorite thing, but I understand what the teacher is saying

2. How did you feel when you started this math problem?

   Just needed to think back to other things I needed to do.

3. Did you feel this math problem was too hard or too easy?

   Not too hard, just had to think back to what I did before

4. How do you feel when the math is too hard?

   Just pay attention more and ask a friend for help

5. How do you feel when the math is too easy?

   Just keep working on it because sometimes on end of year testing you have to remember how to do it, so I just keep focusing on it

6. How do you feel when you get a high score on a math test?

   Just feel glad that I focused and paid attention

7. What do you think when another student gets finished with a math problem before you?

   I wouldn't really care because it's their work, not mine

8. Do you always do your math homework?

   I usually do, but if something comes up then I don't do it.

   So if you get busy you don't do it?

   Ya

   But if you're not busy you do it?

   Yes

9. Do you ask your parents for help on your homework?

   Not really

10. How does your mom feel about math?

    In algebra she's really good, she's helped me with that a lot. And with times tables and basic math she is a really big help.

So do you think she likes math?

Ya

11. How does your dad feel about math?

    He's really good…he loves decimals, adding yards and feet, and fractions and stuff because he works in construction and he has to know it.

12. Do you feel smart when you are doing math?

    If it's a really easy one, ya I guess.

    If it's difficult do you still feel smart?

    I mean, I wouldn't call myself smart, I would just work through it.

13. Do you like doing math problems with a partner or in a group?

    I like to do them in a partnership because if I don't know they can help me and if they don't know I'm glad to help them.

14. Do you like math more when it is in the morning or afternoon?

    In the morning.

    Why's that?

    Because it helps you remember to just do it every morning. Sometimes in the afternoon you forget and it's the easiest to remember because it's the start of the day and it can help you remember math easy.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

6A3 – Low P/Low SE

1. How do you feel when your teacher says it's time for math?

   A bit scared because sometimes math is a bit hard

2. How did you feel when you started this math problem?

   Confused and hard

3. Did you feel this math problem was too hard or too easy?

   Too hard

4. How do you feel when the math is too hard?

   Scared that I might fail math

5. How do you feel when the math is too easy?

   Confident

6. How do you feel when you get a high score on a math test?

   Excited and a bit happy

7. What do you think when another student gets finished with a math problem before you?

   Scared like I'm going to fail

   So having a person finish before you makes you feel like you are going to fail?

   (Nods yes)

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Sometimes, when it's too hard

   Who do you usually ask?

   Mom, but if she doesn't know it she'll go to (step dad) and if he doesn't know it then she'll go to her friend who is a tutor.

10. How does your mom feel about math?

    Well, ever since our first homework I don't think she's liked it

    Your first homework in 6th grade?

Ya

11. How does your dad feel about math?

    NA

12. Do you feel smart when you are doing math?

    No, not that much

13. Do you like doing math problems with a partner or in a group?

    Group or partner

    Why's that?

    Because I can get some help from them

14. Do you like math more when it is in the morning or afternoon?

    Either one is good

15. Does you teacher encourage you by telling you how well you do in math?

    Sometimes

16. Do your parents tell you that you do well in math?

    Kind of

    Is there anything else about math you want to tell me?

5F23 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   I feel excited because math is my favorite subject in school. Especially geometry and all of the beautiful creations you can create with geometry.

2. How did you feel when you started this math problem?

   Sort of stressed out because it was difficult and hard to figure out, but it was about as easy as other difficult problems.

3. Did you feel this math problem was too hard or too easy?

   I feel like it was sort of in the middle…it was both easy and hard because you had to think deep into it to figure out how to do it.

4. How do you feel when the math is too hard?

   Number one, that usually never happens to me, but if it did happen it would make me feel like I need to ask a lot of questions.

5. How do you feel when the math is too easy?

   Like I don't need to be in the class…I can be in 6th grade.

6. How do you feel when you get a high score on a math test?

   Very good

7. What do you think when another student gets finished with a math problem before you?

   I still feel good because I'm still able to do it and get the answers correct and I feel good for them because they were able to do it before me and that's usually really hard to do.

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   Only sometimes

   Who do you usually ask?

   Usually my mom because she's the only one home, but sometimes my dad.

10. How does your mom feel about math?

She was a good student in her day, but she's kind of slow at it.

11. How does your dad feel about math?

    He's really good at it. When I was in first grade he taught me how to do square roots and when I was in second grade he taught me cubed roots. He's a teacher in Orem.

12. Do you feel smart when you are doing math?

    Yes

13. Do you like doing math problems with a partner or in a group?

    By myself because when I am with other people I feel like they are not up to my level so it drags me down…but then I feel good about it because I can help them find new angles to solve problems with

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because it's like a brain workout. In the morning you are all awake and hyped up and in the afternoon you are sleepy so I like math because it wakes me up again.

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

5B3 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Sometimes I worry that I won't get questions right. I don't know, if I know that we are talking about the same topic as yesterday and I got the topic I like it usually, but at first it is hard and then it gets easier.

2. How did you feel when you started this math problem?

   When I was reading it I was confused. And I tried to get it different ways to get the numbers, but it was confusing

3. Did you feel this math problem was too hard or too easy?

   It was too hard. At first I was getting it and then when I went to do the math I got confused.

4. How do you feel when the math is too hard?

   Like I can't really do it. Then I get bummed out. Then I ask kids to help me or the teacher

5. How do you feel when the math is too easy?

   Confident in myself

6. How do you feel when you get a high score on a math test?

   I feel happy, and then I take it home and show my mom

7. What do you think when another student gets finished with a math problem before you?

   It doesn't really bother me because I take my time, and if they finish before me I really don't care I'll just keep doing it until I finish.

8. Do you always do your math homework?

   Ya

9. Do you ask your parents for help on your homework?

   Yes, since we are Hispanic I have to translate for my mom, but she usually helps me and I have been going to the math class after school upstairs.

   Who do you usually ask for help?

   Mom

10. How does your mom feel about math?

Good, she likes math. And when she understands it she'll help me. When she reads it in English shes likes, what's this word, and if she understands it she can help me

11. How does your dad feel about math?

    He's good at it, he knows a lot of English. My mom knows less English than him

12. Do you feel smart when you are doing math?

    Sometimes. When it's easy I don't really feel smart, but I feel like I can do it

13. Do you like doing math problems with a partner or in a group?

    Sometimes I'd rather do it by myself and sometimes I want to do it in a group. When I do it by myself I can do it fast when I know how to do it. When I want to do it in a group it is when I don't understand it and I know how to do a little bit of it, but not the rest.

14. Do you like math more when it is in the morning or afternoon?

    Morning, because I'm not as stressed and I feel better about it

15. Does you teacher encourage you by telling you how well you do in math?

    Yes, sometimes when I don't get a problem and I go back with her and she helps me with it and I concentrate on it and try to do it and she's like you just got to know it and do it.

16. Do your parents tell you that you do well in math?

    Ya, when I take home math tests and stuff they are like, "see you can do it." Because at home I get stressed and I'm like, "mom I can't do it," and she says that I can do it.

    Is there anything else about math you want to tell me?

4W16 – Low P/High SE

1. How do you feel when your teacher says it's time for math?

   Excited

   Do you like doing math?

   (nods head)

2. How did you feel when you started this math problem?

   NA

3. Did you feel this math problem was too hard or too easy?

   NA

4. How do you feel when the math is too hard?

   Kind of frustrated.

   Does it frustrate you like you don't want to do it anymore, or like you need to do more of them so you understand?

   I need to do more so I understand

5. How do you feel when the math is too easy?

   Kind of happy

6. How do you feel when you get a high score on a math test?

   Happy because I did my best

7. What do you think when another student gets finished with a math problem before you?

   Mad

   Why?

   Because I'm like slower than them

8. Do you always do your math homework?

   Nods yes

9. Do you ask your parents for help on your homework?

   Nods yes

10. How does your mom feel about math?

Good

Does she like it?

Nods yes

Is she good at it?

Nods yes

11. How does your dad feel about math?

    He's really good

12. Do you feel smart when you are doing math?

    Nods yes

13. Do you like doing math problems with a partner or in a group?

    With a partner or a group

    Why is that?

    Because it is more easier when people are helping you get through answers

14. Do you like math more when it is in the morning or afternoon?

    Morning

    Why?

    Because if you get it done in the morning then in the afternoon you are free to do what you want

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

    Is there anything else about math you want to tell me?

4S13 – High P/High SE

1. How do you feel when your teacher says it's time for math?

   Sometimes I don't want to do it, but then when I start doing it, it feels good

2. How did you feel when you started this math problem?

   Sort of hard at first, but then I caught on to it

3. Did you feel this math problem was too hard or too easy?

   Middle

4. How do you feel when the math is too hard?

   Keep on trying…then I know it

5. How do you feel when the math is too easy?

   I feel like I want to rush through it and just be done

6. How do you feel when you get a high score on a math test?

   Feels good

7. What do you think when another student gets finished with a math problem before you?

   I just feel like, ok…they're done now I don't have to worry about anything, I just have to worry about getting my stuff done

8. Do you always do your math homework?

   Yes

9. Do you ask your parents for help on your homework?

   rarely

   Who do you usually ask?

   My dad, but if he's not there then my mom

10. How does your mom feel about math?

    I don't know

11. How does your dad feel about math?

    He likes math a lot. He likes to help me with my homework

12. Do you feel smart when you are doing math?

Yes

13. Do you like doing math problems with a partner or in a group?

    By myself so that I can just do it all and I don't have to argue with other people about the answer

14. Do you like math more when it is in the morning or afternoon?

    Afternoon because my eyes have already seen math because we have to do daily math in the morning

15. Does you teacher encourage you by telling you how well you do in math?

    Yes

16. Do your parents tell you that you do well in math?

    Yes

Is there anything else about math you want to tell me?

CURRICULUM VITAE

JODI HADERLIE MANTILLA

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EDUCATION

Ph.D. Expected: August, 2015
Education, Utah State University
Specialization: Curriculum and Instruction
Emphasis: Mathematics Education and Leadership
Dissertation: Identifying Factors Common Among Students Who Do Not Fit The Typical Mathematics Self-Efficacy and Achievement Correlation
Chair: Dr. Jim Dorward
Committee: Dr. Patricia Moyer-Packenham, Dr. Susan Turner, Dr. Sarah Clark, Dr. Kerry Jordan

M.Ed. July 2008
Education, Southern Utah University
Emphasis: Elementary Math Endorsement

M.Ed. May 2008
Education, Western Governors University
Emphasis: Learning and Technology

B.S. April 2006
Elementary Education, Utah Valley State College

LICENSURE

Utah Elementary Education Level 2 License, grades 1– 8, April 2010.
Praxis 0522-Principles of Learning & Teaching (K-6), November 2008, Passed.

Utah Elementary Education Level 1 License, grades 1– 8, April 2006.
Praxis 10014-Content Knowledge, January 2006, Passed.

EMPLOYMENT HISTORY

Visiting Professor *(Fall 2014-Present)*
Brigham Young University, Provo, Utah.

5th Grade Teacher *(2006-2014)*
Larsen Elementary, Spanish Fork, Utah.

UNIVERSITY CLASSES TAUGHT

ElEd 447 – Teaching Math in Grades K-6
Brigham Young University – Fall 2014, Winter 2015

TEd 589R – Numbers and Operations
Brigham Young University – Fall 2014

EDUC 5455 – Mathematics for Elementary Teacher K-8: Numbers and Operations
Southern Utah University – Summer 2014

TEAL 4630 – Methods for Teaching Middle-Level Mathematics
Utah State University – Fall 2013

ELED 4060 – Teaching Mathematics and Practicum
Utah State University – Spring 2012

ELEMENTARY CLASSES TAUGHT

5th Grade Core
Language Arts, Math, Science, Social Studies, Technology, Fine Arts

Bright Ideas
A class focused on Gifted and Talented students. Taught one Saturday per month and summers. Each year has a different theme. I teach K – 6th grade students.

GRANTS FUNDED

Lead Principal Investigator ($474). *Educational Technology for the Classroom*. (2014). Nebo Foundation, Spanish Fork, Utah. Project goal: To provide audio books to classrooms for listening centers.

Lead Principal Investigator ($500). *Educational Technology for the Classroom*. (2010). Nebo Foundation, Spanish Fork, Utah. Project goal: To buy a document camera for the classroom.

Lead Principal Investigator ($250) *Educational Technology for the Classroom*. (2009). Nebo Foundation, Spanish Fork, Utah. Project goal: Mount the projector on the ceiling for easier use.

Lead Principal Investigator ($250). *Educational Technology for the Classroom*. (2009). Nebo Technology Department, Spanish Fork, Utah. Project goal: To get a classroom projector.

PUBLICATIONS

Mantilla, J., Fuhriman, C., Scoubes, K., Teuscher, L., (2007). *Science and Literacy Integration Curriculum,* Brigham Young University, Provo, Utah.

NATIONAL PRESENTATIONS

Twitchell, R., Mantilla, J., & Rushton, S. (2012, April). *Making the Common Core State Standards Accessible with Technology, grades 5 – 8.* Workshop Presentation (Focus Session), National Council of Teachers of Mathematics (NCTM) Annual Meeting and Exposition, Philadelphia, PA.

STATE PRESENTATIONS

Twitchell, R., Mantilla, J., & Rushton, S. (2012, February). *Accessing the Common Core*
State Standards, grades 5 – 8. Utah Council of Teachers of Mathematics (UCTM) Annual Conference, Magna, UT.

Twitchell, R., Mantilla, J., & Rushton, S. (2011, November). *Using Technology in the Common Core State Standards, grades 5 – 8.* Utah Coalition for Educational Technology (UCET) Annual Conference, Sandy, UT.

INVITED PRESENTATIONS

Invited presenter for TEAL 7551: Mathematics Education Research Foundations (for Dr. Patricia Moyer-Packenham) (2013, March).

Invited presenter for ELEM 4060: Teaching Mathematics and Practicum (for Dr. Amy Brown) (2012, March).

Invited presenter for ELEM 4060: Teaching Mathematics and Practicum (for Dr. Amy Brown) (2012, October).

NATIONAL LEADERSHIP & SERVICE

Reviewer Association of Mathematics Teacher Educators (AMTE) Conference Proposals 2011. 2012, 2013

UNIVERSITY LEADERSHIP & SERVICE

Interviewer Utah State University – College of Education (2011-2014) Co-Interviewer of group assessments for applicants in the Elementary Education Program.

Internship Utah State University – College of Education (2011-2012) Trained pre-service teachers to provide feedback to students online for mathforum.org through Drexel University.

SCHOOL LEADERSHIP

School Community Council Co-Chair, Larsen Elementary, Nebo School District
2013 - 2014

Technology and Computer Specialist, Larsen Elementary, Nebo School District
2010 - 2014

Wellness Facilitator, Larsen Elementary, Nebo School District
2007 - 2012

Science Fair Chair, Larsen Elementary, Nebo School District
2006 – 2010

Student Council Advisor, Larsen Elementary, Nebo School District
2006 - 2007

CONFERENCES ATTENDED

Association of Mathematics Teacher Educators (AMTE) 2015. Orlando, FL

National Council of Teachers of Mathematics (NCTM) 2012. Philadelphia, PA

NCSM Leadership in Mathematics Education 2012. Philadelphia, PA

BYU Partnership Leadership Conference 2011, 2013, 2015. Salt Lake City, UT

BYU Partnership Writing Conference 2010, 2012. Salt Lake City, UT

Utah Coalition for Educational Technology (UCET) 2008, 2009, 2010, 2011, 2012, 2013, 2014. Salt Lake City, UT

PROFESSIONAL DEVELOPMENT COURSES TAUGHT

Nebo School District, Spanish Fork, Utah. *Social Studies Core Workshop* (2009, June).

PROFESSIONAL DEVELOPMENT COURSES COMPLETED

New Utah Math Core Training
2012
Nebo School District

GAINS: Drama Theatre for Elementary Teachers
2012
Nebo School District

Google Apps for Education
2011
Nebo School District

GAINS: Music Theatre for Elementary Teachers
2011
Nebo School District

Arts Collaboration in Education (ACE)
June 2010
Nebo School District

Elementary Fine Arts Training
2009 – 2010 School Year
Nebo School District

Classroom Management
July 2009
Nebo School District

Math and Technology Part II
July 2009
Nebo School District

Comprehensive Math Initiative with DMI System of Tens
2009 – 2010 School Year
Nebo School District

Comprehensive Math Initiative with DMI Meaning of Operations
2008 – 2009 School Year
Nebo School District

Integrating Technology and Curriculum
June 2009
Utah Education Network

K-6 Math Strategies for Student Success
2008 – 2009 School Year
Nebo School District

CORE Academy
Summer 2007 and 2010
Utah State Office of Education

New Teacher Induction
Summer 2006
Nebo School District