

Fall 2012

An Investigation of the Self-Efficacy Beliefs of Black and Hispanic Students that have Experienced Success or Failure in Mathematics

Dayton Fennimore Hibbs

Follow this and additional works at: <https://scholarship.shu.edu/dissertations>



Part of the [Education Commons](#)

Recommended Citation

Hibbs, Dayton Fennimore, "An Investigation of the Self-Efficacy Beliefs of Black and Hispanic Students that have Experienced Success or Failure in Mathematics" (2012). *Seton Hall University Dissertations and Theses (ETDs)*. 1836.
<https://scholarship.shu.edu/dissertations/1836>

**AN INVESTIGATION OF THE SELF-EFFICACY BELIEFS OF BLACK AND
HISPANIC STUDENTS THAT HAVE EXPERIENCED SUCCESS OR FAILURE IN
MATHEMATICS**

by

Dayton Fennimore Hibbs

Dissertation Committee

Martin Finkelstein, Ph.D., Mentor

Joseph Stetar, Ph.D.

Mei-Lin Chang, Ph.D.

Dawn Kemp, Ph.D.

Submitted in partial fulfillment of the
Requirements of the Doctor of Education
Seton Hall University

December 2012

SETON HALL UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN SERVICES
OFFICE OF GRADUATE STUDIES


APPROVAL FOR SUCCESSFUL DEFENSE

Doctoral Candidate, Dayton F. Hibbs, has successfully defended and made the required modifications to the text of the doctoral dissertation for the Ed.D. during this Fall Semester 2012.

DISSERTATION COMMITTEE
(please sign and date beside your name)

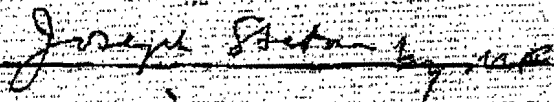
Mentor:

Dr. Martin Finkelshtien

 12/3/12

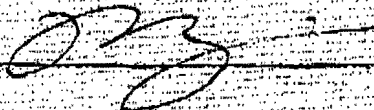
Committee Member:

Dr. Joseph Stetar

 12/3/12

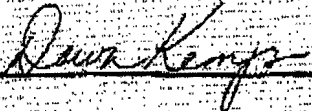
Committee Member:

Dr. Mei-Lin Chang

 12/6/12

Committee Member:

Dr. Dawn Kemp

 12/3/12

The mentor and any other committee members who wish to review revisions will sign and date this document only when revisions have been completed. Please return this form to the Office of Graduate Studies, where it will be placed in the candidate's file and submit a copy with your final dissertation to be bound as page number two.

ABSTRACT

This study explored the self-efficacy beliefs of Black and Hispanic middle school students that have experienced success or failure on a standardized mathematics test. Using qualitative analysis techniques, this study sought to complement the existing extensive quantitative literature on student self-efficacy. Seventeen middle school students in grades 6 through 8 were interviewed with varying experiences of success or failure on the Mathematics portion of the Georgia Criterion Referenced Competency Test (CRCT) over a 3 year period. The results revealed that students with multiple failures (limited mastery experience) were more apt to express negative self-efficacy beliefs associated with mathematics compared to their higher achieving peers. In addition, it was discovered that grade level strongly influenced the self-efficacy beliefs where students in upper middle grades more routinely expressed negative beliefs than students in the lower middle grades. This research supported the assertion that educators can reference constructs such as student self-efficacy as a means to understand the consequences of student failure and can perhaps raise achievement by employing improvement strategies that directly address student self-efficacy perceptions.

ACKNOWLEDGEMENTS

Although I am typically someone that believes most things are possible, acknowledging everyone involved in the accomplishment of this dissertation is almost impossible. This work is the culmination of the collective support of many individuals.

Dr. Finkelstein, thank you for your ongoing commitment to this process. I am still in awe by your level of responsiveness and support. You permitted me to take a unique path through the dissertation process that, in turn, supported my passion, improving the conditions for all students.

To my professional colleagues, you continue to inspire me on a daily basis. During the difficult moments often associated with pursuing a doctorate, numerous colleagues often provided words of encouragement that nudged me forward.

To all of the students that I have had the privilege of impacting, I often learned more from you than you learned from me. Working with all of you was one of most impactful times in my career. I have continuously drawn upon these experiences as I moved into positions of leadership.

Mentors often play a critical role in the success of others. This is certainly true in my case. Dr. Jones, two simple words, thank you. From day one, you have unselfishly provided continues guidance, support, and expertise. Thank you for being such a special person in my life.

I am much indebted to my family. In particular, I cannot thank my mother, step-father, and mother-in-law enough. You inspired me throughout this journey.

Most importantly, I am grateful to my beautiful wife beyond words. This process was a sacrifice for the both of us. Please know that this is not my degree, it is OURS!

DEDICATION

This work is dedicated to my grandmother, Mildred Most, and late grandfather, Clarence Most. Thank you for providing me with the *self-efficacy* to pursue such a challenging and rewarding profession. Please know that any success I have been blessed to achieve is in your honor.

Table of Contents

	Page
Abstract	ii
Acknowledgements	iii
Dedication	iv
Table of Contents	v
List of Tables.....	vii
List of Figures	viii

Chapter I: INTRODUCTION

Statement of the Problem.....	1
Background of the Problem	2
Purpose/Significance of Study	5
Research Questions	6
Hypotheses	6
Study Limitations	7
Study Delimitations	8
Definition of Terms.....	8

Chapter II: REVIEW OF RELATED LITERATURE

Introduction.....	11
Problem Identification	
The Achievement Gap	11
Impact of Demographics on Achievement	14
Closing the Achievement Gap – Contemporary Findings	17
The Middle Grades	20
Investigating Sources of the Problem	
Self-Efficacy vs. Self-Concept.....	21
Theoretical Foundations of Self-Efficacy	21
Self-Efficacy & Academic Motivation	23
Self-Efficacy & Mathematics	24
Student Self-Efficacy - Implications for Educators	26
Extending the Research	
Qualitative Research in Self-Efficacy	28
Future Research	29
Summary	29

Chapter III: RESEARCH DESIGN AND METHODOLOGY

Introduction.....	31
Participants & Setting	31
Research Design.....	33
Instrumentation	33
Procedures.....	36

Data Analysis	36
Reliability & Validity	38
Summary	40

Chapter IV: ANALYSIS OF DATA

Introduction	41
Section One: Findings Related to the General Research Question	43
Section Two: Analysis of Mediating Variables	46
Mastery Experience	50
Mastery Experience & Perceived Confidence	54
Social Persuasion (Teachers/Adults)	58
Social Persuasion (Peers)	68
Vicarious Experiences (Family/People Admire)	72
Vicarious Experiences (Peers)	75
Emotional and Physiological States	78
Section Three: Most Influential Mediating Variable	83
Conclusion of Analysis	87

Chapter V: CONCLUSION

Introduction	88
Findings Related to the General Research Question	88
Findings of Subsidiary Research Question 1 – Grade Level	89
Findings of Subsidiary Research Question 2 – Gender	90
Findings of Subsidiary Research Question 3 – Race	91
Findings of Subsidiary Research Question 4 – Most Influential Variable	92
Final Discussion	92
Recommendations for Practice	93
Recommendations for Future Research	94
Implications for Education Policy	96

References	98
------------------	----

Appendix A: IRB Approval	106
Appendix B: Parent Letter of Solicitation	108
Appendix C: Informed Consent Form	110
Appendix D: Student Letter of Solicitation	113
Appendix E: Student Assent Form	115
Appendix F: Email; permission to use interview protocol	117
Appendix G: Shorthand Codes	119
Appendix H: Interview Protocol Coding Tables	122
Appendix I: Quantitative Coding Chart	126

List of Tables

	Page
Table 1 Participant Identification Protocol.....	32
Table 2 Student Interview Protocol.....	34
Table 3 Definition of Outcome Codes.....	37
Table 4 Participant Unique Identifiers and Descriptors	42
Table 5 Summary of Findings Related to the General Research Question	46
Table 6 Interpretive Codes Defined with Examples.....	47
Table 7 Interpretive Codes and Code Band Descriptions	48
Table 8 Foundational Questions from Self-Efficacy Interview Protocol.....	50
Table 9 Mastery Experience and Self-Description as a Student	53
Table 10 General Confidence and Mastery Experience	57
Table 11 Social Persuasion & Messages Received from Teachers.....	66
Table 12 Social Persuasion & Teacher Messages to Parents	67
Table 13 Social Persuasion & Recognition from Others	67
Table 14 Social Persuasion & Messages from Peers.....	71
Table 15 Vicarious Experiences from Family and People Admire	74
Table 16 Vicarious Experiences from Peers' Performance.....	78
Table 17 Emotional/Physiological States & Mathematics Tasks.....	83
Table 18 Definition of Descriptors.....	84
Table 19 Average Response Score per Variable Studied	84
Table 20 Strategies to Increase Student Self-Efficacy	93

List of Figures

	Page
Figure 1 Average Response Score by Participant.....	85
Figure 2 Average Score by Variable Studied	86

Chapter I

INTRODUCTION

Statement of the Problem

Success in mathematics continues to challenge numerous American students. This struggle is especially accentuated for minority children and has contributed to a sustained achievement gap between White students and minority subgroups. The achievement gap has been well documented since the inception of standardized testing (Snyder, Dillow, & National Center for Education Statistics, 2011). Although ample literature exists on the subject, the achievement gap continues to persist. Through the federal No Child Left Behind Act (NCLB), the United States government has taken steps to hold educators accountable for closing the achievement gap among all subgroups of students (i.e. Black, Hispanic, students with disabilities, etc.) (No Child Left Behind [NCLB], 2002). By 2014, all students must meet the English language arts and mathematics standards of their perspective states. Schools failing to meet these Federal targets will not achieve Adequate Yearly Progress (AYP) and potentially fall subject to sanctions; unless the school resides in a state that has been granted a waiver from NCLB. However, even in states with NCLB flexibility, having systems in place to monitor and address the achievement gap is still a federal requirement (U.S. Department of Education, 2012).

If the existing literature includes substantial evidence of proven best practices for promoting achievement in mathematics, why do students continue to struggle? Perhaps we need to look at the broader conditions associated with academic achievement. In addition to academic strategies, the research suggests that a student's sense of self-efficacy impacts achievement (Pajares & Urdan, 2006). I contend that even well-intended interventions may not prove beneficial if the outcomes do not increase a student's self-efficacy to successfully navigate

coursework in mathematics. The purpose of this research is to use the theoretical constructs of social cognitive theory to uncover the psychological conditions associated with academic performance of middle school students in mathematics. I aim to challenge practitioners as to how they can help students improve self-efficacy and concentrate efforts beyond traditional best practices.

Background of the Problem

According to the *The Nation's Report Card* produced by The National Center for Education Statistics (2009), achievement gaps in mathematics remain prevalent with Black and Hispanic students, as well as, among students living in poverty. This conclusion was realized from the most recent National Assessment of Educational Progress (NAEP) in grades 4 and 8. Even though the most recent evidence demonstrates progress, these data have remained a point of concern since the initial NAEP assessments dating back to 1973 (Aud et al., 2010). For instance, the achievement gap has narrowed for the Black demographic. In 1973, Black 13-year-olds earned a scale score of 228 as opposed to a score of 274 for White students (achievement gap of 46 points). By 2008, the achievement gap closed to 28 points based upon the White subgroup earning an average scale score of 290 points and the Black subgroup earning an average scale score of 262 points. Hispanic 13-year-olds earned a scale score of 239 in 1973, 35 points behind their White peers. In 2008, the achievement gap for Hispanic students narrowed to 22 points. Although the evidence suggests a narrowing of the achievement gap, the difference in performance between ethnic groups remains significant.

A similar trend surfaced in the state of Georgia as a result of the implementation and assessment of the Georgia Performance Standards (GPS). Georgia students in grades 3 through

8 are assessed in the spring of each year on the GPS through the administration of the Criterion-Referenced Competency Tests (CRCT) (Georgia Department of Education, 2011). They are tested in all core subject areas including mathematics. Based upon their performance, students fall into one of three proficiency levels: *Does Not Meet, Meets, or Exceeds*. In the middle grades, the percentage of White students meeting and exceeding standards has outpaced Black and Hispanic students since the inception of the CRCT. After the 2011 administration of the CRCT, Black sixth through eighth grade students lagged the furthest behind with 71.66% meeting or exceeding standards in mathematics as compared to 88.33% of White students.

Although performance levels are higher in a suburban Georgia school district, the mathematics achievement gap of Black and Hispanic students in the middle grades mirrors national and state trends (The Governor's Office of Student Achievement, 2011). As a result of the 2011 CRCT administration in mathematics, 77.67% of Black students in grades 6 through 8 met or exceeded standards and 81.67% of Hispanic students respectively. Conversely, 93.67% of White students in the middle grades met or exceeded standards.

Math interventions are often focused on increasing the cognitive functions of students. Researchers such as Marzano, Gaddy, and Dean (2000), have identified high impact strategies that have proven successful in assisting students towards gaining mastery. This includes instructional methods such as identifying similarities and differences, using graphic organizers to display information, and teaching note taking skills. When teachers formatively evaluate student progress towards mastery, they look directly at the students' learning outcomes (i.e. how many the student answered correctly versus incorrectly). If a student does not perform well, an effective teacher will further differentiate his or her methods as a means of remediation and then formatively assess again at the end of the treatment. Although this academic cognitive approach

produces gains in student learning, there are learners that still continue to underperform as highlighted in the national trends (National Center for Education Statistics, 2009).

In a suburban Georgia school district, these results have persisted for middle school students even though school personnel have adopted best practices such as Response to Intervention (RtI). RtI includes a three-tiered series of interventions for assisting struggling students with each level supported by researched-based strategies (Gersten et al., 2009). One such strategy includes providing identified struggling students with additional time to access the curriculum. Hence, students identified as being at-risk of failure (not meeting standards in previous years) were provided with a level two RtI strategy of additional instructional time in a smaller group setting where they worked strategically on their skill gaps.

While focusing on academic intervention is critical for struggling students, research indicates that another construct, self-efficacy, must be addressed. Social cognitive theorists argue that students' senses of self-efficacy play formidable roles in achievement outcomes. According to Bandura (1993), self-efficacy is defined as people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. Four major processes are associated with self-efficacy: affective, cognitive, motivation, and self-regulation. Affective processes include emotional states while cognitive processes include the functions of thinking during the acquisition of information. Motivation is the level of intensity one puts forth during a course of action. Self-regulation involves an individual's ability to exercise control over processes. Research suggests these areas need further exploration for our persistently struggling students; especially when high impact strategies have not proven entirely effective. As noted by Pajares (1996), researchers need to assist practitioners beyond

strategies for skill improvement; they must also provide teachers with tools to assist students in altering poor self-judgments.

Perceived student self-efficacy is informed by four sources: mastery experience, social persuasion, vicarious experience, and physiological states (Bandura, 1994). Mastery experience, the most prominent source, develops over time as students experience successes and failures. Overall, success resulting from overcoming obstacles produces positive mastery experiences and higher levels of efficaciousness. Social persuasion is developed as students interact with the individuals around them. For instance, verbally encouraging parents and teachers can raise a student's self-efficacy. Vicarious experiences occur as students view the successes and failures of others. A student's sense of self-efficacy is more positively impacted if he or she observes someone with common characteristics (age, gender, perceived similar abilities, etc.) experience success. Lastly, as students judge their capabilities, they also rely on their emotional states. For example, anxiety and stress lowers self-efficacy while excitement and positive mood increases self-efficacy. Teachers should consider these four sources to better understand previous student achievement and improve subsequent academic performance.

Purpose and Significance of the Study

The purpose of this study was to empower educators to realize the importance of self-efficacy in academic achievement. This study qualitatively evaluated the self-efficacy beliefs of middle school Black and Hispanic students that have experienced success and failure on a high stakes tests in mathematics. The large body of quantitative research linking self-efficacy with student achievement forms the theoretical foundation of this study. Using qualitative techniques, I sought to expand on the existing body of quantitative research while addressing the current qualitative gap in the literature. The results of the analysis provided insight as to the

prevalence and psychological underpinnings of the mathematics achievement gap. My intent is to present educational leaders with a different paradigm to holistically address the needs of struggling students.

Research Questions

The following primary focus question guides this research study: How does success versus failure affect self-efficacy beliefs of middle students in mathematics? Subsidiary questions relevant to this study include:

1. How is the relationship between success/failure and self-efficacy mediated by grade level (grades 6-8)?
2. How is the relationship between success/failure and self-efficacy mediated by gender?
3. How is the relationship between success/failure and self-efficacy mediated by race?
4. Among the variables of grade level, gender, and race, which variable has the most mediating influence on the relationship between success/failure on a standardized test and perceived self-efficacy in mathematics of middle school students?

Hypotheses

In response to the research questions, I hypothesize the following:

- Students experiencing repeated failure on high stakes tests in mathematics generally demonstrate greater negative attitudes towards future mathematical tasks than their more successful peers.
- The self-efficacy source of social persuasion increases in impact as students matriculate through the middle grades; especially for Black and Hispanic children.

- Students with negative self-efficacy beliefs will articulate experiences where they routinely observed (vicariously) others also struggling with mathematics. The opposite experience will be articulated by passing students.
- Students with habitual failure in Mathematics will associate high levels of stress with high stakes testing whereas passing students will demonstrate higher levels of excitement.
- The need for a nurturing, positive relationship with a mathematics teacher will be a reoccurring theme expressed by the study participants.

Study Limitations

While my intent is to conduct a study that would produce implications relevant to other education environments, this study includes the following limitations:

1. This proposed qualitative study is limited to 17 Black and Hispanic sixth through eighth grade students from one suburban Georgia school district. Six students from each grade level (3 males & 3 females) will participate in the interview process. Ideally, a larger sample would provide additional data to either support or refute the conclusions of this study.
2. The concept of self-efficacy is a multidimensional construct (Bandura, 1997) and is not easily measured (Choi, Fuqua, & Griffin, 2001).
3. The participants attended various schools throughout their educational careers which could account for a wide-range of educational experiences.
4. Due to the interview protocol implemented, the results of this study are limited to the individual perceptions of the participants. The study could be strengthened by also interviewing individuals with direct knowledge of the participants' abilities.
5. All qualitative analyses are limited to my interpretations and perceptions.

6. There is derisory information from researchers contending the advocacy of self-efficacy.

Study Delimitations

As I explored strategies for evaluating the impact of repeated failure, various methods were evaluated. Analyzing failure through the lens of self-efficacy was selected based upon the quantitative data existing in the literature. However, being that I sought feedback directly through student interviews, qualitative methods were employed which will build upon the existing quantitative research. This study is constrained by a variety of factors:

1. The study is delimited by time; between three administrations of the criterion-referenced high stakes test.
2. Only middle students (grades 6-8) from one Georgia suburban school district were selected to participate.
3. There is a high probability that most of the students resided in low income households as the schools in which the students attended held school-wide Title I distinctions.
4. I selected a self-efficacy interview protocol previously utilized by an established researcher in order to promote validity and reliability.

Definition of Terms

Adequate Yearly Progress (AYP). The measures used to hold schools accountable for yearly progress of students in English Language Arts and Mathematics (No Child Left Behind, 2001).

Achievement Gap (score gap). The achievement differential on standardized tests between students of different ethnicities (KewalRamani, Gilbertson, Fox, Provasnik, & National Center for Education Statistics (ED), 2007)

At-Risk Student. A child in danger of academic failure (failing a grade level or has already failed one or more grade levels) or in danger of dropping out (Williams, Haertel, et al., 2010).

Black. A person with origins in any of the Black racial groups of Africa (National Center for Education Statistics, 2002).

Emotional and Physiological States. Involves the process of how individual's interpret their moods and feelings (Bandura, 1986).

Free and Reduced-Price Lunch Program. A federally assisted food and nutrition program for children of low-income families (KewalRamani, Gilbertson, Fox, Provasnik, & NCES 2007).

Georgia Criterion-Referenced Competency Tests (CRCT). Annual assessments in the core content areas designed to measure students' mastery of the Georgia Performance Standards (Georgia Department of Education, 2010).

Georgia Performance Standards. The content Georgia students must learn at each grade level in each subject area (Georgia Department of Education, 2010).

High-Stakes Testing. Tests that have serious consequences for students such as grade retention if a specified score is not met (Jones, Jones, & Hargrove, 2003).

Hispanic. A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race (National Center for Education Statistics, 2002).

Mastery Experience. Previous successes an individual attains (Bandura, 1986).

No Child Left Behind Act of 2001 (NCLB). A United States federal law that aims to improve academic achievement for all learners through increased school accountability (NCLB, 2002).

Response to Intervention. A tiered framework that identifies and assists struggling students before they fall behind academically (Gersten, et al., 2009).

Self-Efficacy. "...beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3).

Self-Regulation. Exercise of influence over one's own motivation, thought processes, emotional states and patterns of behavior (Bandura, 1994).

Social Persuasion. Encouragement an individual receives from others that he/she is capable of completing a particular skill (Bandura, 1986).

Vicarious Experiences. The modeling (observations) a person experiences from witnessing the behavior of others (Bandura, 1986).

Chapter II

REVIEW OF RELATED LITERATURE

Introduction

Several key areas related to the development of this research study are encompassed in the review of related literature. These areas were explored sequentially. First, the mathematics achievement gap was examined to highlight the persistence of underperforming Black and Hispanic groups in the middle grades and the implications of this continued failure. Then, current recommendations in the literature on closing the achievement gap were reviewed followed by an in-depth appraisal of the challenges associated with the middle grades. The goal of this sequence was to clearly identify a persistent problem that merits continued research.

To investigate sources of the identified problem (continued failure of Black and Hispanic students as evidenced by the Mathematics achievement gap), I proposed examining failure through the lens of self-efficacy. Bandura's (1986) theoretical construct of social cognitive theory was initially reviewed and the sources of self-efficacy were then described in detail. In addition, related attributes such as student motivation were summarized. Finally, I discussed methods of measuring self-efficacy and suggested the value of qualitative research to address current gaps in the literature as purported in the existing literature.

The Achievement Gap

According to *The Nation's Report Card* (National Center for Education Statistics (ED), 2009), achievement gaps in Mathematics remain prevalent among Black and Hispanic students, as well as, between students that do and do not qualify for free lunch services. The report analyzed students in grades 4 (168,000 students) and 8 (161,000 students) collectively

representing the following demographic groups: White, Hispanic, Black, Asian/Pacific Islander, American Indian/Alaska Native, male/female, and socio economic status. The participating students were administered the National Assessment Educational Progress (NAEP) Mathematics Assessment which assessed student grade level mastery in number properties and operations; measurement; geometry; data analysis, statistics, and probability; and algebra. Once the fourth grade scores were analyzed, a 26-point score gap in mathematics scores between White and Black students was realized. This gap is similar to the findings from a previous evaluation in 2007 where there was 21-point score gap between White and Hispanic students. This result has remained relative unchanged since 1990. In addition, students that did not qualify for the federal lunch program scored 24-points higher than students qualifying for free lunch. Similarly, the achievement gap increased in eighth grade with a 32-point gap between White and Black students and a 26-point gap between White and Hispanic students. The achievement gap represented by socio-economic status was also apparent. Students not eligible for the federal lunch program scored 29 points higher than their peers qualifying for free lunch.

As is reflected in the Testing Brief released by the Georgia Department of Education (Georgia Department of Education, 2011), Hispanic and Black students have demonstrated lower levels of academic achievement in Mathematics compared to their White counterparts. Georgia elementary and middle school students are administered the Criterion-Reference Comprehensive Test (CRCT) each year in five core subject areas: language arts, reading, mathematics, social studies, and science. Students are placed in one of three levels according to their scale score: *Does Not Meet, Meets, or Exceeds*. For the purposes of this review, the results of the mathematics portion of the test for middle grades students were analyzed. In each grade level (1-

8), White students consistently outperformed Black and Hispanic students. This is a trend that has continued since the inception of the standards-based Mathematics CRCT.

Georgia implemented a phase-in process as the Georgia Performance Standards (GPS) were introduced. Sixth grade students were first assessed in 2006 on the GPS in mathematics, seventh grade followed in 2007, and then eighth grade in 2008. In 2008, the following percentage of middle school Black students met and exceeded standards : sixth grade, 56%; seventh grade ,70%;, and eighth grade, 49%. Hispanic students performed as follows: sixth grade, 65%; seventh grade, 77%; and eighth grade,55%. White students outperformed Black and Hispanic students in 2008 with the following results: sixth grade,79%; seventh grade, 90%; and eighth grade, 79%. From 2008 to 2011, the performance of Black and Hispanic did improve, however the achievement gap has sustained in some grade levels. For instance, in 2008 the achievement gap between sixth grade White students and Black students was 23%. In 2011, the gap remained steady at 22%. Hispanic sixth grade students performed slightly better with the achievement gap of 14% in 2008, decreasing to 11% in 2011. Seventh grade Hispanic and Black students have narrowed the gap to 11% and 4% respectively. However, in 2011, the achievement gap for Black and Hispanic students remained significant with an achievement gap of 17% for Black students and 10% for Hispanic students.

In a suburban Georgia school district, the achievement gap for middle school students is also prevalent (The Governor's Office of Student Achievement, 2011). After the 2011 Mathematics CRCT administration, the achievement gap of Black and Hispanic students compared to White students remained on average greater than 10%. Twenty-six percent of Black students and 20% of Hispanic students did not meet standards versus 9% of White students (average achievement gap of 14%). The achievement gap for seventh graders was only

slightly better with 15% of Black students and 16% of Hispanic students not meeting standards compared to 2% of White students (average achievement gap of 13.5%). This trend continued for eighth grade students. Eight percent of White students met and exceeded mathematics standards compared to 26% of Black students and 19% of Hispanic students (average achievement gap of 14.5%). Unfortunately, these data provides further evidence of the continued achievement gap among White students and their Hispanic or Black peers.

Of the middle school students (grades 6-8) that took the Mathematics CRCT in March 2011, 3 years of historical test data were available for 64.42% of the students, 2 years of data were available for 12.40% of students, and 1 year of data were available for 23.18% of students. From this data set, 350 failed the test one time (21.06%) and 224 students failed more than one time (13.48%). Of the three grade levels examined, eighth grade held the highest rate of students with repeated failure at 16.96%. While these data point to the continued failure of some students, considerable data are missing that could further suggest the extent to which failure is occurring. I was unable to collect the historical data of 113 test takers in the district from grades 6 through 8 that did not meet standards on the 2011 Mathematics CRCT. Taking into account the continued achievement gap for middle school Black and Hispanic students both at state and local levels, a significant percentage of these students most likely also experienced repeated failure.

Impact of Demographics on Achievement

The authors of *Status and Trends in the Education of Racial and Ethnic Minorities* (KewalRamani et al., 2007) provided insight as to the indicators that may contribute to the achievement gap. For example, the percentage of children living in poverty is higher for Black and Hispanic students than for White students. The negative impact of poverty on student

achievement is well documented. According to Caro (2009), the achievement gap in mathematics tends to widen over time for children of low socio-economic status. The gap in the elementary grades remains stable and then builds in the middle grades and into high school. The authors provided further clarity, “In other words, achievement differences among students of varying socio-economic backgrounds remain invariant during elementary school and sharply widen in the transition from elementary school to middle school” (p 577). Consequently, the average gap between the ages of 7 to 11 nearly doubles between the ages of 12 to 15. The percentages of children living in poverty are higher for Black and Hispanic students, making this trend of particular relevance to this study.

In addition, the study conducted by KewalRamani, Gilbertson, Fox, Provasnik, and NCES (2007) found that White students were more likely to reside in households with parents of higher education attainment than the parents of Black and Hispanic students. A parent’s level of education tends to impact various areas directly or indirectly related to schooling such as levels of parental involvement, a child’s sense of self-efficacy, and socio-economic status. Upon review of the NAEP scores in mathematics since 1973, the impact of a parent’s level of educational attainment on their children’s achievement is evident (Snyder et al., 2011). The NAEP reports divide parents among four categories: (a) did not finish high school, (b) graduated high school, (c) some education after high school, or (d) graduated college. A continuum of higher levels of achievement commiserate with the parent’s level of education exists for each of the 11 years the NAEP has been administered. For example, in 1982 the students of parents who were college graduates outperformed students of parents without a high school diploma by 31 scale points. The gap has narrowed over time; however, the evidence suggests much ground still exists. The most recent NAEP assessment (2008) resulted in students of parents who are college

graduates outperforming students of parents who did not complete high school by 23 scale points. After researching the relationship between student achievement and a parent's level of educational attainment, Desforges and Abouchaar (2003) discovered an important connection. According to their research, parental education is positively related to parent-teacher contact. The higher degree of education attainment, the more likely parents are to become involved in their child's education. Through citing the work of Kohl et al., Desforges and Abouchaar found that parents with little education were less apt to serve as "co-educator."

As noted in the *Status and Trends in the Education of Racial and Ethnic Minorities* (KewalRamani et al., 2007), Black students tend to maintain higher levels of grade retention. A longitudinal study of grade retention conducted by Jimerson and Ferguson (2007) provides further evidence. They followed 72 students until their eleventh grade year, all of whom were retained at least once between kindergarten and second grade. An analysis of fourth through eleventh grade achievement showed that promoted students consistently outperformed their previously retained peers. In some cases, the retained students also exhibited more aggressive behaviors. The authors further stressed that retained students had a propensity to drop out of school at a higher rate than their on-grade level peers.

Finally, KewalRamani, Gilbertson, Fox, Provasnik, and NCES (2007) identified that families at or above the poverty line were more likely to enroll their children in preprimary programs. Students enrolled in preprimary programs tend to demonstrate better preparedness when they enter kindergarten. In a descriptive study entitled, "A Comparison of the Mathematical Skills of First Graders With and Without Preschool Education", Dursun (2009) identified the benefits of preschool programs for preparation in mathematics. The sample consisted of 150 Turkish elementary school students. Students that attended preschool (5 to 6

years of age) demonstrated higher achievement gains in the skill areas of addition and subtraction. Since addition and subtraction are important foundational skills, Durson asserted that a deficit in these areas could produce a detrimental impact on the achievement gap starting in the primary grades. This finding amplifies the compounding debilitating and iterative effects of poverty on academic achievement.

Closing the Achievement Gap – Contemporary Findings

In a large-scale California study entitled, *Gaining Ground in the Middle Grades: Why Some Schools Do Better*, the characteristics of high performing middle schools were identified (EdSource, 2010). The study included an extensive survey of principals, English Language Arts (ELA) teachers and mathematics teachers in grades 6 through 8 from 303 schools. The research question for the study was, “Why do some middle grades schools clearly outperform others on standards-based tests even though they serve a similar student population?” (p. 3). Using multiple regression analyses, the researchers identified the reported practices that were positively and significantly associated with higher student test scores (not with lower test scores). These practices were divided into 10 study domains of practice: intense focus on academic outcomes; standards-aligned instruction and curriculum; use of data to improve instruction and learning; proactive academic interventions; teacher competencies, evaluation, and support; principal leadership; superintendent leadership and district support; school environment; organization of teaching and instruction; and attention to student transitions.

A key finding of the middle grades study indicated that higher-performing middle grades schools focused on early identification and proactive intervention for students with greater academic needs. Struggling students may be identified as performing 2 or more years below

grade level or may be at risk of failure for the current year. Early identification allows educators to quickly match interventions to students in need of remediation. For example, higher performing middle schools required extra instructional time during the regular school day (may replace an elective) for at-risk students. However, Williams, et al. (research team of EdSource 2010 study) iterated that they reviewed numerous characteristics of effective middle schools and recommended for schools to implement comprehensive programs reflective of all 10 aforementioned domains.

In an effort to synthesize the empirical research available for interventions in mathematics, Baker, Gersten, and Lee (2002) used meta-analytic techniques to analyze 15 studies from an original pool of 194 studies. In order to meet the conditions of the study, the total duration of the interventions had to be at least 90 minutes in duration and the interventions had to serve participants at risk of poor performance in mathematics. After calculating the strength of the effect of each intervention over the control group, four broad categories were developed: (a) providing data or recommendations to teachers and students; (b) peer-assisted learning; (c) explicit teacher-led and contextualized teacher-facilitated approaches; and (d) providing parents with information about student successes. With the first recommendation, students and teachers must be provided with progress monitoring data. It is important for the student to own his or her progress and for teachers to regularly respond (providing instructional treatments) to the student's needs based upon his or her performance data. Secondly, peer-tutoring increased student achievement when students worked in pairs and rotated as tutor/tutee. The greatest gains with the peer tutoring intervention were realized in the area of computation. Third, struggling students tended to benefit from explicit teacher-led instruction. Before moving to more conceptual teaching approaches, it is critical for students to experience the direct

teaching of math concepts and problem solving. In the last key finding, although the number of studies was limited, Baker, Gersten, and Lee noticed a positive impact on achievement when parents were regularly involved in the progress of their children. The authors of this meta-analytic study contended that parents with a better understanding of their children's deficits tend to be better equipped to provide support from home.

Response to Intervention (RtI) is a relatively new trend in American education utilized to increase student achievement. RtI provides a framework of intervention designed to identify struggling students and intervene with research-based practices as early as possible (Gersten et al., 2009). There are three tiers in which students may fall. Tier 1 applies to all students who receive effective instruction and are universally screened for potential deficits. Students identified as needing supplemental instruction are moved to tier 2. This level includes additional instruction of at least 20-40 minutes, four to five times within 1 week. Tier 3 students fail to respond to previous intervention and often require one-on-one support. The overarching goal of this tiered process is to prevent students from progressively falling behind, thereby reducing compounding gaps in learning.

In the report by Gertsen et al. (year), interventions for mathematics are organized into three categories: (a) Strong, (b) Moderate, and (c) Low. In order to receive a strong rating, the intervention needed to meet the requirements of the What Works Clearinghouse (WWC) which includes: evidence from several well-designed, quasi-experiments or the intervention needed to be supported by well-designed, randomized control trials. Two interventions in tiers 2 and 3 received strong ratings. First, interventions for struggling students should be explicit and systematic (supported by six randomized controlled trials). Secondly, struggling students benefit from instruction on solving word problems that are focused on common underlying structures

(supported by nine randomized controlled trials). Gertsen et al. asserted that students should understand the key vocabulary in the problem and be able to associate the correct property of mathematics. In addition, the researchers stressed that providing students with both examples and non-examples (compare and contrast) is also a vital key to generating understanding.

The Middle Grades

School transitions provide considerable academic challenges for countless students (Alspaugh, 1998; Bedard & Do, 2005; Rockoff & Lockwood, 2010). For at-risk students in particular, these challenges may be compounded. Researchers have found achievement losses in mathematics and language arts associated with school transition (Schwerdt, 2011). For example, students entering sixth grade from elementary school suffered greater achievement losses than students who do not enter middle school. Even more disturbing, research indicates the high school drop-out rates for students attending grade 6-8 middle schools is higher for students with less transition (attended K-8 schools) (Alspaugh, 1998). It is important to note that this model of students moving from to middle school after fifth grade is becoming increasingly popular, therefore it is potentially impacting great numbers of students (Rockoff & Lockwood, 2010).

Alspaugh (1998) purported that the achievement losses realized during school transitions may be linked to other research which points to reductions in self-esteem and self-perception that also occur during transitions. For instance, Seidman and others (1994), identified changes in the academic self-efficacy expectations of poor urban youth as a result of grade transitions. The more students struggled with the transition, the more likely they were to be unprepared for class and earn poor grades. In an earlier study, Wigfield, Eccles, Mac Iver, Reuman, and Midgley (1991) found that losses in self-esteem during transitional years were linked to specific subject areas, such as mathematics. Therefore, as students transition through the middle years, it is

important to understand the development of their self-beliefs and how to improve them (Anderman, National Center for School Leadership, & others, 1994).

Self-Efficacy vs. Self-Concept

It is important to differentiate between two key self-beliefs that have received increased attention because they have presented different findings in the research: self-efficacy and self-concept (Pajares & Schunk, 2002). Self-efficacy is a personal judgment regarding one's ability to perform a task or an activity. On the other hand, self-concept is a more global construct involving the general evaluation of one's self-worth. Self-efficacy has been found to be a stronger predictor of achievement. For instance, in a study of college students, Pajares and Miller (1994) found math self-efficacy was a better predictor of problem solving than math self-concept. Similarly, in a study of 416 high school students, Pietsch, Walker, and Chapman (2003) also determined self-efficacy to be a more suitable predictor of student performance in mathematics than self-concept. While a child's self-concept may have other developmental implications, self-efficacy appears to show more promise in predicting academic achievement.

Theoretical Foundations of Self-Efficacy

Albert Bandura is considered a foundational theorist in the area of self-efficacy and social cognitive theory. Originally trained as a behaviorist, Bandura (as cited in Pajares, 2002) moved beyond classic behaviorism of observable stimuli and responses by focusing on affective processes that involve self-regulation. He proposed that individuals develop self-perceptions of their capabilities from their experiences. Self-perceptions guide the extent to which an individual feels as though they are able to accomplish a particular task (Bandura, 1977). These feelings produce a sense of self-efficacy and can impact one's decision making. Bandura stated, "Not only can perceived self-efficacy have directive influence on choice of activities and

settings, but through expectations of eventual success, it can affect coping efforts once they are initiated” (p. 194).

Bandura (1986) embedded self-efficacy within the larger theoretical framework of social cognitive theory. He espoused that human achievement is influenced by interactions between one’s behaviors, personal factors, and environmental conditions. This ongoing interplay produces self-beliefs that individuals utilize as they exercise control and personal agency. Fortunately, Bandura’s social cognitive theory provides hope and insight for educators. As is described by Pajares (2002), factors such as economic conditions and familial structures do not necessarily directly affect human behavior. Rather, these factors impact self-regulatory influences such as people’s aspirations, emotional states, and self-efficacy beliefs. This perspective is of particular importance to educators as they should realize that student beliefs are not fixed; rather they are a modifiable, task-specific collections of beliefs (Margolis & McCabe, 2004). In other words, even if impoverished students show signs of low self-efficacy and poor academic performance, educators can play a formidable role in improving the learning conditions and self-beliefs of these students.

Bandura (1986, 1997) suggested that human functioning is the result of triadic reciprocal causation known as reciprocal determinism . Behavior, internal personal factors (cognitive, affective, and biological events), and the external environment reciprocally triangulate to develop one’s perceived sense of self-efficacy. Bandura stressed that the three factors are not necessarily of equal strength but that a degree of influence exists among each factor. Efficacious individuals are more willing to accept new challenges and take action when obstacles are presented. Conversely, individuals with less self-efficacy experience difficulty in regulating their own experiences and tend to succumb to institutional impediments.

There are four sources that inform self-efficacy: mastery experience, vicarious experience, social persuasion, and physiological states (Bandura, 1986). Identified as the most influential source of efficacy information, mastery experience involves the development of self-beliefs through the conduit of previous experience. When an experiential outcome is successful, the individual's self-efficacy raises. Individuals also cultivate self-beliefs based upon the experiences of others. This source, vicarious experience, is especially relevant when a person identifies with another individual experiencing success. For instance, if a physically disabled child witnesses a similarly disabled child overcome an obstacle, then he or she may also feel as though he or she can experience comparable success. As Bandura (1986) further explained, social persuasion includes the verbal judgments of others. Individuals are impacted by both negative and positive persuasions. A child with encouraging parents may possess higher self-efficacy than a child with less encouraging parents. The final source informing self-efficacy is physiological states. Academic tasks can create a variety of states such as fear, stress, and anxiety. In order to raise self-efficacy, it is important to enhance one's physical and emotional well-being.

Self-Efficacy and Academic Motivation

Self-efficacy plays a role in academic self-motivation (Zimmerman, Bandura, & Martinez-Pons, 1992). Students with high self-efficacy tend to perceive themselves as capable of regulating their learning. They, in turn, are apt to set challenging personal goals. The proximity of the goals is important however (Schunk, 1991). Proximal goals tend to produce increased levels of motivation and self-efficacy and distant goals are more difficult for students to judge. Students should also be involved in the goal-setting process to maximize self-efficacy and motivation.

Additionally, self-efficacious students are more willing to persist through difficult tasks. They have a stronger motivation to attempt new mathematic tasks even if the assignment or project is deemed as ambitious. Furthermore, the more efficacious a student feels, the more resistant he/she will be to the negative affective impacts of failure (Bandura, 1986). For example, if a student earns a failing grade in a subject in which he or she has otherwise held strong mastery experiences, the student may maintain the motivation to overcome such an academic setback.

Pajares and Schunk (2002) contend that self-efficacy beliefs impact students in a variety of ways. Students make choices based upon what they are confident in attempting. For instance, a student will not select rigorous coursework if he or she does not feel confident in completing challenging material. Secondly, a student's level of efficacy impacts the amount of effort applied and the degree to which he or she will persevere through a difficult task. Students with low self-efficacy may even perceive a task as more difficult than it really is and will give up prematurely. Finally, these feelings of inadequacy produce emotional reactions. While students with high self-efficacy feel motivated to approach complicated tasks, students with low self-efficacy develop anxiety and nervousness.

Self-Efficacy and Mathematics

Mathematics has been studied in great detail in determining the link between self-efficacy and achievement (Pajares & Graham, 1999). Why is there a focus on this particular subject area? Mathematics is a prominent subject and is often the gate-keeper for students to enter into more advanced coursework. Students must also often meet certain scores on mathematic exams in order to enter particular college programs.

As determined by Pajares and Miller (1994), self-efficacy is a highly predictive variable in determining student success in solving math problems. In fact, it was the strongest variable they explored and mediated the effects of other constructs to include self-concept, math anxiety, and perceived usefulness. Their findings were further confirmed by Pajares and Graham (1999). In their study of 273 sixth-grade students, self-efficacy was the only motivation variable to predict student performance in mathematics. In addition, their research on gender, self-efficacy, and mathematics has shown that male and female students tend to show similar levels of efficacy during the elementary years. As time progresses into middle and high school, male students seem to maintain greater efficacy levels than female students. Furthermore, Pajares and Graham discovered that the self-beliefs of middle schools students in mathematics started to diminish as early as sixth grade. In addition, as expected, they found that gifted students held higher self-efficacy, higher self-concept, and earned better performance scores than non-gifted students. Regular education students even demonstrated decreases in self-efficacy for self-regulation which is a vital motivational skill needed when encountering challenging tasks.

The literature has noted that Black students may have substantially lower self-efficacy in their mathematical problem solving than that of their White peers (Pajares & Kranzler, 1995). This finding is consistent with the achievement gap discussed earlier. Interestingly, Black students tend to show above average confidence judgments (inaccurately predicted their success on completing math problems). Perhaps the development of false confidence is a means of coping with particular sources of self-efficacy such as social persuasion.

Student Self-Efficacy - Implications for Educators

The literature is filled with notable contributions by researchers in understanding the relationship between self-efficacy and achievement. As stated by Parjares and Urdan (2006), by 2005 more than 3,000 articles on the concept of self-efficacy were authored. The empirical evidence derived from this research has determined that self-efficacy explains approximately 25% of the variance in predicting academic performance. Educators can utilize this research to confidently inform their practice. For example, the research suggests that unless students believe they are capable of producing the results they desire, they will have little motivation to persevere when challenges ensue. Knowing this, educators should understand how efficacy beliefs develop and how to improve these beliefs as mechanisms to raise achievement for their students.

Simply articulated, failure lowers self-efficacy while success encourages efficaciousness. There are strategies educators can implement to reduce failure that are related to the four sources as espoused by Albert Bandura in 1986. Pajares and Urdan (2006) have provided a variety of strategies for educators built upon these sources. As an example, teachers can raise competence by focusing on specific skill development. The goal is to develop successful mastery experiences for struggling students. In doing so, it is critical to ensure that the complexity of the work assigned is at an appropriate instructional level. As stressed by Pajares and Urdan, "Academic work should be hard enough that it energizes, not so hard that it paralyzes" (p. 345). When failure does occur, it should lead to subsequent achievement. Mastery experience is positively impacted when a failure is overcome by a later success.

Pajares and Urdan (2006) also stressed the importance of vicarious experiences. Students can learn from peer and adult models. Students with low efficacy can learn from watching others make mistakes, engage in coping behaviors, and then succeed. If this sequence is modeled by a peer, the impact becomes even more meaningful. As teachers improve vicarious

experiences for students, they need to be careful in balancing the degree to which students are compared by their skills and abilities. Students with low self-efficacy should develop their own internal expectations that are realistic and personally rigorous. Furthermore, educators should exercise great caution when grouping students by ability as this can destroy students' self-beliefs over time. One solution offered is the differentiation of instruction since it allows students to develop independently without the external pressures of peer comparisons.

Children respond to the verbal messages they receive (Pajares & Urdan, 2006). The judgments they receive can produce self-talk that students begin repeating in their minds. Students can rise to the expectations set for them through social persuasion. If a student hears repeatedly that he or she is not worthy of college, this expectation can become self-fulfilling. It is critical though that praise is delivered specificity and honesty. Failing to provide honest feedback can lead to students struggling with identifying when real accomplishment occurs. Educators should avoid linking accomplishment to intelligence hence it is preferable to praise effort and persistence instead of ability. Additionally, teachers should balance public and private praise. Too much public praise can uplift an individual student but degrade his or her peers.

The final source informing self-efficacy is physiological and emotional states. Students interpret situations through their emotions. Students with high efficacy respond to strong emotional states with energy and hope. On the other hand, students with low efficacy succumb to strong emotional states with debilitating thoughts. Teachers can counteract negative feelings by helping students interpret their feelings. This can encompass providing students with coping strategies when anxious feelings arise. For some students, avoidance behaviors are more comfortable than confronting tasks head-on. They may choose to fail instead of demonstrating persistence with the assigned task. Using this logic, the student can suggest he/she failed due to

a lack of effort and not due to his/her own lack of efficacy. Unfortunately, such an approach creates a cycle of failure and self-deprecating talk. Teachers with students that show these qualities need to foster both competence and confidence. Students should not be allowed to merely give-up and instead be lead through a series of challenging but yet achievable tasks.

Qualitative Research in Self-Efficacy

Compared to the vast quantitative research conducted on student self-efficacy, peer-reviewed qualitative research in this area is vastly limited (Usher & Pajares, 2008). One of the few studies incorporating qualitative methods was employed by Ellen Usher (2009). She utilized a semi-structured interview process to question eight middle school students who demonstrated high or low self-efficacy in mathematics on a previously administered survey. Four higher performing students with high self-efficacy and four poor performing students with low self-efficacy were interviewed. The questions utilized in the semi-structured interview addressed Bandura's hypothesized four sources of self-efficacy and explored the heuristics students use as they form self-beliefs. Upon analysis of the interviews, Usher discovered that mastery experience was a significant source of influence on a student's self-efficacy. Students initially identified as demonstrating low self-efficacy reported few recollections of previous success in mathematics and viewed the amount of effort required as a sign of their inability to navigate difficult coursework. Vicarious experiences also informed self-efficacy. Students with low self-efficacy felt as though they were inferior to their peers with higher self-efficacy. In addition, Usher observed that students with low self-efficacy rarely received positive feedback about their abilities compared to the positive praise experienced by their more successful peers. This observation supports social persuasion as a source of self-efficacy. Finally, students with low self-efficacy demonstrated negative physiological and affective states towards mathematics by expressing feelings of incompetence and fear.

Future Research

Although considerable research has been conducted linking self-efficacy to student achievement, there is ample opportunity for further study. Knowing that students with high self-efficacy tend to perform better in school, the research can now shift to further understanding the sources of self-efficacy and how educators can best counteract students with negative self-beliefs. Furthermore, Usher's (2009) qualitative research suggests promise in using the semi-structured interview process to further explore the four sources of self-efficacy, as well as, supports expansion of the literature through implementing similar qualitative methods. Usher and Pajares (2008) provided a cogent reflection regarding productive next steps for self-efficacy research in the educational setting:

If Bandura (1986) is correct that self-efficacy beliefs constitute the key factor of human agency, and we believe he is, investigating the genesis of these beliefs and the factors that either nurture or deteriorate them is warranted. Findings from this line of inquiry will make substantive contributions to educational theory, thinking practice, and policy. (p. 791)

Summary

This chapter illustrated the need for continued research in closing the unyielding achievement gap between White students and their Black and Hispanic peers. This disparity is well documented in the literature and is a focus of schools and education policy across the nation. As this research study was initiated, I sought to uncover why an achievement gap continues even when ample research exists on the topic. In taking a closer examination of the literature, the social construct of self-efficacy was discovered, and a case was built to explore achievement through an alternate lens other than simply analyzing achievement scores on

standardized tests. I suggested educators need to look deeper into the genesis of student self-beliefs in order to design relevant, effective, and enduring achievement efforts. Perhaps this approach is best articulated by Pajares and Urdan (2006), “One need only cast a casual glance at the world’s landscape to see that attending to the self-beliefs of young people is both a noble and necessary enterprise” (p. 366).

Chapter III

RESEARCH DESIGN AND METHODOLOGY

Introduction

The purpose of this study was to utilize qualitative methods to develop a rich description of the self-efficacy beliefs of middle school students that have experienced success and failure on a high stakes in Mathematics. Rich descriptions enable researchers to gain an in-depth understanding of why complex phenomena may be occurring (Merriam, 2009). The concept of self-efficacy is grounded in social cognitive theory. This is an extremely complex process that involves the reciprocal interplay between cognitive, behavioral, and environmental factors (Bandura, 1986). By capturing detailed accounts through qualitative research, researchers can better understand how self-efficacy beliefs are developed and perhaps, how to improve them as a means to increase student achievement.

Participants and Setting

The participants of this study resided in a suburban district in northern Georgia. Five students attended a sixth grade school and 12 students attended a middle school comprised of seventh and eighth grade students. Initially, the goal was to select three male students and three female students at each grade level of Black or Hispanic heritage. This goal was met except for sixth grade where consent was not available for a female student with repeated failure. To the best extent possible, the following identification protocol was implemented:

Table 1

Participant Identification Protocol

Grade	Gender	Number of Participants	Mathematics CRCT Performance per Participant (2009-2011)
6	Male	3	<ul style="list-style-type: none"> • Experienced 0 failure in last 3 years • Experienced 1 failure in last 3 years • Experienced 2 or more failures in last 3 years
6	Female	3*	<ul style="list-style-type: none"> • Experienced 0 failure in last 3 years • Experienced 1 failure in last 3 years • Experienced 2 or more failures in last 3 years
7	Male	3	<ul style="list-style-type: none"> • Experienced 0 failure in last 3 years • Experienced 1 failure in last 3 years • Experienced 2 or more failures in last 3 years
7	Female	3	<ul style="list-style-type: none"> • Experienced 0 failure in last 3 years • Experienced 1 failure in last 3 years • Experienced 2 or more failures in last 3 years
8	Male	3	<ul style="list-style-type: none"> • Experienced 0 failure in last 3 years • Experienced 1 failure in last 3 years • Experienced 2 or more failures in last 3 years
8	Female	3	<ul style="list-style-type: none"> • Experienced 0 failure in last 3 years • Experienced 1 failure in last 3 years • Experienced 2 or more failures in last 3 years

*Consent was not available for a student of repeated failure.

Both the sixth grade school and the middle school qualify as school-wide Title I institutions. At the time of the study, approximately 65% of the students in the district qualified for free and reduced priced meals. Being that academic achievement is linked to socio-economic status and race, there is a strong likelihood that many of the students in this study within the failure categories were economically disadvantaged students.

There were interventions in place at both institutions to provide struggling students with additional assistance in mathematics. Some of the students with minimal failure and all of the

students with repeated failure in this study were considered struggling students due to failing the state mandated assessment. As a result, they were placed in remedial mathematics classes in addition to the regular on-grade level mathematics course. There were also after school tutoring opportunities available for these students.

Research Design

A qualitative research design was used in this study. The purpose of using qualitative research is to gain a rich and comprehensive description into the lives of the survey participants in order to gather meaning of a phenomenon (Merriam, 2009). In this case, the impact of success and failure in Mathematics is the phenomenon being explored through the theoretical framework of student self-efficacy.

I intended to discover answers that will directly make a positive difference in the lives of students who have experienced continued struggles in mathematics. According to Merriam (2009), "...I believe that research focused on discovery, insight, and understanding from the perspectives of those being studied offers the greatest promise of making a difference in people's lives" (p. 1). Semi-structured interviews provide opportunities for researchers to make these discoveries; hence Merriam's perspective informed my decision to incorporate a semi-structured interview protocol as the qualitative data collection method for this study.

Instrumentation

The interview protocol implemented was designed by Ellen Usher (2009). Dr. Usher's work was originally adapted from Zeldin and Pajares (2000) in order to accurately retrieve information regarding the four sources of self-efficacy. The interview protocol was organized into categories anticipatory of conversational flow; however, some changes in the order were occasionally infused to maintain a conversational feel for the participant. The interview protocol

was continually referenced throughout the interviews to ensure all questions on the interview instrument were addressed. While Usher's interview protocol was developed to comprehensively address all sources of self-efficacy, the last question directly probes these sources (e.g., "What could make you feel more confident about yourself in Mathematics?"). Usher's purpose of using this 'universal' last question was to reinforce the answers elicited throughout the interview. The entire interview protocol is reflected in Table 2.

Table 2

Student Interview Protocol

Background

1. Tell me about where you have previously gone to school.
2. Tell me a little bit about your family.
3. Tell me a little bit about yourself.
 - a. What sort of personality do you have?
 - b. What sorts of things do you enjoy doing outside of school?
 - c. Tell me about your friends.
 - d. Tell me about the people you most admire.
4. Describe yourself as a student.
 - a. What would you say is your best subject in school? Why? Which subject is your favorite? Why?
 - b. What subject do you feel is your weakest? Why? Which subject is your least favorite? Why?
 - c. Tell me about the grades you typically make in school. Do you agree with the grades you were given?

Mathematics experiences and self-efficacy

5. I am going to ask you several questions about a specific subject you study in school. I want you to think hard about all the math classes you've taken as well as other experiences you've had involving math. First, tell me about yourself as a math student.
 - a. What sort of work habits do you have in math?
 - b. If you were asked to rate your ability in math on a scale of 1 (lowest) and 10 (highest), where would you be? Why? How would you rate your confidence that you will do well on the upcoming state math test?
 - c. What do you like to do related to math outside of school? {mastery experiences}
 - d. Tell me about a time you experienced a setback in math. How did you deal with it?
6. Tell me a story that explains to me something about the type of student you are in math. In other words, share with me something that happened to you that involves this subject and perhaps your parents, teachers, or friends.

Mathematics learning environment

7. Tell me about the math class you are in.
 - a. Does your school group students according to their abilities in math? If so, which group are you in?
 - b. How would you say you compare to the rest of your classmates in your math abilities? How about to the rest of the students in your grade?
8. Tell me about the math teachers you've had.
 - a. What sorts of things do your teachers tell you about your performance in math?
 - b. What do you think your teacher(s) would tell your parents about how you do in math?
 - c. How does your teacher make you feel about your ability in math?
 - d. Describe the best teacher you've had in math. What made her (or him) so good?
 - e. What could your teachers do to help you feel more confident in your math abilities?
9. Under what conditions do you perform well in math? Under what conditions do you perform less well? Why?

Mathematics and others

10. Have you ever been recognized for your ability in math? Explain.
11. Tell me about your family and math.
 - a. What do members of your family do that involves math?
 - b. What do your parents tell you about math?
 - c. How are your siblings in math?
 - d. What would your parents tell your teachers about you as a math student?
12. Tell me about your friends (not necessarily your classmates) and math.
 - a. Describe how most of your friends do in math.
 - b. What do your friends say about math? What do they say about those who do well?
 - c. How do you think your friends would describe you in math? Why?
13. Do you think the people you admire would be good in math? Why?

Affective and physiological response to Mathematics

14. I want to ask you to think about how math makes you feel. You probably haven't been asked to think about that before. When you are given a math test, how does that make you feel? How do you feel when you are given a math assignment?

Sources of self-efficacy in Mathematics

15. Earlier you rated your math ability on a scale of 1 to 10. How would you rate your confidence? Why? What could make you feel more confident about yourself in math?
-

Procedures

After receiving permission from the Institutional Review Board (IRB) of Seton Hall University, I elicited approval to conduct research by the cooperating school district. Upon approval, I was permitted to access the district's assessment warehouse to randomly identify potential study participants based on success or failure on the Criterion Referenced Competency Test (CRCT) in Mathematics during a consecutive 3 year period (2009-2011). A representative sample of Black/Hispanic and male/female middle school students with various experiences with failure was selected. A letter of solicitation and parent consent form (as approved by IRB) was then provided to each parent of the identified students via U.S. mail. Study participants were randomly selected from the returned consent forms and were provided with a letter of solicitation and a student assent form. After this process concluded, a total of 17 assenting students that met all of the variables within the identification protocol were included in this study: three males and two females in grade 6 plus three males and three females in each of grades 7 and 8.

Interviews were scheduled in May of 2012. In an effort not to impact each student's core academic instruction, 45 minute interview sessions were established during elective periods or at a time most conducive to the student's schedule as determined by the school. The interviews were recorded digitally by a trained research assistant and later transcribed and interpreted by me.

Data Analysis

Using the assistance of digital coding software in addition to employing manual techniques, the transcripts were coded and analyzed. First, the participants were assigned codes combined with their pseudonym to readily identify the variables associated with each student. The variables were coded as follows: grade level (6, 7, or 8), gender (M=male and F=female), race (B=Black and H=Hispanic) and failure category (0=0 failures, 1=one failure, and

2=multiple failures). For example, a sixth grade Black male student with multiple failures was coded as 6BM2. A detailed list of all participants and their corresponding codes (unique descriptors) is provided in Chapter IV. .

Similar to Usher (2009), I utilized Miles and Huberman's (1994) concept of data reduction to organize and interpret the qualitative data derived from the semi-structured interviews. First, an initial set of shorthand codes was developed reflective of the interview protocol (see Appendix G). These codes were loaded into digital coding software that allowed for the codes to be accurately consolidated and sorted by each variable explored in the study. Then, I further reduced the data by identifying the participant responses that most readily informed their sources of self-efficacy and subsequently coded them at positive, neutral, negative, or mixed. Patton (2002) suggested using qualitative matrix analysis to organize data that is difficult to measure. Therefore, the subsequent-level codes were organized into summary tables (matrices). The coding schema that was utilized is shown in Table 3.

Table 3

Definition of Outcome Codes

Codes	Value Assigned	Definition
Positive	1	Participant's response was associated with positive self-efficacy.
Neutral	0	Participant's response was inconclusive or not decisively positive/negative.
Negative	-1	Participant's response was associated with negative self-efficacy.
Mixed	X – No Value Assigned	Participant's response(s) included contradictions.

To ensure reliability in coding, reliability checks were conducted by reviewing individual transcripts for a second time. During this process, codes were collapsed and/or combined

(reduced) as redundancies were discovered. This process was conducted for each transcript and then conducted again collectively after all of the transcripts were reviewed. By following such a thorough coding protocol, I was able to maintain internal consistency of the coding process.

Reliability and Validity

To strengthen the analytical process and encourage reliability in the interpretation of the data, a triangulation strategy was employed which included extracting quantitative data from the qualitative interviews. According to Patton (2002), triangulation strategies assist the researcher in testing for consistency. In several instances throughout the interview process, students were asked to provide their answers using a scale of 1 to 10. This data was organized into table format and analyzed. In addition, I applied a coding strategy to the qualitative data to yield quantitative results.

This analytical process was applied in three phases (triangulation). Phase 1 included a review of the general findings during which a combination of qualitative and quantitative data were reviewed. Phase 2 included a thorough qualitative analysis through the identification of themes that were coded and organized into matrices as described above. The third phase included an evaluation of the qualitative data through the application of a quantitative strategy. In addition to assisting with data validation, the intent was for all phases to inform each other as specific patterns, similarities, and differences were identified.

The third phase of the data validation process utilized averaging (see Appendix I) to inform the interpretation of data. Students that expressed more routine negative responses produced average response scores closer to -1 , while students with a greater number of positive responses produced average responses closer to $+1$. A value was not assigned to contradictory responses because the interpretation was inconclusive. Students that provided responses that

were not contradictory but were also not clearly positive or negative, received a score of 0 (neutral) for the particular area of the interview protocol being interpreted.

Although the self-efficacy interview protocol developed by Usher (2009) was already tested for reliability and validity, this study further confirmed the internal reliability of the instrument. The interview protocol readily provided qualitative data that tended to align with quantitative measures. Generally, students with no failure expressed higher quantitative scores than students of repeated failure. Furthermore, the quantitative results tended to support the qualitative findings. For instance, students with lower quantitative results also verbally expressed an overall lack of confidence, reduced willingness to attempt new mathematical tasks, and a negative view of how others view their mathematical abilities.

External validity was also established through a variety of proximal and sampling factors. For instance, this study complimented the initial work of experts in the field regarding the sources of self-efficacy, including that of Pajares and Bandura. Secondly, the research protocol and methodology implemented is similar to a process utilized by an established researcher, Ellen L. Usher (2009). Finally, as Usher also stressed, the clear descriptions of the participants provided both in this chapter and in Chapter IV should enable readers to accurately apply this research to other contexts (Miles & Huberman, 1994).

Summary

Studying self-efficacy is a complex process that has traditionally been evaluated using quantitative techniques. This study sought to explore deeper into the self-efficacy beliefs of students by employing the qualitative tool of semi-structured interviews. Through the voices of students that have experienced success or failure in mathematics, I aspired to discover the sources of their self-beliefs, and how they are influenced by the mediating variables of grade level, gender, and race. This task did present challenges, as qualitative data can be cumbersome to collect, organize, code, and interpret. I readily addressed these validity and reliability challenges by planning a triangulation strategy that encouraged further accuracy, through cross-checking, during the interpretation of data.

Chapter IV

ANALYSIS OF DATA

Introduction

The purpose of this study was to explore the self-efficacy beliefs of Black and Hispanic students that have experienced success and failure in mathematics. As described in the literature review, research suggests that mastery experience is the most influential source of self-efficacy; hence, this self-efficacy study identified participants based upon their success or failure on a mathematics standardized test. The following research question guided the study: How does success versus failure affect self-efficacy beliefs of middle students in mathematics? To thoroughly address this question, the variables (mediating factors) of grade level, gender, and ethnicity were explored in detail and are reflected in the subsidiary research questions:

1. How is the relationship between success/failure and self-efficacy mediated by grade level (grades 6-8)?
2. How is the relationship between success/failure and self-efficacy mediated by gender?
3. How is the relationship between success/failure and self-efficacy mediated by race?
4. Among the variables of grade level, gender, and race, which variable has the most mediating influence on the relationship between success/failure on a standardized test and perceived self-efficacy in mathematics of middle school students?

To assist the reader in tracking these variables, unique identifiers are included in parenthesis next to the participant's pretend name throughout the analysis. Table 4 provides a description of these identifiers:

Table 4

Participant Unique Identifiers and Descriptors

Pretend Name	Unique Identifier	Grade Level	Race	Gender	Number of Failures (within 3 years)
Steve	6BM0	6	Black	M	0 = No Failure
Joanna	6HF0	6	Hispanic	F	0 = No Failure
Michael	6BM1	6	Black	M	1 = Minimal (1 in 3 years)
Nya	6BF1	6	Black	F	1 = Minimal (1 in 3 years)
Dwayne	6BM2	6	Black	M	2 = Frequent (>1 in 3 years)
Robert	7HM0	7	Hispanic	M	0 = No Failure
Ashley	7BF0	7	Black	F	0 = No Failure
Bob	7HM1	7	Hispanic	M	1 = Minimal (1 in 3 years)
Jennifer	7BF1	7	Black	F	1 = Minimal (1 in 3 years)
James	7BM2	7	Black	M	2 = Frequent (>1 in 3 years)
Leslie	7HF2	7	Hispanic	F	2 = Frequent (>1 in 3 years)
John	8BM0	8	Black	M	0 = No Failure
Anna	8HF0	8	Hispanic	F	0 = No Failure
LaBron	8BM1	8	Black	M	1 = Minimal (1 in 3 years)
Kayla	8BF1	8	Black	F	1 = Minimal (1 in 3 years)
James B.	8HM2	8	Hispanic	M	2 = Frequent (>1 in 3 years)
Aaliyah	8BF2	8	Black	F	2 = Frequent (>1 in 3 years)

In order to strengthen the findings of the study, a triangulation strategy was implemented; hence this analysis is divided into three distinct sections. Section 1 includes a review of the general findings of the overarching research question where a combination of qualitative and quantitative data is reviewed. Section 2 includes a thorough qualitative analysis of the initial three subsidiary research questions (mediating variables) through the identification of themes.

To answer the final subsidiary research question, Section 3 includes an evaluation of the qualitative data through the application of a quantitative strategy. The intent is for all three sections to triangulate to inform the overall purpose of this study, which is to better understand the impact of failure in mathematics on the perceived self-efficacy of middle school students.

Section 1: Findings Related to the General Research Question

Prior to examining the subsidiary research questions in detail, this analysis first addresses the overarching research question of the study: How does success versus failure affect self-efficacy beliefs of middle students in mathematics? As explained in the Methodology section, the participants were identified based upon their success or failure (mastery experience) on a high stakes standardized mathematics test. The purpose of this initial analysis, organized by mastery experience, is to provide the reader with an overview of the study participants' self-beliefs in mathematics. The analysis of the subsidiary questions that follow provides a more thorough examination linked to each source of self-efficacy.

When students of the no failure category were asked to rank their abilities in mathematics using a scale of 1 to 10 (10 being the highest), they collectively expressed high scores ranging from 7 to 9. When explaining his score of 9, Robert (7HM0) articulated that he had great skills and felt very confident. Students with minimal failure also held positive self-beliefs of their abilities in mathematics; their scores ranged from 7 to 9.5. In fact, the highest score of 9.5 was expressed by Kayla (8BF1), a student that experienced minimal failure. Michael (6BM1) stated, "Cause I'm very good at math. I get mostly all hundreds. And some people don't think that I'm very good at math but I actually am." In contrast, students with multiple failures expressed negative beliefs. James (7BM2) explained he does not "get it" most of the time and also does not like to ask for help. The other seventh grade student with multiple failures, Leslie (7HF2),

rated her mathematics ability as a 5 and related her score to the level of difficulty of the math assignment. She stated, “Half-in-half...sometimes it could be easy and sometimes it could be hard.” Aaliyah (8BF2) indicated a score of 7.5, which appeared incongruent with her explanation. When asked why she selected this score, she indicated, “But sometimes I don’t have the confidence about what I’m doing so I’ll be just like, I can’t do it.”

The students were also asked to compare themselves to the rest of their class and their grade. The students with no failures consistently ranked themselves fairly high. For the students that provided numerical responses, they all selected a score of 8 or higher. Only Anna (8HFO) provided a less confident answer when she expressed being “a little behind” her more advanced peers. (It is important to take into consideration that mathematics is Anna’s only regular class and during the interview she compared her work to that of her friends from higher level mathematics classes.) Students with minimal failure also tended to express positive self-beliefs when comparing themselves to others; however, when comparing themselves to the rest of their grade, their ratings declined. Five of the six students interviewed from this category (minimal failure) expressed a lower rating as they compared themselves to students across their grade level. For example, LaBron (8BM1) changed his rank from an “8 or 9” to a “5 or 6.” He thought other students performed better than him when compared to the whole eighth grade. The results were inconsistent for students with multiple failures. For instance, when comparing themselves to their classmates, Aaliyah (8BF2) provided a rating of “8 or 9,” while James B. (8HM2) rated himself as a 4. Similarly, Dwayne (6BM2) expressed a rating of 8 while Leslie (7HF2) thought she was a 6. Leslie perceived that there were students “way better” than her. Of the five students with repeated failures, only one student expressed a significantly less confident answer when asked to compare himself to the entire grade. James B. (8HM2) thought he was

“probably like the worst one”. Aailyah did not respond to this question but she did convey her distinct dislike for grouping students by ability. She thought math “can’t get any harder than it is,” and that grouping students can make some feel as though they are “not good enough.”

Summary of Findings Related to the General Research Question

After examining student responses of their perceived ability in mathematics, responses remained consistent for students with no failure and those with minimal failure. For students with multiple failures, perceptions of their abilities in mathematics were lower. Overall, all students, regardless of success or failure, held higher perceptions of their mathematics abilities when compared to their classmates than compared to the entire grade level. When students were asked to compare themselves to the entire grade level, sixth through eighth grade students with minimal and multiple failures generally maintained lower perceptions of their mathematics abilities. Interestingly however, students with multiple failures provided inconsistent statements as a group. While interpreting these results, it is important to consider that student responses were relative to their perceived understanding of both how well their classmates performed in mathematics and how well the rest of the students in their grade level performed (see Table 5). For this reason, it is imperative to closely examine the analysis of the subsidiary questions before drawing any conclusions.

Table 5

Summary of Findings Related to the General Research Question

Interview Protocol: If you were asked to rate your ability in math on a scale of 1 (lowest) and 10 (highest), where would you be? How would you say you compare to the rest of your classmates in your math abilities? How about to the rest of the students in your grade?

Pretend Name	Grade Level	Code	Math Ability	Compare to Classmates	Compare to Grade
Steve	6	6BM0	8	over exceeding	smart
Joanna	6	6HF0	8 or 9	7 or 8	8
Robert	7	7HM0	9	between top & middle	between the top
Ashley	7	7BF0	7	8	No answer
John	8	8BM0	8	9	8
Anna	8	8HF0	7	8	A little behind
Michael	6	6BM1	8	7	6
Nya	6	6BF1	7	6	4
Bob	7	7HM1	8	1 student better	No answer
Jennifer	7	7BF1	7	8	6 or 7
LaBron	8	8BM1	8	8 or 9	5 or 6
Kayla	8	8BF1	9.5	10	8.5
Dwayne	6	6BM2	9.5	8	7.5
James	7	7BM2	5	normal	Probably average
Leslie	7	7HF2	5	6	8
James B.	8	8HM2	5	4	Worse one
Aaliyah	8	8BF2	7.5	8 or 9	No answer

Section 2: Analysis of the Mediating Variables

For the analysis of the initial three subsidiary research questions, the following organizational sequence is employed: source of self-efficacy and related research question(s), mediating variable, narrative summary of findings, and a summary chart of findings. The final research question contained in Section 3 of this analysis, relating to the most influential

mediating variable, collectively references the findings of the first three subsidiary research questions using a quantitative strategy.

A qualitative coding method was employed during the analysis phase of the mediating variables and is displayed in summary tables following each qualitative summary. The summary tables were designed to assist the reader in differentiating beliefs related to self-efficacy among students of various mastery experience levels on a standardized mathematics test. The responses were coded into one of four categories: positive (+1), neutral (0), negative (-1), and mixed (no value assigned). Table 6 and Appendix H include definitions and examples of each interpretive code. Because multiple codes were often found within each failure category, a range is provided where applicable (see Table 7). The associated point values are applicable to Section 3 and are explained in further detail later in this chapter.

Table 6

Interpretive Codes Defined with Examples

Term	Definition	Example Responses
Positive (+1)	Participants' responses were associated with positive self-efficacy.	<p>Question: If you were asked to rate your ability in math from one to ten, what would you give yourself?</p> <p>Dwayne (6BM2) – “It would be like a nine, nine-and-a-half.” “Like, when I learn stuff, it’s like really easy to memorize.”</p> <p>Robert (7HM0) – “A nine.” “Because I feel like I’m pretty smart in math. I feel confident.”</p>
Neutral (0)	Participants' responses were inconclusive or not decisively positive/negative.	<p>Question: How do you think your friends would describe you in math?</p> <p>Kayla (8BF1) – “Well, they really don’t say anything because they don’t know.”</p> <p>LaBron (8BM1) – “They’ll say I do good but sometimes I’ll have like a little bump...on the math things.”</p>

Term	Definition	Example Responses
Negative (-1)	Participants' responses were associated with negative self-efficacy.	<p>Question: Describe yourself as a student.</p> <p>Aaliyah (8BF2) – "...so I can get very frustrated with myself. I'll just get mad and just like throw it on the floor...and just be like ok, I don't care. I don't care."</p> <p>James B. (8HM2) – "Slacker, lazy."</p>
Mixed (no value)	Participants' responses contradicted each other.	<p>Related Question: How do you feel about the test you took this year?</p> <p>Dwayne (6BM2) – "Yes, I knew I was going to pass math."</p> <p>James B. (8HM2) – "I don't know, I don't really want to talk about it." "I'm kind of nervous."</p>
Mixed (no value)	Individual participant's responses contained a contradiction	<p>Related Questions to Family Involvement & Mathematics</p> <p>Jennifer (7BF1) – This student clearly stated 'No' when asked if her family ever talks about Math but later in the interview she stated, "Like my sister tells me what they do in high school and, yeah, we talk about it sometimes."</p>

Table 7

Interpretive Codes and Code Band Descriptions

Code/Code Band	Description
Positive	All responses were coded as positive.
Neutral	All responses were coded as neutral.
Mixed	All responses were coded as mixed.
Negative	All responses were coded as negative.
Mixed/Neutral	Mixed and neutral responses were discovered.
Neutral to Positive	Neutral and positive responses were discovered.

Code/Code Band	Description
Mixed/Neutral to Positive	Neutral, mixed, and positive responses were discovered.
Neutral to Negative	Neutral and negative responses were discovered.
Mixed/Neutral to Negative	Neutral, mixed, and negative responses were discovered.
Positive to Negative	Positive and negative responses were discovered; can also include neutral and mixed responses.

The interview protocol produced a significant amount of qualitative data. The intent of this portion of the analysis was to consolidate the student responses into summary illustrations that are representative of the interview protocol. This was accomplished by extracting the foundational questions that provided the most robust evidence as to how the students were being impacted by the sources of self-efficacy. However, it is important to stress that one of the strengths of semi-structured interviews is that respondents are able to provide rich descriptions throughout the data collection process. Therefore, even though there was a focus on the foundational questions extracted from the interview protocol, the transcripts were analyzed in their entirety. There were several instances where students provided feedback related to the foundational questions as they were responding to other questions asked during the interview process. The foundational questions are reflected in Table 8.

Table 8

Foundational Questions from Self-Efficacy Interview Protocol

Area of Self-Efficacy	Foundational Questions
General Mastery Experience	<ul style="list-style-type: none"> • Describe yourself as a student. • Earlier you rated your math ability on a scale of one to ten. How would you rate your confidence?
Social Persuasion (Teachers)	<ul style="list-style-type: none"> • What sorts of things do your teachers tell you about your performance in math? • What do you think your teacher(s) would tell your parents about how you do in math? • Have you ever been recognized for your ability in math?
Social Persuasion (Peers):	<ul style="list-style-type: none"> • How do you think your friends would describe you in math?
Vicarious Experiences (Family)	<ul style="list-style-type: none"> • Tell me about your family and math. Are your siblings good at math? Are the people you admire good at mathematics?
Vicarious Experiences (Peers)	<ul style="list-style-type: none"> • Describe how most of your friends do in math.
Analysis of Emotional/Physiological States	<ul style="list-style-type: none"> • When you are given a math test, how does that make you feel? How do you feel when you are given a math assignment?

Mastery Experience**Interview Protocol: Describe yourself as a student.**

Variable: Grade Level. The sixth grade students involved in the study held relatively positive beliefs of themselves as students, irrespective of their achievement on a standardized test. For example, when Steve (6BM0) was asked to describe himself as a student, he specifically mentioned the CRCT and how he mastered all of the standards. Similarly, Joanna (6HF0) thought she did not need to study and was really smart for her age. Dwayne (6BM2)

provided a more neutral response (not decisively positive or negative) as he described himself as active and expressed he will complete work when he wants to get it done.

James (7BM2), a seventh grade student with multiple years of failure, portrayed a sense of apathy towards school. Although he thought he performed “ok” in school, he viewed school as being “too much” and he noted that teachers were always getting him in trouble. His peer with multiple years of failure, Leslie (7HF2), indicated she was generally an A/B student but also mentioned earning Cs in certain classes due to missing class and struggling with the difficulty of the content. In contrast, a student with no failure, Ashley (7BF0) stated she could still perform well in school even though she experienced excessive absences from school. Seventh grade students with minimal failure also held positive beliefs of themselves. Bob (7HM1) described himself as a “thinker” and that he tries to get the best answers.

There were differences shared in the self-beliefs of eighth grade students that experienced multiple years of failure and those that did not experience failure. For instance, John (8BM0) had not experienced failure on the CRCT and described himself as one that “likes to exceed expectations.” He further stated, “I won’t stop until I’m done.” Anna (8HF0) was not as presumptuous and suggested she liked to procrastinate and was not organized. However, she was quick to mention that she somehow will “pull it off” and pass all of her classes. Conversely, James B. (8HM2) defined himself as a “slacker” and explained he was lazy. Unlike Anna, his mastery experience is also tied to grade level failure as he failed the eighth grade in addition to repeatedly failing the state assessment. His peer, Aaliyah (8BF2), described herself as a good student at times but that she gets very frustrated with herself and will throw her work on the floor. Students with minimal failure, Kayla (8BF1) and LaBron (8BM1), both described

themselves as “good.” When LaBron was asked if he was hard working or just naturally smart, he selected hard working.

Variable: Gender. When analyzed by gender, the self-perceptions of male students were clearly affected by repeated failure. James (7BM2) and James B. (8HM2) both held negative perceptions of themselves as students. Dwayne (6BM2) did not articulate that he was a bad student but described himself as active and talkative. In contrast, male students with no and minimal failure held positive perceptions of themselves as students.

Female students verbalized positive perceptions of themselves overall with a few exceptions. Aaliyah (8BF2), a student with repeated failure, did not think she was a bad student but described frustrations specific to mathematics where she tends to get mad and have an “I don’t care” attitude. Her peer, Leslie (7HF2), expressed she was an A/B student but also mentioned earning Cs because the work was too hard. Anna (8HFO), a student with no failure, indicated she does not study and is not organized. She then stated, “...but somehow I pull it off and I’m passing all of my classes.” The remaining study participants held relatively positive beliefs of themselves as students.

Variable: Race. Black students with repeated failure were less apt to describe themselves positively as students than the Black students with no or minimal failure. Dwayne (6BM2), James (7BM2), and Aaliyah (8BF2) all expressed less than favorable attributes of themselves as students. Kayla (8BF1), a student with minimal failure, stated she likes to joke around but will first work hard to complete her work. The remaining Black participants provided positive descriptions of themselves as students. Hispanic students followed this same trend where students with repeated failure were not as likely to state definitively positive statements about themselves as students. Leslie (7HF2) contradicted herself by initially stating she was an

A/B student but then expressed doubt as she explained earning Cs because the work was too hard. Conversely, James B. (8HM2) thought he was lazy student. Anna (8HF0) also contradicted herself but in a manner related to positive self-efficacy. She described herself as being a procrastinator but indicated she finds a way to “pull it off” and pass all of her classes. Joanna (6HF0) and Bob (7HM1) stated very clear positive descriptions of themselves as students.

Summary of Mastery Experience

In examining grade levels, gender, and race, students with experience in failure were more likely to articulate negative descriptions of themselves as students. However, the distinctions were more readily apparent at the eighth grade level where the students with multiple failures provided emotional responses to include “slacker” and throwing work due to frustration. In contrast, students that more routinely passed the state test tended to speak positively about their abilities. However, there were instances with Hispanic and female students with no failure where they expressed mixed responses. Table 9 includes a summary of these findings.

Table 9

Mastery Experience and Self-Description as a Student

Interview Protocol: Describe yourself as a student.

Positive – Participants’ responses were associated with positive self-efficacy.

Neutral – Participants’ responses were not decisively positive or negative.

Negative – Participants’ responses were associated with negative self-efficacy.

Mixed – Participants’ responses contradicted each other.

Grade Level	No Failure	Minimal Failure	Multiple Failures
6	Positive	Positive	Neutral
7	Positive	Positive	Mixed to Negative

Grade Level	No Failure	Minimal Failure	Multiple Failures
8	Mixed to Positive	Positive	Negative

Gender	No Failure	Minimal Failure	Multiple Failures
Male	Positive	Positive	Neutral to Negative
Female	Mixed to Positive	Positive	Mixed to Negative

Race	No Failure	Minimal Failure	Multiple Failures
Black	Positive	Positive	Neutral to Negative
Hispanic	Mixed to Positive	Positive	Mixed to Negative

Mastery Experience and Perceived Confidence

Interview Protocol: Earlier you rated your math ability on a scale of one to ten.

How would you rate your confidence?

Variable: Grade Level. When asked about their confidence, sixth grade students rated themselves very high using a scale of 1 to 10. The lowest score was verbalized by Nya (6BF1); an 8. Dwayne's (6BM2) denial of previous failure seems to also translate to his level of confidence since he rated himself as a 10. Confidence seemed to wane with seventh graders that experienced repeated failure. Both James (7BM2) and Leslie (7HF2) rated themselves as a 5 in confidence. Students with minimal failure produced mixed results. Bob (7HM1) rated his confidence at a 10, and Jennifer (7BF1) rated her confidence at an 8 or 9. However, Bob (7HM1) did say his confidence would decrease if he failed a test and had to take it again. In this situation, he rated his confidence at a 6. The students with no failure articulated contradictory responses. Ashley (7BF0) rated her confidence at a 6 while Robert (7HM0) thought he was a 9. Perhaps Ashley's rating is the result of the anxiety she feels prior to taking mathematics tests.

Eighth grade students that experienced repeated failure also held relatively low ratings in self-confidence. Aaliyah (8BF2) thought a rating of 5 reflected her confidence, and James B. (8HM2) selected a 6. Overall, the ratings were higher for eighth grade students that experienced minimal failure or no failure. Kayla (8BF1) selected 8, LaBron (8BM1) selected 9, and John (8BM0) selected 10. Anna (8HF0), on the other hand, verbalized 4 as her confidence rating. This may be tied to the fact that she always exceeded standards on other areas of the state exam but always met standards on the mathematics section. During the interview, Anna (8HF0) explained “Yeah, I always meet it. I can exceed all of it and math is just the only one I always just meet.”

Variable: Gender. Generally, male students expressed high levels of confidence when asked to rate their confidence on a scale of 1 to 10 (10 being the highest). All of the male students in the study besides James (7BM2) and James B. (8HM2) of the repeated failure category rated themselves very high. James (7BM2) rated himself at a 5 while James B. (8HM2) stated a score of 6. James B. (8HM2) agreed with the research assistant when she asked if he was just “kind of” confident in mathematics. In contrast to the other students with repeated failure, Dwayne (6BM2) put up 10 fingers when asked to rate himself. The other male participants’ scores ranged from 9 to 10. Bob (7HM1) acknowledged that his confidence would slip from a 10 to a 6 if he had to retake a test in which he had already failed.

Female students with repeated failure showed the same trend as male students with repeated failure. Both Leslie (7HF2) and Aaliyah (8BF2) rated themselves as a 5. Aaliyah (8BF2) stated, “...if I can’t do this, so what’s the point of like in trying to apply myself.” Unlike male students, there were two instances of female students with no failure, suggesting they were not confident. For example, Anna (8HF0) stated she was not confident in math and gave herself

a 4. Her peer, Ashley (7BF0), only gave herself a 6. The remaining female students responded positively by providing ratings of 8 or 9.

Variable: Race. The results were generally positive when Black students were asked to rate their confidence. Only two Black students with repeated failure expressed lower levels confidence. Aaliyah (8BF2) rated herself as a 5, and James (7BM2) suggested his confidence was also a 5. Their ratings contrasted with Dwayne (6BM2), another student with repeated failure, as he thought his confidence was a 10. The remaining Black participants rated themselves as an 8 or higher except for Ashley (7BF0) who intonated a score of 6. During the interview, Ashley (7BF0) expressed a lack of interest in studying or completing extra work to increase her confidence. Even though she never failed the state test, her confidence score of 6 may be attributed to her overall lack of interest in trying harder in school.

Hispanic students produced mixed results when asked to rate their confidence in mathematics. Positive ratings of 9 or 10 were described by Joanna (6HF0), Bob (7HM1), and Robert (7HM0). In contrast, Leslie (7HF2) and Anna (8HF0) stated ratings of 5 and 4 respectively. James B. (8HM2) expressed a neutral score of 6 and suggested he was “kind of” confident. These data suggest there is not a discernible pattern for Hispanic students in this study as a race or by failure category.

Summary of Mastery Experience and Confidence

To summarize, all of the seventh and eighth grade students that experienced repeated failure held lower confidence levels than their higher achieving peers. This did not hold true for Dwayne, a sixth grader that experienced repeated failure and still held a high level of confidence. Generally, the higher achieving students tended to articulate higher levels of confidence but there were exceptions with female students. When gender was analyzed, female students with no

failure produced mixed results. This differed slightly from male students where both male students with no failure and minimal failure held elevated levels of confidence. Both male and female confidence tended to decline when multiple failures were experienced. When race was analyzed, Black and Hispanic students with minimal failure held high levels of confidence. Conversely, Black and Hispanic students with both no failure and repeated failure produced mixed results when asked to rate their confidence in Mathematics. Table 10 includes a summary these findings.

Table 10

General Confidence and Mastery Experience

Interview Protocol: Earlier you rated your math ability on a scale of 1 to 10. How would you rate your confidence?

Positive (8-10) – Participants' responses were associated with positive self-efficacy.

Neutral (6-7) – Participants' responses were inconclusive or not decisively positive/negative.

Negative (<6) – Participants' responses were associated with negative self-efficacy.

Mixed (N/A) – Participants' responses contradicted each other.

Grade Level	No Failure	Minimal Failure	Multiple Failures
6	Positive	Positive	Positive
7	Neutral to Positive	Positive	Negative
8	Mixed	Positive	Neutral to Negative

Gender	No Failure	Minimal Failure	Multiple Failures
Male	Positive	Positive	Negative to Positive
Female	Mixed	Positive	Mixed to Negative

Race	No Failure	Minimal Failure	Multiple Failures
Black	Neutral to Positive	Positive	Mixed
Hispanic	Mixed	Positive	Neutral to Negative

Analysis of Social Persuasion (Teachers/Adults)

The analysis in this section independently examines student responses to three questions from the interview protocol related to social persuasion from teachers:

- What sorts of things do your teachers tell you about your performance in math?
- What do you think your teacher(s) would tell your parents about how you do in math?
- Have you ever been recognized for your ability in math?

The findings of all three questions are reflected in a final summary and in the summary tables at the conclusion of this section.

Interview Protocol: What sorts of things do your teachers tell you about your performance in math?

Variable: Grade Level. Generally, the sixth grade students interviewed indicated that their teachers would tell them they are good mathematics students. Additionally, the students stated their teachers make them feel positive about their math abilities. Dwayne (6BM2) denoted that his teacher might also express that he needs to stop talking and playing around. Nya (6BF1) was not as confident as her sixth grade peers and provided a neutral response. She explained, “They say I do good, sometimes.” Steve (6BM0) contradicted himself slightly. He indicated that his teachers spoke positively about his ability in mathematics, but they also expressed he needs to prepare himself better as a result of not studying.

By and large, seventh grade students provided favorable responses as to what their teachers say about their mathematics abilities; except for the students that experienced multiple failures. For instance, James (7BM2) indicated that his teachers have said he can do better.

Leslie (7HF2) described instances where her teachers have said she is “doing good,” even though she really was not performing well. Other teachers have told her that she needs to catch up. When inquired as to how their mathematics teachers make them feel, all of the students spoke relatively positive about their teachers and thought they were supportive.

Similar to the sixth and seventh grade students, the eighth grade students typically spoke favorably about their teachers. They explained how their teachers are helpful and encouraging. Even James B. (8HM2) noted the encouragement his teacher provided; however he linked his teacher’s behavior to his own. James B. stated, “...she encourages me sometimes and then I try which does that” (the encouragement is the product of his effort). Conversely though, Anna (8HF0) said her teacher thought she was lazy because she did not show all of her work.

Variable: Gender. Male students held positive perceptions of their teachers. Overall, regardless of the students’ experiences with failure, they explained their teachers are very encouraging and supportive. Interestingly though, the male students with no failure provided neutral to mixed responses. Steve (6BM0) mentioned that his teachers tell him he is good in mathematics but needs to study more because he did not know the answers on previous assessments. Robert (7HM0) explained that his mathematics teachers become frustrated when he does not show his work. He stated, “I just do it in my head and they get frustrated with that.” Generally though, Robert (7HMO) indicated that his teachers tell him he is “good at math.” John (8BM0) expressed a very similar response. He also alluded to his teacher reinforcing the importance of him showing his work. He struggled with what his teacher would say specifically about his performance in mathematics and suggested his teacher typically praises the entire class when they perform well.

Female students tended to provide tentative responses when asked what their teachers would say about their abilities in mathematics. Of the female study participants, only three students clearly provided positive responses: Jennifer (7BF1), Aaliyah (8BF2), and Anna (8HF0). Aaliyah (8BF2) in particular, a student with multiple failures, praised her teacher. She explained the teacher allows her to teach the class when she understands a concept. Anna (8HF0), however, is the only student that provided a clearly negative response. She stated her teachers described her as lazy. The remaining female students provided neutral responses. For example, Ashley (7BF0) stated, "They really don't tell me much." Kayla (8BF1) did not specifically mention what her teachers said about her abilities in mathematics. Instead, she described the individual help she received due to understanding things in a different way. Nya (6BF1) showed tentativeness when she stated, "They say I do good, sometimes."

Variable: Race. When analyzed by race, a range of neutral and positive responses emerged from Black students. Three students provided definitive positive responses and eight students provided neutral response. None of the Black students in the study provided clear negative responses regarding how their teachers would describe them in mathematics. These findings did not correspond to failure experience. Two of the three students that provided positive feedback, Jennifer (7BF1) and LaBron (8BM1), were from the minimal failure category. The third student, Aaliyah (8BF2), experienced repeated failure. Consistency was discovered with Black students with no failure. These students tended to provide tentative responses that were coded as neutral or mixed.

Hispanic students generally provided positive responses across the three failure categories. Joanna (6HF0), Bob (7HM1), Leslie (7HF2), James B. (8HM2) intonated definitive positive feedback when asked what their teachers would say about their mathematics skills.

Conversely, Anna (8HF0) expressed that her teachers would respond negatively while Robert (7HM0) intoned a mixed response.

Interview Protocol: What do you think your teacher(s) would tell your parents about how you do in math?

Variable: Grade Level. Collectively, sixth grade study participants felt as though their teachers would suggest to their parents that they are good students in mathematics. Joanna (6HF0) recalled her teacher speaking positively about her mathematics ability, and that she could eventually obtain a scholarship to college. Nya (6BF1) thought her teacher would describe her mathematics abilities as excellent. Only Dwayne (6BM2), who experienced repeated failure, provided a slightly contradictory response. He thought his teacher would say, "He's doing really good in my class. He just needs to stop the talking or like playing around." Dwayne further explained that his parents and teacher would agree that he needs to stop talking instead of expressing he is a good at mathematics.

Seventh grade students also felt as though their teachers would tell their parents they performed well in mathematics. Robert (7HM0) believed his teacher would describe his mathematics abilities as skilled. Jennifer (7BF1) thought her teacher would say, "I do good in math and I listen and I don't clown around and everything in class." James (7BM2), along with Ashley (7BF0), provided neutral answers. Specifically, James (7BM2) believed his teacher would say that he is just doing "alright." His teacher might suggest for him to stay focused in class and for his parents to help him with his homework.

Eighth grade students were more critical in what they thought their teachers would say to their parents. Anna (8HF0) and James B. (8HM2) thought their teachers would respond negatively to their performance in mathematics. Anna explained that her teacher would state she

does not try hard enough and she needs to study more. James B. (8HM2) specifically recalled a discussion between his teacher and his parents. "I can answer this! They would be like, your son James, he does bad in class but I know he can do it cause he is a smart kid. Cause they have said that before." Kayla (8BF1) provided a mixed response and thought her teacher would state, "She struggles sometimes to understand it (mathematics) but she'll eventually catch on." Similarly, LaBron (8BM1) expressed he teacher would describe him as having a "good knowledge in math" but would also explain he struggles at first.

Variable: Gender. It was more likely for male students to believe their teachers would describe their abilities in mathematics positively as opposed to providing less favorable responses. Only one student, James B. (8HM2), thought his teacher would describe his progress as "bad," while James (7BM2) and Steve (6BM0) were the only students to express neutral responses. The remaining male study participants thought their teachers would provide positive or mixed feedback.

Female students mirrored male students when asked what they thought their teachers would say about them as mathematics students. One student, Anna (8HF0) provided a negative response. Kayla (8BF1) and Aaliyah (8BF2) provided mixed responses. The remaining female study participants tended to express their teachers would speak positively about them as students in mathematics.

Variable: Race. Black students generally expressed their teachers would speak favorably to some degree about them as mathematics students. James (7BM2), Ashley (7BF0), and Steve (6BM0) provided neutral responses, but the remaining Black students provided mixed to positive responses. Hispanic students also tended to feel their teachers would respond

favorably. The only exceptions were Anna (8HF0) and James B. (8HM2). Interestingly, Anna had not experienced failure while James B. experienced multiple failures.

Interview Protocol: Have you ever been recognized for your ability in math?

Variable: Grade Level. Sixth grade students expressed neutral and positive responses but tended to generalize (responses not directly related to a formal recognition in mathematics) when asked if they had been recognized for their mathematics ability. For instance, Dwayne (6BM2) proudly discussed making the A/B honor roll. Joanna (6HF0) mentioned earning the Mayor's Award. Nya (6BF1) provided a neutral response as she described being recognized by her grandmother for designing clothes on a piece of paper. Michael (6BM1) responded positively by sharing a time that he received recognition from his mother for earning a higher math grade than his sister. Steve (6BM0) described an instance in which he earned one of the highest GPAs in his mathematics class.

The theme shifted slightly with seventh grade students. The seventh grade students with experience in failure were more apt to say they were not recognized for their abilities in mathematics. James (7BM2), Leslie (7HF2), and Jennifer (7BH1) stated they had not been recognized. James went further and described his lack of desire for recognition, as he does not want to be "spotted." The other seventh graders interviewed referenced some type of recognition. Robert (7HM0), in particular, was quite thorough in his response. He proudly stated,

In fifth grade, my teacher cause I was really good at math and I always was pumped to math. And I would go into the classroom and ask what are we going to do for math today? And she would already give me the worksheet. And I would do it like in under like two minutes.

The responses from the eighth grade students mirrored the seventh graders. For example, John (8BM0) articulated that he won numerous mathematics awards in elementary school and a couple in middle school. Conversely, James B. (8HM2) responded with an emphatic, “Nope!” His peer, Aaliyah (8BF2), also indicated that she was never recognized for her abilities in mathematics, and that her strength was reading. Kayla (8BF1) and LaBron (8BM1) discussed being recognized informally by the teacher in the classroom with verbal praise.

Variable: Gender. Male students with no or minimal failure tended to described instances during which they were recognized for their mathematics abilities. In contrast, students of multiple failures presented neutral or negative responses. Dwayne (6BM2) discussed being recognized but did not tie his response directly to his mathematics ability. James (7BM2) and James B. (8HM2) were emphatic that they had never been recognized.

Female students were less apt to experience recognition than male students. Only three female students clearly stated they had been recognized: Joanna (6HF0), Ashley (7BF0), and Kayla (8BF1). Nya (6BF1) and Anna (8HF0) provided neutral responses while the remaining female students indicated they had not been recognized for their mathematics abilities. Similar to the male students, the female students with repeated failure in the study, Leslie (7HF2) and Aaliyah (8BF2), explained that they had never been recognized.

Variable: Race. Black students with no failure indicated they had been recognized for their achievement in mathematics. Students with minimal and repeated failure produced mixed results. Students with repeated failure tended to believe teachers would not provide positive feedback about their mathematics ability. Dwayne (6BM2) slightly contradicted his peers with repeated failure when he described being awarded for the A/B Honor Roll; however, he did not speak directly to his ability in mathematics. Black students with minimal failure presented

positive, neutral, and negative responses respectively. Jennifer (7BF1) stated she was never recognized in mathematics. Nya (6BF1) recalled an experience with her grandmother when she was acknowledged for measuring and designing clothes, but her response did not definitely suggest she was clearly recognized for her mathematics ability. Kayla (8BF1) articulated very clearly being positively recognized by her teacher. She explained, while at times speaking in third person, “I will get pointed out. Like, she’s the only one who passed the test or she’s the only one that does her homework and understands.”

Similar to the Black students in the study, Hispanic students with repeated failure tended to indicate that they have not been recognized for their ability in mathematics. Both Leslie (7HF2) and James B. (8HM2) explained that they had not been recognized. Conversely, two Hispanic students with no failure described being recognized. Joanna (6HF0) confidently stated, “And like my fifth grade math teacher said I was like one of her best math students.” Her peer Robert (7HM0) also remembered a fifth grade experience. Because he excelled in the subject, he explained that his teacher would be prepared to give him a mathematics worksheet as soon as he walked into the classroom. Bob (7HM1), a student with minimal failure, recalled receiving a mathematics award at an awards night.

Summary Social Persuasion (Teachers/Adults)

Study participants, regardless of grade level, gender, or race generally maintained positive reflections of their mathematics teachers. Eighth and seventh grade students were more critical in what they thought their teachers might say about them; especially if they experienced failure. They were also more critical when asked what their teachers would say to their parents. Although the students who experienced repeated failure mentioned their perceived weaknesses, they still viewed their teachers as supportive. In addition, students in higher-grade levels that

experienced failure were more likely to indicate they had not been formally recognized for their abilities in Mathematics. Tables 11 through 13 include summaries of these findings.

Table 11

Social Persuasion & Messages Received from Teachers

Interview Protocol: What sorts of things do your teachers tell you about your performance in math?

Positive – Participants' responses were associated with positive self-efficacy.

Neutral – Participants' responses were not decisively positive or negative.

Negative – Participants' responses were associated with negative self-efficacy.

Mixed – Participants' responses contradicted each other.

Grade Level	No Failure	Minimal Failure	Multiple Failures
6	Mixed to Positive	Neutral to Positive	Positive
7	Neutral to Mixed	Positive	Mixed to Positive
8	Negative to Neutral	Neutral to Positive	Positive
Gender	No Failure	Minimal Failure	Multiple Failures
Male	Neutral to Mixed	Positive	Mixed to Positive
Female	Mixed	Neutral to Positive	Positive
Race	No Failure	Minimal Failure	Multiple Failures
Black	Neutral to Mixed	Neutral to Positive	Mixed to Positive
Hispanic	Mixed	Positive	Positive

Table 12

Social Persuasion & Teacher Messages to Parents

Interview Protocol: What do you think your teacher(s) would tell your parents about how you do in math?

Grade Level	No Failure	Minimal Failure	Multiple Failures
6	Neutral to Positive	Positive	Mixed to Positive
7	Neutral to Positive	Positive	Neutral to Positive
8	Mixed to Negative	Mixed	Mixed to Negative
Gender	No Failure	Minimal Failure	Multiple Failures
Male	Mixed/Neu. to Positive	Mixed to Positive	Mixed/Neu. to Negative
Female	Mixed	Mixed to Positive	Mixed to Positive
Race	No Failure	Minimal Failure	Multiple Failures
Black	Mixed/Neutral	Mixed to Positive	Mixed/Neutral
Hispanic	Mixed	Positive	Mixed

Table 13

Social Persuasion & Recognition from Others

Interview Protocol: Have you ever been recognized for your ability in math?

Grade Level	No Failure	Minimal Failure	Multiple Failures
6	Positive	Neutral to Positive	Neutral
7	Positive	Mixed	Negative
8	Neutral to Positive	Neutral to Positive	Negative

Gender	No Failure	Minimal Failure	Multiple Failures
Male	Positive	Neutral to Positive	Neutral to Negative
Female	Neutral to Positive	Mixed	Negative

Race	No Failure	Minimal Failure	Multiple Failures
Black	Positive	Mixed	Neutral to Negative
Hispanic	Neutral to Positive	Positive	Negative

Analysis of Social Persuasion (Peers)

Interview Protocol: How do you think your friends would describe you in math?

Variable: Grade Level. Most of the sixth grade students interviewed responded favorably when asked how their friends would describe them in their mathematics abilities. Joanne (6HF0) jokingly stated she is sometimes called a nerd by her friends. Many of the students indicated their friends come to them for help. This also held true for Dwayne (6BM2) although he could not specifically state how his friends would describe his math abilities.

Seventh grade students provided a range of responses. Leslie (7HF2), Jennifer (7BF1), and Bob (7HM1) all thought their friends would describe them as being good or smart in mathematics. Robert (7HM0) indicated that he does not have many friends in his classes and does not know how his friends would describe his math abilities. Ashley (7BF0) did not provide a response to this direct question but did indicate that she is the “go to” person for help in her class. In contrast, James (7BM2) stated he would more likely ask his friends for help than his friends asking him for assistance.

Overall, eighth grade students held less favorable opinions of what their friends would say about their math abilities. Aaliyah (8BF2) thought her friends would describe her as “shaky”

in mathematics and she could use a lot more help. Similarly, James B. (8HM2) indicated his friends might say, "...that kid is so bad in math." Kayla (8BF1) neutrally expressed her friends do not know about her abilities in math but that her boyfriend calls her a nerd. LaBron (8BM1) thought his friends might say he is good in math but sometimes has a "little" bump. The students with no failure gave contrasting answers. Anna (8HF0) stated her friends would describe her as slow, while John (8BM0) thought they would say he is pretty good because he helps them with their mathematics or science work. Anna may have been referring to the speed in which she completes her assignments; not referring to a lack of ability to grasp mathematical concepts. Later in the interview, Anna (8HF0) suggested that she does well when she has more time.

Variable: Gender. Male students with no or minimal failure tended to have positive perceptions of how their friends would describe them in mathematics. Of this group, only Robert (7HM0) seemed unsure. He stated, "I don't know. I don't have my friends in most of my classes." Students with repeated failure were more likely to provide negative responses. James (7BM2) said he would go to his friends for help instead of them asking him for assistance. James B. (8HM2) also explained his friends would not ask him for help and they would describe him as a poor performer in mathematics. Dwayne (6BM2), another male student with repeated failure, provided a neutral response. He expressed that his friends sometimes ask him for help but did not provide further details regarding how his friends would judge his abilities.

Female students generally held positive perceptions of how their friends would describe them in mathematics but there were a few inconsistencies. For instance, both Aaliyah (8BF2) and Anna (8HFO) provided negative responses although they held different experiences with success and failure. Kayla (8BF1) expressed a neutral answer when she explained her friends really do not know how well she performs in mathematics. She stated, "Well, they really don't

say anything because they don't know." The remaining female participants in the study felt as though their friends would respond favorably as to how well they performed in mathematics.

Variable: Race. Five Black study participants thought their friends would describe them as performing well in mathematics. Five students held negative or neutral perceptions of what their friends might say. Aaliyah (8BF2) was the only Black student that held negative perceptions while LaBron (8BM1) provided a contradictory (mixed) response. Two of the three Black students with no failure expressed clearly positive responses of how their friends would describe their abilities in mathematics. The third Black student in the study with no failure, Ashley (7BF0), intonated a neutral response.

Hispanic students also produced a variety of responses regarding the social persuasion of their peers. Anna (8HF0) and James B. (8HM2) stated that their friends would describe them as being slow or bad in mathematics. This contrasted with Bob (7HM1), Joanna (6HF0), and Leslie (7HF2) as they all held positive perceptions. In fact, although Leslie (7HF2) experienced multiple failures, she expressed the following, "They're like, you're smart. You're smarter than me." Robert (7HM0) provided a neutral response as he did not know how his friends might respond.

Summary of Social Persuasion (Peers)

As students moved through the grade levels, they were more apt to express negative perceptions of what friends might say about their mathematics abilities. Eighth grade students with multiple years of failure thought their friends would not respond favorably. This distinction was as not as prevalent among the sixth and seventh grade students with no or minimal failure. When the influence of gender was examined, a discernible pattern among or between male and

female students did not emerge. The variable of race also produced mixed results. Both Black students and Hispanic students provided a variety of responses irrespective of their experiences with failure. Table 14 includes a summary of these findings.

Table 14

Social Persuasion & Messages from Peers

Interview Protocol: How do you think your friends would describe you in math?

Positive – Participants' responses were associated with positive self-efficacy.

Neutral – Participants' responses were not decisively positive or negative.

Negative – Participants' responses were associated with negative self-efficacy.

Mixed – Participants' responses contradicted each other.

Grade Level	No Failure	Minimal Failure	Multiple Failures
6	Positive	Positive	Neutral to Positive
7	Neutral	Positive	Neutral to Positive
8	Mixed	Mixed to Neutral	Negative
Gender	No Failure	Minimal Failure	Multiple Failures
Male	Neutral to Positive	Mixed to Positive	Neutral to Negative
Female	Mixed	Neutral to Positive	Mixed
Race	No Failure	Minimal Failure	Multiple Failures
Black	Neutral to Positive	Mixed/Neu. to Positive	Negative to Neutral
Hispanic	Mixed	Positive	Mixed

Analysis of Vicarious Experiences (Family/People Admire)

Interview Protocol: Tell me about your family and math. Are your siblings good at math? Are the people you admire good at mathematics?

Variable: Grade Level. Sixth grade students, regardless of experience with failure, connected their family and/or people they admire positively to mathematics. Dwayne (6BM2) admired his auntie and expressed she was good at mathematics along with his mother and father. Nya (6BF1) and Steve (6BM0) specifically stated their mothers were good in mathematics. Michael (6BM1) admired his father and stated he learned “lots of math” from him. Likewise, Joanna (6HF0) spoke positively about her father’s ability in mathematics but also described in detail her mother’s intense dislike for mathematics.

Three seventh grade students shared similar opinions of their family members as sixth grade students. Ashley (7BF0), Leslie (7HF2), and Robert (7HM0) thought their parents performed well at mathematics. Bob (7HM1), on the other hand, was not as positive about the mathematics abilities of his family members. He stated, “My mom and my dad don't know that much math.” James (7BM2) was practically non-responsive when asked about his family members and mathematics; however, he definitely verbalized that he did not talk to them about mathematics. Jennifer (7BF1) contradicted herself as she initially expressed that she did not interact with her family regarding the subject but later in the interview described that her sister was good in math and that they talk about math “sometimes.”

From the perspective of experience with failure, eighth grade students provided diverse answers. James B. (8HM2) articulated a vivid example. He explained, “I showed her {mother} one of my papers with fractions and letters, she was like, ‘what is that?’ Like, that’s my math work. That is why I complain so much.” Similarly, Kayla (8BF1) mentioned that her sister and

mother were not good in mathematics. Anna (8HF0) provided a contradictory answer. She described her brother as being “really good” in mathematics when he attended school but was not as positive in describing her mother’s abilities. She stated, “Well, since my mom had us at an early age, she didn’t really finish school so asking her really wouldn’t help me.” Aaliyah (8BF2), LaBron (8BM1), and John (8BM0) connected mathematics positively with their family members. For example, John (8BM0) linked mathematics to his father’s profession and also described his siblings as performing well in the subject.

Variable: Gender. There was a stronger association between failure and vicarious experience with male students than female students. Male students with no failure described positive vicarious experiences with family members while students with minimal or no failure provided instances of negative experiences. For female students, the relationship was inversely associated. In a few cases, female students with no and minimal failure described family members as performing poorly in mathematics while the reflections of female students with repeated failure were positive.

Variable: Race. Black students with no failure described family members that performed well in mathematics. The results for students with minimal failure and repeated failure were mixed. This differed slightly from Hispanic students where all three failure categories described instances of negative vicarious experiences with family members. However, Hispanic students with no failure were more likely to articulate positive experiences.

Summary of Vicarious Experiences (Family/People Admire)

Vicarious experience through family members influenced the variables of the study in a variety of ways. Seventh and eighth grade students were more likely to describe negative

vicarious experiences than sixth grade students. For gender, instances of negative vicarious experiences were associated to failure with male students and somewhat inversely associated with female students. Hispanic students across all three failure categories appeared more apt than their Black peers to articulate negative vicarious experiences in mathematics with family members. Table 15 includes a summary of these findings.

Table 15

Vicarious Experiences from Family and People Admire

Interview Protocol: Tell me about your family and math. Are your siblings good at math? Are the people you admire good at mathematics?

Positive – Participants' responses were associated with positive self-efficacy.

Neutral – Participants' responses were not decisively positive or negative.

Negative – Participants' responses were associated with negative self-efficacy.

Mixed – Participants' responses contradicted each other.

Grade Level	No Failure	Minimal Failure	Multiple Failures
6	Mixed to Positive	Positive	Positive
7	Positive	Mixed to Negative	Mixed
8	Mixed to Positive	Mixed	Mixed
Gender	No Failure	Minimal Failure	Multiple Failures
Male	Positive	Mixed	Positive to Negative
Female	Mixed to Positive	Mixed	Positive
Race	No Failure	Minimal Failure	Multiple Failures
Black	Positive	Mixed	Mixed
Hispanic	Mixed to Positive	Negative	Mixed

Analysis of Vicarious Experiences (Peers)

Interview Protocol: Describe how most of your friends do in math.

Variable: Grade Level. For sixth grade students, there was an association between failure and how they perceive their friends' abilities in math. Students with no failure in mathematics thought their friends performed well in the subject. Nya (6BF1) and Michael (6BM1), students with minimal failure, provided mixed answers. They suggested some of their friends were good at math and others were not. Michael thought his friends "kind of" liked mathematics and explained some are faster than him and some are slower. Nya expressed that her "true friends" enjoyed mathematics like her but other friends "don't like school at all." Dwayne (6BM2) stated his friends were "not so good" at math.

Seventh grade students provided a range of responses regarding their friends. Leslie (7HF2) believed some of her friends did better than her in mathematics while others did not. Her response took on an increasingly negative tone as she described her friends also getting headaches like her, and that they do not like mathematics. James (7BM2) never stated whether his friends were good at mathematics, but he did positively suggest he would go to them for help. Jennifer (7BF1) did not know how her friends performed in mathematics while Bob (7HM1) described his friends as "good" in mathematics even though some of them did not care for the subject. Ashley (7BH0) did not directly describe the perceived ability of her friends but she did say that she would ask them for help. Robert (7HM0) eluded this question as he stated earlier that he did not speak with his friends about math because they were in different classes. He also did not talk about mathematics with his friends.

Eighth grade students held positive opinions of their friends' abilities in mathematics except for James B. (8HM2). He clearly stated that his friends shared in his dislike for the

subject and his lack of ability. Although Aaliyah (8BF2) also experienced failure on multiple occasions, she perceived her friends as good in mathematics and even relies on them for assistance. LaBron (8BM1) and Kayla (8BF1) held positive opinions of their friends' abilities. LaBron described them as "good" in mathematics and Kayla sometimes relies on her friends to "translate" math concepts. Anna (8HF0) believed mathematics was easy for her friends and readily mentioned that they were all in an advanced mathematics class. She then articulated her friends did not like mathematics even though it came easy to them due to the amount of work required. John (8BM0) did not speak directly to his friends' abilities in mathematics but indicated they were enrolled in higher level classes such as gifted and magnet.

Variable: Gender. Male students with repeated failure tended to believe their friends were not good at mathematics. Both Dwayne (6BM2) and James B. (8HM2) thought their friends were not good at mathematics. Michael (6BM1), a student with minimal failure provided a mixed response. He stated, "Some of them are faster than me, some of them are slower." The other male study participants described their friends as good in mathematics.

Female students expressed held a variety perceptions of their friends' mathematics abilities. Leslie (7HF2) was the only female student to provide a clearly negative response when she expressed that her friends get headaches too. Anna (8HFO), along with several of her female peers, provided positive responses. Anna's response, in particular, illustrated the impact of vicarious experiences. She replied, "My friends are all in advanced math, so it is really easy to them and they really get it and it is almost like effortless to them. Which makes me want to be like oh, if they don't care and they can still pass, well I can do that too..." . Jennifer (7BF1) and Nya (6BF1) provided neutral and mixed responses respectively.

Variable: Race. When analyzed by the variable of race, mixed results were discovered for Black students. Aaliyah (8BF2), a student with repeated failure, suggested her friends were good at mathematics and even went to them for help. Dwayne (6BM2), another student with repeated failure contradicted Aaliyah's response. He described his friend's performance as "not so good." Michael (6BM1) and Jennifer (7BF1) provided mixed and neutral responses respectively while the remaining Black participants expressed positive responses.

Hispanic students tended to express neutral or positive vicarious experiences in mathematics with their peers except for students with repeated failure. James B. (8HM2) provided a clearly negative response. He expressed that his friends did not like mathematics and also did not perform well in the subject. Leslie (7HF2) emphasized her friends also get headaches as they work with mathematics and they hate the subject. Robert (7HMO) expressed neutral responses while the remaining Hispanic interviewed clearly stated their friends performed well in mathematics.

Summary of Vicarious Experiences (Peers)

A mixed pattern emerged after analyzing all three variables. A few students that experienced repeated failure across all three grade levels described negative vicarious experiences of their friends that were linked to their own experiences with mathematics. Dwayne (6BM2), Leslie (7HF2), and James B. (8HM2) specifically stated their friends were not good at and/or did not like math. Leslie even suggested her friends responded to mathematics by getting headaches; similar to her physical response. However, James (7BM2) and Aaliyah (8BF2) did not quite fit this pattern as they were both willing to elicit help from their friends. Table 16 includes a summary of these findings.

Table 16

*Vicarious Experiences from Peers' Performance***Interview Protocol: Describe how most of your friends do in math.**

Positive – Participants' responses were associated with positive self-efficacy.

Neutral – Participants' responses were not decisively positive or negative.

Negative – Participants' responses were associated with negative self-efficacy.

Mixed – Participants' responses contradicted each other.

Grade Level	No Failure	Minimal Failure	Multiple Failures
6	Positive	Mixed	Negative
7	Neutral to Positive	Neutral to Positive	Mixed
8	Positive	Positive	Mixed

Gender	No Failure	Minimal Failure	Multiple Failures
Male	Neutral to Positive	Mixed to Positive	Mixed
Female	Positive	Mixed/Neu. to Positive	Mixed

Race	No Failure	Minimal Failure	Multiple Failures
Black	Positive	Mixed/Neu. to Positive	Mixed
Hispanic	Neutral to Positive	Positive	Negative

Analysis of Emotional/Physiological States**Interview Protocol: When you are given a math test, how does that make you feel?****How do you feel when you are given a math assignment?**

Variable: Grade Level. Sixth grade students expressed a variety of affective and physiological responses when asked how they would feel taking a mathematics test or completing a mathematics assignment. Steve (6BMO) indicated he would be a "little nervous" if he had to take a mathematics test but thought he would be prepared. Dwayne also stated that he

would be nervous (6BM2); however he felt more comfortable with general assignments in mathematics than taking tests. Nya (6BF1) explained she feels nervous if she is under time constraints. In contrast, Michael (6BM1) expressed he liked taking tests and that he feels “ok” with assignments in mathematics.

Seventh grade students also yielded a range of responses. Ashley (7BF0) feels stressed when taking a mathematics test but not on regular mathematics assignments such as homework. Robert (7HM0) expressed confidence with mathematics tests and enjoys completing mathematics assignments. In fact, when asked about assignments he stated, “I feel like, pumped.” Bob (7HM1) said his heart would start to race if he had to take a mathematics test and would simply try his best if given a mathematics assignment. Jennifer (7BF1) did not provide a definitive answer but suggested she would need to stay focused and think clearly during a mathematics test. She would only feel nervous if there was not time to study. James (7BM2) essentially was neutral in his response and apathetically stated he would feel “normal” or “regular” when presented with a mathematics test or assignment. Leslie (7HF2), on the other hand, described how she gets sick with headaches when having to complete mathematics assignments and that it gets worse with tests. It appeared as though this physiological response was the result of self-inflicted pressure. She stated, “I’m so stressed when I’m taking a math test because I’m afraid I’m going to fail.”

The physiologically states of the eighth grade students interviewed with experience in repeated failure intensified when asked about completing math assignments and tests. For example, Aaliyah (8BF2) stated she would start shaking if she had to complete a mathematics assignment and would feel paranoid if she had to take a mathematics test. When James B. (8HM2) was asked what emotions he would feel, he said he would feel lazy and dizzy. In a

testing situation he would feel “all stressed.” Eighth grade students with minimal failure also expressed negative feelings. Kayla (8BF1) indicated she gets stressed out with tests and reacts by putting her head down. However, when asked to complete assignments such as math problems, she stated, “Yes, it is still like the main thing that I really get so it’s like not a struggle. Piece of cake!” LaBron (8BM1) described that he struggles with homework because his teacher is not around but he wasn’t concerned with taking a test. Anna (8HF0) said she was comfortable with mathematics assignments if she is working at a good pace. She also does not like to feel rushed and will perform well if she had the opportunity to practice. John (8BM0) stated he feels nervousness and discomfort when having to take a mathematics test.

Variable: Gender. Responses were mixed when male students were asked how they would feel if given a mathematics test. Four out of the nine study participants expressed negative or mixed feelings such as nervousness. Three male students of varying experiences with failure provided positive responses. LaBron (8BM1) thought he would be ready, Michael (6BM1) intoned that he likes taking tests, and Robert (7HM0) stated he would be confident. Steve (6BM0) expressed, in a neutral manner, that he would feel a “little” nervous. When asked about math assignments, the results were typically positive except for James B. (8HM2) and LaBron (8BM1). James B. (8HM2) mentioned he would feel lazy and dizzy when presented with a mathematics assignment. LaBron (8BM1), although he was generally very positive, mentioned he struggled when his teacher is not around. These data suggest that failure and gender was not associated with negative or positive emotions.

Female students expressed more consistent feelings of apprehension than male students as the data revealed no study participants of this variable with a definitely positive response. For example, when asked about taking tests in mathematics, the most favorable responses were

expressed neutrally by Jennifer (7BF1) and Anna (8HF0). Even female students with no failure described emotions of nervousness. For instance, Ashley (7BF0) stated, "I'm so stressed when I'm taking a math test because I'm afraid I'm going to fail." Similarly, Joanna (6HF0) described feeling nervous on unit tests. Aaliyah (8BF2), a student with repeated failure, was particularly emotional in her response. She articulated, "I'm like, oh gosh. I have to pass. What if I don't pass? I have all these thoughts in my head cause I have paranoia." Regardless of failure experience, female students also expressed negative responses when asked about mathematics assignments in general. Aaliyah (8BF2) thought she would start shaking and Leslie (7HF2) mentioned getting headaches when she has to complete work in mathematics. Joanna (6HF0) described her frustrations with algebra, and Kayla (8BF1) explained that she starts to get headaches when she does not understand a mathematics assignment.

Variable: Race. An exploration of race yielded mixed results when Black students were asked how they respond to mathematics tests. Of the 11 Black students in the study, 2 students provided negative responses, 3 students' responses were neutral, 4 students' responses were mixed, and the remaining 2 students held beliefs that were clearly positive. For instance, LaBron (8BM1) felt confident about taking a test (positive), Steve (6BM0) expressed a degree of nervousness but explained he would be prepared (neutral), while Aaliyah (8BF2) expressed that she "freaks out" (negative). When the students were asked how they respond to mathematics assignments, a similar trend continued although there were fewer negative responses. Three students provided positive responses, three other students provided negative responses and the rest were neutral. Clear associations to failure category were not apparent.

There was a consistent association to repeated failure with Hispanic students. When asked how they would respond to a mathematics test or assignment, the students with repeated

failure provided negative responses. James B. (8HM2) stated, "I'm just like what is this? I don't remember going through this." He also expressed feelings of laziness when given a mathematics assignment. His peer, Leslie (7HF2), related getting headaches to taking mathematics tests and completing mathematics assignments. Students with minimal and no failure expressed neutral, negative, or mixed responses. Anna (8HF0) suggested in a neutral fashion that she would feel comfortable if she is able to practice and work at a "good" pace. Joanna (6HF0) felt good completing mathematical tasks related to fractions but expressed frustration with algebra (mixed). Bob (7HM1) negatively expressed nervousness when presented with a mathematics test and would just try his best to finish a mathematics assignment.

Summary of Grade Level and Emotional/Physiological States

The data suggested failure may increase the likelihood a student will feel anxious when presented with mathematic assignments and/or tests. This finding became more prevalent as the grade levels increased. However, past success does not eliminate negative emotional and physiological responses. Even some of the high achieving students associated stress with mathematics; primarily related to tests. When gender was examined, the responses from male students were mixed but female students tended to consistently express anxious and nervous feelings. The results for race were also generally mixed; however, Hispanic students of minimal and multiple failures demonstrated affective and physiological responses clearly associated with negative self-efficacy. Table 17 includes a summary these findings.

Table 17

Emotional/Physiological States & Mathematics Tasks

**Interview Protocol: When you are given a math test, how does that make you feel?
How do you feel when you are given a math assignment?**

Positive – Participants' responses were associated with positive self-efficacy.

Neutral – Participants' responses were inconclusive or not decisively positive/negative.

Negative – Participants' responses were associated with negative self-efficacy.

Mixed – Participants' responses contradicted each other.

Grade Level	No Failure	Minimal Failure	Multiple Failures
6	Mixed/Neutral	Mixed to Positive	Mixed
7	Mixed to Positive	Neutral to Negative	Neutral to Negative
8	Neutral to Negative	Mixed to Positive	Negative

Gender	No Failure	Minimal Failure	Multiple Failures
Male	Mixed	Mixed	Mixed/Neu. to Negative
Female	Mixed/Neutral	Mixed/Neutral	Negative

Race	No Failure	Minimal Failure	Multiple Failures
Black	Mixed/Neu. to Negative	Mixed/Neu. to Positive	Mixed/Neu. to Negative
Hispanic	Mixed/Neu. to Positive	Negative	Negative

Section 3: Most Influential Mediating Variable

The final analysis of this study examines the influence of the variables explored and is guided by the following research question: Among the variables of grade level, gender, and race, which variable has the most influence on the perceived self-efficacy in mathematics of middle school students? To quantify the qualitative data, numerical values were assigned to each descriptor. Table 18 below depicts how the quantitative values were assigned per descriptor.

Table 18

Definition of Descriptors

Descriptor	Value Assigned
Positive	1
Neutral	0
Negative	-1
Mixed	X – No Value Assigned

An average score was generated by averaging the total scores for each study participant (refer to Appendix I). Table 19 and Figure 1 depict the results of this analysis.

Table 19

Average Response Score per Variable Studied

Grade Level	No Failure	Minimal Failure	Multiple Failures	Average
6	0.87	0.87	0.29	0.76
7	0.63	0.53	-0.19	0.33
8	0.13	0.64	-0.47	0.07
Gender	No Failure	Minimal Failure	Multiple Failures	Average
Male	0.52	0.42	0.24	0.40
Female	0.43	0.37	0.06	0.33
Race	No Failure	Minimal Failure	Multiple Failures	Average
Black	0.52	0.42	0.21	0.36
Hispanic	0.43	0.56	0.11	0.37

Race	No Failure	Minimal Failure	Multiple Failures	Average
All Variables	0.46	0.42	0.21	0.36

The average scores across failure categories consistently declined for all variables except for two instances; minimal failure for the Hispanic subgroup and minimal failure for eighth grade students. Overall however, these data suggest an association exists between failure in mathematics and reduced levels of perceived self-efficacy towards mathematics. In particular, the association between failure and negative self-efficacy strengthened for students of the repeated failure category.

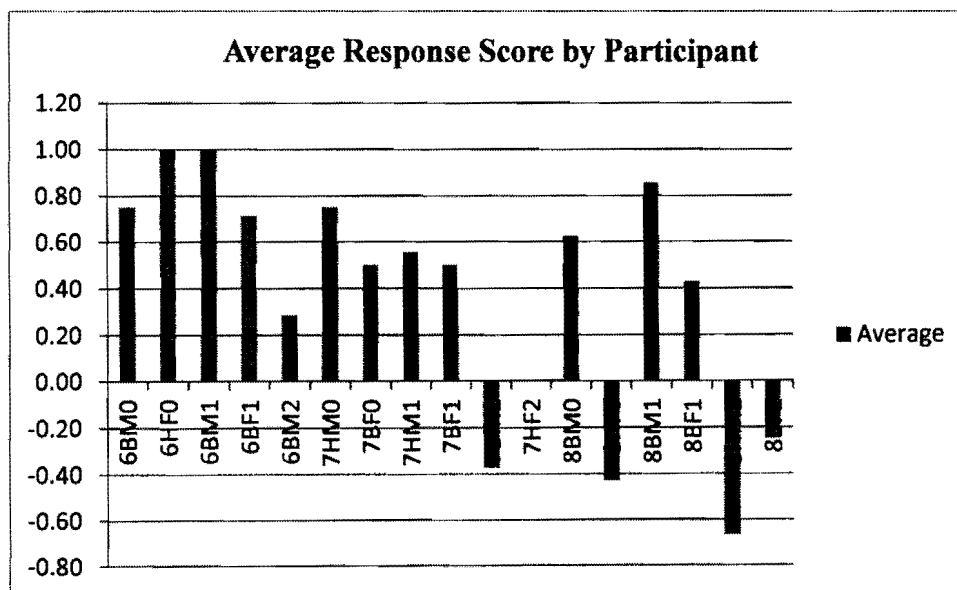


Figure 1. Average response score by participant.

From an examination of Figure 1 another trend was discovered. Male students with repeated failure held both the lowest average score at their grade level and their average scores consistency declined from grade 6 through grade 8. For example, Dwayne (6BM2) produced the lowest sixth grade average score of .29. This average declined further for James (7BM2); produced a score of -.38, which was also the lowest for his grade level. The average score of James B (8BM2) plummeted even further to a -.67. Repeated failure, for these male students,

appeared to have a significantly negative association on their self-efficacy beliefs that increased in severity from grades 6 through 8 (see Figure 1). It is important to highlight however that Anna (8HF0) contradicted this trend. She was the only study participant of the no or minimal failure categories that produced a negative average.

In determining the most influential variable, these data suggest that grade level most strongly influenced the self-efficacy believes of all students. Average total scores steadily declined for all three grade levels (see Figure 2). As described, the steepest declines were realized with students of multiple failures; from .29 to -.47. In contrast, the deltas for the total average scores for gender and race were not as dramatic as grade level variable. Female students produced an average lower than male students (.33 and .40 respectively) while Black students held averages slightly lower than Hispanic students (.36 and .37 respectively).

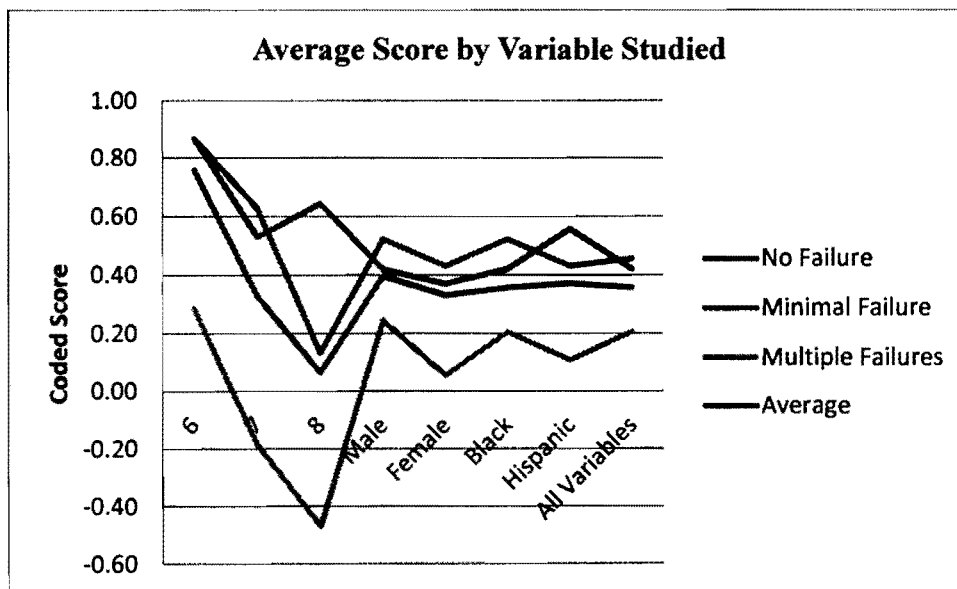


Figure 2. Average score by variable studied.

Conclusion of Analysis

The findings related to the overarching research questions (Section 1), subsidiary research questions related to the variables studied (Section 2), and the quantitative data realized in the quantitative analysis (Section 3), triangulate to support the negative impact of repeated failure as students matriculate through the middle grades. From the analysis of the general research question in Section 1, a slight pattern emerged among students of repeated failure. While all of the students with repeated failure did not report suppressed levels of self-efficacy, three of the five students interviewed viewed themselves as substantially less capable than their peers with no or minimal failure. In Section 2, where the sources of self-efficacy were thoroughly analyzed, students of repeated failure also tended to expressed answers consistent with suppressed perceptions of their mathematics abilities. This is evidenced by the last column of the summary tables (depicting multiple failures) where there were increased instances of negative responses in comparison to the findings listed in the first two columns (No failure and Minimal failure). When analyzed by row, this same pattern emerged with the grade level variable. Section 3 confirmed these findings where a numerical coding strategy was employed. The data from the students with multiple failures were substantially lower than students with no failure and minimal failure. Similarly, the most significant changes in average score (variable of most impact) was realized in the analysis of grade level.

Chapter V

CONCLUSION

Introduction

This study sought to qualitatively determine how success versus failure on a standardized test affects middle school students' self-efficacy beliefs in mathematics. In the analysis, the theoretical predictions of this study were generally upheld. Students with limited mastery experience tended to express lower self-efficacy beliefs in comparison to their peers with greater mastery experience. As explained by the foundational theorist of self-efficacy, mastery experience strongly influences achievement and future success (Bandura, 1997; Pajares, 1996).

It was my intent to supplement the ample quantitative data on self-efficacy in mathematics by employing a qualitative methodology. The qualitative data supported the findings of quantitative studies found within the larger body of literature (Pajares & Urdan, 2006), hence this summary will attempt to answer why or how the phenomenon of decreased self-efficacy develops from the independent variable of mastery experience and the mediating variables of grade level, gender, and race. A conclusion is provided for each research question explored in this study as each question references one of the variables explored.

Findings Related to the General Research Question

How does success versus failure affect self-efficacy beliefs of middle students in mathematics?

From an examination of the overarching research question that guided this study, repeated failure in mathematics tended to negatively impact the perceived self-efficacy beliefs of students. As students' survey responses were evaluated based upon failure history, self-efficacy perceptions routinely declined from students with no failure, to students with minimal failure, to

students with multiple failures. Students with multiple failures were less likely to view themselves as capable students in mathematics, surround themselves with other capable students, and associate family members as competent in mathematics. As a means to understand this phenomenon further, it was important to reflect upon the subsidiary research questions in the study.

Findings of Subsidiary Research Question 1

How is the relationship between success/failure and self-efficacy mediated by grade level (grades 6-8)?

Grade level had a substantial influence on the development of self-efficacy beliefs for students with repeated failure. Although this study is cross-sectional, this finding suggests a potential link between maturation and the development of self-beliefs. For instance, preadolescents may be less susceptible to the negative consequences of failure because their ability to interpret mastery experience is still developing. As students matriculate through middle school however, they begin to solidly beliefs based upon their success and failure experiences that can either support or hinder how they view their mathematics abilities. As explained by Pajares and Urdan (2006), "As teens become more skilled at coordinating conflicting information and expectations, they form more stable and integrated views of their capabilities, values, and attributes" (pg. 77). In fact, Eccles, Wigfield, and Schiefele (1998) found that self-perceptions tend to begin declining in seventh grade or earlier. Again, it is important to clarify that these conclusions are based on cross-sectional data and did not involve three independent measures of self-efficacy over a 3 year period.

In sixth grade, it may not be too late to reverse students' self-beliefs. According to the qualitative responses in this study, sixth grade students still felt positive about their abilities;

even to the point where their self-perceptions were a misrepresentation of their actual achievement. For example, a Black sixth grade male study participant with repeated failure articulated that he was very confident in mathematics and he actually misrepresented his previous failures. This is quite different than the self-perceptions of students in the latter middle grades; especially eighth grade students. The eighth grade students in the study with repeated failure often provided apathetic or emotional responses. They were substantially less apt to speak positively about their mathematics abilities or even about the mathematics abilities of those around them. Perhaps the incongruence demonstrated by the sixth grade student of repeated failure is a result of poor personal calibration. As explained by Pajares and Kranzler (1995), students that overestimate their abilities are considered to possess poorly calibrated self-beliefs. Their research also found that individuals become better at appraising their own abilities over time and that Black students tended to demonstrate more overconfidence than their White peers. Being that the student was in the lowest grade level compared to the other minority students in the study of repeated failure, this finding does appear to have an empirical explanation.

Findings of Subsidiary Research Question 2

How is the relationship between success/failure and self-efficacy mediated by gender?

Although the results were not nearly as dramatic as grade level, female students more frequently articulated reduced levels of self-efficacy compared to their male peers. This is consistent with findings in the literature where females students demonstrate reduced levels of confidence than boys even when success was achieved (Lloyd, Walsh, & Yailagh, 2005). This educator proposes that perceived self-efficacy may be a key construct in reversing this trend.

Female students may feel more comfortable with mathematics if they are positively exposed to the other sources of self-efficacy beyond mere mastery experience; productive vicarious experiences and positive social persuasion interactions in particular. One could argue that this combination of efficacious experiences would then increase the likelihood female students would link mathematics to positive emotional and physiological states thereby increasing their overall self-efficacy.

Findings of Subsidiary Research Question 3

How is the relationship between success/failure and self-efficacy mediated by race?

The qualitative results of this study did not demonstrate that race substantially informed self-efficacy beliefs among Black and Hispanic students. While the self-efficacy beliefs of both races declined when multiple failures were experienced, the differences between the races were minimal. These finding suggests that the construct of self-efficacy influences Black and Hispanic students in a similar manner. As suggested by Stevens, Olivarez, Lan, and Tallent-Runnels (2004), Hispanic students have fewer opportunities to experience positive role models in Mathematics which negatively influences self-efficacy. The research also suggests that some Black students may lack exemplars in Mathematics (Klopfenstein, 2005). Furthermore, a higher proportion of Black and Hispanic students live in poverty than their White peers (Drake & Rank, 2009). These factors may contribute to the similar impact of failure on self-efficacy of both races. Additional research would need to be conducted in this area though before a more definitive conclusion could be drawn.

Findings of Subsidiary Research Question 4

Among the variables of grade level, gender, and race, which variable has the most mediating influence on the relationship between success/failure on a standardized test and perceived self-efficacy in mathematics of middle school students?

As stated earlier in this chapter, grade level clearly held the strongest mediating effect on the perceived self-efficacy in mathematics of middle school students. Positive self-perception responses to the survey protocol consistently declined across the grade levels with repeated failure categories. What does this tell us? Although this study employed a cross-sectional methodology, these qualitative data suggest educators need to incorporate strategies targeted directly to the sources of self-efficacy as students matriculate through middle school. This strategy will grow in importance for seventh and eighth grade students with repeated failure as their beliefs become more solidified.

Final Discussion

This study confirmed the negative influence of repeated failure in mathematics on the self-efficacy beliefs of middle school students. Students with multiple failures consistently held negative self-efficacy beliefs in comparison to their higher achieving peers. These findings suggest that middle school educators may want to employ a balanced set of improvement efforts that directly inform the sources of self-efficacy. If educators continue to select best practices in isolation without any consideration for potential impact on self-efficacy, the nation will continue to produce minority students ill prepared for the mathematical challenges often associated with high school completion (Chau, 2009).

Recommendations for Practice

School leaders should look to other metrics that can inform improved student achievement. Simply administering assessments to obtain data to inform instruction is not sufficient. This is evidenced by the weaknesses of No Child Left Behind (NCLB) where assessment is now a routine process even though achievement gaps persist. Educators need to evolve beyond NCLB in order to completely address the persistent achievement gaps between White and minority students, as well as between affluent and less affluent students (Wentzel & Wigfield, 2009). Innovative educators will look beyond standardized test data by using the tenets of other constructs such as social cognitive theory. One such strategy is surveying students to measure their levels of perceived self-efficacy. In doing so, educators can build a stronger platform in which to employ strategic improvement initiatives.

There are specific strategies school leaders can enact to recognize and increase levels of student self-efficacy. Although mastery experience holds the most potent influence, it is critical for educators to establish practices that address all sources (Pajares & Urdan, 2006). Table 20 includes a list of recommended strategies to increase students' levels of self-efficacy.

Table 20

Strategies to Increase Student Self-Efficacy

Self-Efficacy Strategy	Sources of Self-Efficacy Addressed
Ensure students understand how new learning links to previously learned skills	Mastery experience
Integrate the instruction to assist students in making curricular connections	Mastery experience
Craft assignments at the students' instructional levels and then challenge them further once mastery is achieved	Mastery experience

Self-Efficacy Strategy	Sources of Self-Efficacy Addressed
Continuously involve parents	Vicarious experience, social persuasion
Utilize 'like' peers that have demonstrated mastery to tutor other 'like' peers that are struggling	Vicarious experience, social persuasion
Plan opportunities for smooth transitions (elementary school to middle school, middle school to high school)	Emotional and physiological states
Explicitly teach and model self-regulation strategies	Mastery experience, emotional and physiological states
Create supportive, differentiated learning environments	Mastery experience, emotional and physiological states

Strategies derived from: Pajares & Urdan, 2006; Schunk & Pajares, 2009

While the list of recommended strategies is not considered a program, it is important to consider these approaches as middle school initiatives are implemented and evaluated. A middle school educator might want to give pause to interventions that do not positively inform both mastery experience and the other sources of self-efficacy. For instance, the utilization of graphic organizers is considered a high-impact strategy (Marzano et al., 2000) as academic achievement has proven to increase when this strategy is implemented. However, a teacher may also raise a struggling student's self-efficacy if the strategy is accompanied with peer grouping; whereby also influencing the self-efficacy sources of vicarious experience and social persuasion.

Recommendations for Future Research

Although the construct of self-efficacy continues to build momentum, much of the research is based upon quantitative findings. Further qualitative research is required in order to fully inform the body of research. Qualitative research is both time intensive and complex. However, if we are to truly understand the psychological underpinnings of how self-efficacy

beliefs are formed, we must listen directly to the source – our students. Examples of potential follow-up studies are as follows:

- Conduct a similar study with similar demographics population size to ascertain if similar results are discovered.
- Conduct a similar study but use a longitudinal methodology where the self-efficacy beliefs of students in mathematics can be evaluated over time; beginning from sixth grade through high school.
- Conduct a comparative qualitative study where students from higher socio-economic households are compared with students of lower socio-economic households. The students in this study primarily resided in lower income households.
- Conduct qualitative studies that focus on one source of self-efficacy to further determine its influence (social persuasion, vicarious experiences, and physiological and emotional states).
- Extend similar qualitative research to other academic areas such as reading, English language arts, science, social studies, and so forth to identify if particular trends exist within various demographic groups across and between subjects.
- Conduct studies that examine the impact of specific interventions (such as self-regulations strategies) on student self-efficacy for a variety of subject areas.
- Conduct qualitative studies to further understand how self-efficacy impacts motivation for adolescents.
- Conduct qualitative studies that explore the ethnic, social, gender, and cultural influences on self-efficacy.

- Conduct mixed-methods research that combines both qualitative and quantitative techniques to complement the existing literature on the predictive power of self-efficacy.
- Conduct studies that examine if correlations exist between student self-efficacy and school climate/culture.
- Conduct quantitative studies to examine the strength of the relationship between resiliency and self-efficacy for middle school students.

Implications for Education Policy

Legislation has driven much of the reforms in education. Perhaps the No Child Left Behind Act of 2001 (NCLB) has proven the most influential policy as states have responded with universal criterion-referenced testing, systems to track school and district progress, academic benchmarks (absolute bars) for all students to reach, punitive measures for persistently failing schools, and so forth. In an effort to move away from the unrealistic targets of NCLB, several states recently submitted waivers to the Federal government (U.S. Department of Education, 2012). However, the waivers still include mandatory evaluation of school progress based upon student achievement data. While tracking student achievement through standardized assessments is a vehicle to measure education attainment across all demographic groups, it is important that policy makers understand the broad implications of such practices. It is clear that these policies alone are not closing persistent achievements gaps across the country. Schools have aggressively responded with high impact strategies that research has proven to impact student achievement. Yes, there are instances of increased levels of student achievement due to these efforts but there are broader social conditions that impact student success. We have learned through studies, such as the one described here, that constructs related to social cognitive theory are critically important to consider as policies are drafted. Perhaps schools should not

only be evaluated using metrics solely related to standardized tests, but policies should also require evaluation criteria that assesses if the cultural conditions are in place to effectively address the social conditions of students which relates to self-efficacy.

Fortunately, there is policy evidence of this approach in the state of Georgia where schools will be evaluated in a more comprehensive manner with the College and Career Readiness Performance Index (CCRPI). Georgia received a waiver from some of the mandates of the federal No Child Left Behind Act in order to enact this flexibility (Georgia Department of Education, 2012b). The CCRPI includes a School Climate rating which is determined from survey feedback from students (Georgia Department of Education, 2012a). Georgia was the first state in the nation to include such a rating in its accountability system and hopefully more states will follow suit. In a survey entitled Georgia Health Survey II, students are asked climate related questions such as: (a) I feel successful at school, (b) I feel my school has high standards for achievement, (c) Teachers treat me with respect and (d) The behaviors in my classroom allow the teacher to teach so I can learn. While school climate and self-efficacy are different constructs, a healthy school climate may positively set the stage for encouraging the sources of self-efficacy. In essence, if students feel respected, safe, and able to learn, the stage for mastery experience may be set for them to experience productive vicarious experiences, positive social persuasion interactions, and healthy emotional and physiological states.

References

- Alspaugh, J. W. (1998). Achievement loss associated with the transition to middle school and high school. *Journal of Educational Research*, 92(1), 20-25. doi: 10.1080/00220679809597572
- Anderman, E. M., National Center for School Leadership, U., & And Others. (1994). *Present and possible selves across the transition to middle grades school*. Retrieved from ERIC database. (ED 396193)
- Aud, S., Hussar, W., Planty, M., Snyder, T., Bianco, K., Fox, M. A., and Drake, L. (2010). *The condition of education 2010 (NCES 2010-02)8*. Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Retrieved from ERIC database. (ED 509940)
- Baker, S., Gersten, R., & Lee, D.-S. (2002). A synthesis of empirical research on teaching mathematics to low- achieving students. *Elementary School Journal*, 103(1), 51-73.
- Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *In Encyclopedia of human behavior*. New York: Academic Press.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84(2), 191-215.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, 28(2), 117-148. doi: 10.1207/s15326985ep2802_3
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman and Company.

- Bedard, K. & Do, C. (2005). Are middle schools more effective. *Journal of Human Resources*, 40(3), 660–682.
- Caro, D. H. (2009). Socio-economic status and academic achievement trajectories from childhood to adolescence. *Canadian Journal of Education*, 32(3), 558–590.
- Chau, Y. (2009). A state policy model to address the nation's dropout crisis. *State Education Standard*, 10(1), 17–23.
- Choi, N., Fuqua, D. R., & Griffin, B. W. (2001). Exploratory analysis of the structure of scores from the multidimensional scales of perceived self-efficacy. *Educational and Psychological Measurement*, 61(3), 475–489.
- Desforges, C. & Abouchaar, A. (2003). *The impact of parental involvement, parental support and Family education on pupil achievements and adjustment: A literature review* (No. RR433). London: Department for Education and Skills.
- Drake, B., & Rank, M. R. (2009). The racial divide among American children in poverty: Reassessing the importance of neighborhood. *Children & Youth Services Review*, 31(12), 1264–1271.
- Dursun, S. (2009). A comparison of the mathematical skills of first graders with and without preschool education. *Educational Sciences: Theory and Practice*, 9(4), 1705–1715.
- Eccles, J. S., Wigfield, A., & Schiefele, U. (1998). Motivation to succeed. In N. Eisenberg (Ed.), *Handbook of child psychology: Vol 3. Social, emotional, and personality development* (5th ed., pp. 1017–1095). New York: Wiley.
- EdSource. (2010). *Gaining ground in the middle grades: Why some schools do better. A large-scale study of middle grades. Practices and student outcomes. Narrative summary of findings*. EdSource. Retrieved from ERIC database. (ED 508674)

Georgia Department of Education. (2010). Criterion-Referenced Competency Tests (CRCT).

Standards, Instruction, and Assessment. Retrieved from

http://www.gadoe.org/ci_testing.aspx?PageReq=CI_TESTING_CRCT

Georgia Department of Education. (2011, June 7). Testing brief: Spring 2011 Georgia Criterion-Referenced Competency Tests. Retrieved from

[http://www.gadoe.org/DMGetDocument.aspx/2011%20CRCT%20Brief%20-](http://www.gadoe.org/DMGetDocument.aspx/2011%20CRCT%20Brief%20-%20FINAL%20060711F.pdf?p=6CC6799F8C1371F67249C22AC2479394EA8C8B2E3A3AEC9F4FA8B273E5B72182&Type=D)

[%20FINAL%20060711F.pdf?p=6CC6799F8C1371F67249C22AC2479394EA8C8B2E3A3AEC9F4FA8B273E5B72182&Type=D](http://www.gadoe.org/DMGetDocument.aspx/2011%20CRCT%20Brief%20-%20FINAL%20060711F.pdf?p=6CC6799F8C1371F67249C22AC2479394EA8C8B2E3A3AEC9F4FA8B273E5B72182&Type=D)

Georgia Department of Education. (2012a). Georgia student health survey II. *Georgia*

Department of Education. Retrieved from <http://www.gadoe.org/Curriculum-Instruction-and-Assessment/Curriculum-and-Instruction/GSHS-II/Pages/Georgia-Student-Health-Survey-II.aspx>

Georgia Department of Education. (2012b). ESEA Flexibility request. Retrieved from

<http://www.gadoe.org/External-Affairs-and-Policy/communications/Pages/NCLB-Waiver.aspx>

Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J. R. (2009). *Assisting*

students struggling with mathematics: Response to Intervention (RtI) for elementary and middle schools. (NCEE 2009-4060). What Works Clearinghouse. Retrieved from ERIC database. (ED 504995)

Jimerson, S. R., & Ferguson, P. (2007). A longitudinal study of grade retention: Academic and behavioral outcomes of retained students through adolescence. *School Psychology Quarterly*, 22(3), 314–339.

- Jones, M. G., Jones, B. D., & Hargrove, T. Y. (2003). *The unintended consequences of high-stakes testing*. Lanham, Maryland: Rowman & Littlefield Publishers, Inc.
- KewalRamani, A., Gilbertson, L., Fox, M. A., Provasnik, S., & National Center for Education Statistics. (2007). *Status and trends in the education of racial and ethnic minorities*. (NCES 2007-039). National Center for Education Statistics. Retrieved from ERIC database. (ED 498259)
- Klopfenstein, K. (2005). Beyond test scores: The impact of Black teacher role models on rigorous math taking. *Contemporary Economic Policy*, 23(3), 416–428.
- Lloyd, J. E., Walsh, J., & Yailagh, M. S. (2005). Sex differences in performance attributions, self-efficacy, and achievement in mathematics: If I'm so smart, why don't I know it? *Canadian Journal of Education*, 28(3), 384–408.
- Margolis, H., & McCabe, P. P. (2004). Self-efficacy: A key to improving the motivation of struggling learners. *Clearing House*, 77(6), 241.
- Marzano, R. J., Gaddy, B. B., & Dean, C. (2000). *What works in classroom instruction*. Aurora, Colorado: Mid-continent Research for Education and Learning.
- Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.
- Miles, M. B., & Huberman, M. A. (1994). *Qualitative data analysis : An expanded sourcebook*. Thousand Oaks, CA: Sage Publications.
- National Center for Education Statistics. (2002). NCES statistical standards: Glossary. Retrieved from <http://nces.ed.gov/statprog/2002/glossary.asp>

- National Center for Education Statistics (ED). (2009). *The nation's report card: Mathematics 2009. National assessment of educational progress at grades 4 and 8* (NCES 2010-451). National Center for Education Statistics. Retrieved from ERIC database. (ED 506746)
- No Child Left Behind (NCLB) Act of 2001, Pub. L. No. 107-110 § 115, Stat. 1425 (2002).
- Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research*, 66(4), 543–578.
- Pajares, F. (2002). Overview of social cognitive theory and of self-efficacy. Retrieved from <http://des.emory.edu/mfp/eff.html>
- Pajares, F., & Graham, L. (1999). Self-efficacy, motivation constructs, and mathematics Performance of entering middle school students. *Contemporary Educational Psychology*, 24(2), 124–139. doi: 10.1006/ceps.1998.0991
- Pajares, F., & Kranzler, J. (1995). Self-efficacy beliefs and general mental ability in mathematical problem-solving. *Contemporary Educational Psychology*, 20(4), 426–443. doi: 10.1006/ceps.1995.1029
- Pajares, F., & Miller, M. D. (1994). Role of self-efficacy and self-concept beliefs in mathematical problem solving: A path analysis. *Journal of Educational Psychology*, 86(2), 193–203.
- Pajares, F., & Schpnk, D. H. (2002). Self and self-belief in psychology and education: A historical Perspective. In J. Aronson (Ed.), *Improving academic achievement: Impact of psychological factors on education* (pp. 3–21). New York: Academic Press.
- Pajares, F., & Urdan, T. (Eds.). (2006). *Adolescence and education, Vol. 5. Self-efficacy beliefs of adolescents*. Greenwich, CT: Information Age Publishing.

- Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage Publications.
- Pietsch, J., Walker, R., & Chapman, E. (2003). The relationship among self-concept, self-efficacy, and performance in mathematics during secondary school. *Journal of Educational Psychology, 95*(3), 589–603.
- Rockoff, J. E., & Lockwood, B. B. (2010). Stuck in the middle: How and why middle schools harm student achievement. *Education Next, 10*(4), 68–75.
- Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational Psychologist, 26*(3/4), 207-231. doi: 10.1207/s15326985ep2603&4_2
- Schwerdt, G. & West, M. R. (2011). The impact of alternative grade configurations on student outcomes through middle and high school. Unpublished manuscript, Harvard University.
- Seidman, E., & Others. (1994). The impact of school transitions in early adolescence on the self-system and perceived social context of poor urban youth. *Child Development, 65*(2), 507–522.
- Snyder, T. D., Dillow, S. A., & National Center for Education Statistics. (2011). *Digest of Education Statistics, 2010* (NCES 2011-015). National Center for Education Statistics. Retrieved from ERIC database. (ED 518987)
- Stevens, T., Olivarez, A., Lan, W. Y., & Tallent-Runnels, M. K. (2004). Role of mathematics self-efficacy and motivation in mathematics performance across ethnicity. *The Journal of Educational Research, 97*(4), 208–221.
- The Governor's Office of Student Achievement. (2011). *2010-2011 Report card*. Retrieved from <http://gadoe.org/ReportingFW.aspx?PageReq=211&PID=61&PTID=67&CTID=216&StateId=ALL&T=0&RID=102>

- U.S. Department of Education. (2012). ESEA flexibility. Retrieved from <http://www.ed.gov/esea/flexibility>
- Usher, E. (2009). Sources of middle school students' self-efficacy in mathematics: A qualitative investigation. *American Educational Research Journal*, 46(1), 275–314.
- Usher, E. L., & Pajares, F. (2008). Sources of self-efficacy in school: Critical review of the literature and future directions. *Review of Educational Research*, 78(4), 751–796.
- Wentzel, K. R., & Wigfield, A. (2009). *Handbook of Motivation at School*. New York: Routledge.
- Wigfield, A., Eccles, J. S., Mac Iver, D., Reuman, D. A., & Midgley, C. (1991). Transitions during early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school. *Developmental Psychology*, 27(4), 552–565.
- Williams, T., Haertel, E., & Et al. (2010). *Gaining ground in the middle grades: Why some schools do better*. Retrieved from EdSource website: <http://www.edsource.org/middle-grades-study.html>
- Zeldin, A., & Pajares, F. (2000). Against the odds: Self-efficacy beliefs of women in mathematical, scientific, and technological careers. *American Educational Research Journal*, 37(1), 215–246.
- Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal*, 29(3), 663–676.

APPENDIX A

IRB Approval



OFFICE OF INSTITUTIONAL
REVIEW BOARD

SETON HALL UNIVERSITY

April 18, 2012

Dayton Hibbs
1620 Tappahannock Trail
Marietta, GA 30062

Dear Mr. Hibbs,

The Seton Hall University Institutional Review Board has reviewed the information you have submitted addressing the concerns for your proposal entitled "An Investigation of the Impact of Failure on High-Stakes Tests on the Perceived Self-Efficacy Beliefs in Mathematics of Blacks and Hispanic Middle School Students." Your research protocol is hereby approved as revised through expedited review. The IRB reserves the right to recall the proposal at any time for full review.

Enclosed for your records are the signed Request for Approval form and the stamped original Consent Form and Assent Form. Make copies only of these stamped forms.

The Institutional Review Board approval of your research is valid for a one-year period from the date of this letter. During this time, any changes to the research protocol must be reviewed and approved by the IRB prior to their implementation.

According to federal regulations, continuing review of already approved research is mandated to take place at least 12 months after this initial approval. You will receive communication from the IRB Office for this several months before the anniversary date of your initial approval.

Thank you for your cooperation.

In harmony with federal regulations, none of the investigators or research staff involved in the study took part in the final decision.

Sincerely,

Mary F. Ruzicka, Ph.D.

Professor

Director, Institutional Review Board

cc: Dr. Martin Finkelstein

Presidents Hall • 400 South Orange Avenue • South Orange, New Jersey 07079-2641 • Tel: 973.313.6314 • Fax: 973.275.2361

A HOME FOR THE MIND THE HEART AND THE SPIRIT

APPENDIX B

Parent Letter of Solicitation

Date

To the parent of: _____;

I'm writing to ask your permission to approach your child to participate in a research study. The lead researcher for this study is Mr. Dayton Hibbs. He is currently a doctoral student at Seton Hall University.

Your child's participation is completely voluntary. If you permit me to approach your child to be in the study, his/her grades will not be impacted in any way. Students that participate will receive a \$5.00 Walmart gift card at the conclusion of the interview.

The purpose of the research is to identify how student self-efficacy influences achievement in mathematics. Self-efficacy involves a student's belief that he/she can accomplish a task. In learning more about self-efficacy, the researcher hopes to find ways to prevent failure in mathematics.

The interview will last for about 45 minutes and take place during an elective class such as art, band, chorus, and or physical education (PE). I will ensure a time is selected that is as least disruptive to your child's schedule as possible.

The interview will include questions that ask your child to describe his/her experiences with school and mathematics. Examples include:

- What would you say is your best subject in school?
- What sort of work habits do you have in math?
- What do you like to do related to math outside of school?

A research assistant (college graduate) will conduct the interview. The interview will be recorded onto a storage device (USB memory stick) using a computer. The recorded information will be kept in a secure location at all times.

Your child's real name will never be used in the study. He/she will be assigned a pretend name or a study number. He/she may even select the pretend name, if desired.

Remember, your child does not have to participate. If you approve for me to approach your child to invite them to participate in this study, please sign the attached consent form.

In advance, thank you for your consideration of this request.

Sincerely,

Office Clerk

APPENDIX C

Informed Consent



Informed Consent Form

With permission from the school district office, a mathematics study is being conducted. Certain minority middle school students are being asked to be in this study to better understand their experiences with mathematics. The study is being conducted by Mr. Dayton Hibbs, a doctoral student enrolled at Seton Hall University's College of Education. Student participation is completely voluntary.

Purpose

The purpose of this study is to assist teachers and researchers in understanding how high-stakes tests influence the development of students' self-efficacy beliefs in mathematics. Self-efficacy includes a student's belief that he/she can accomplish a task. Research has shown that a student's sense of self-efficacy can influence academic performance.

Procedures

This research study will not interrupt regular instruction. During an elective period such as art or physical education (PE), certain middle school students will participate in an interview conducted by a research assistant (college graduate). The interview process will include a variety of questions about school and mathematics such as:

- What would you say is your best subject in school?
- What sort of work habits do you have in math?
- What do you like to do related to math outside of school?
- How do you feel when you are given a math assignment?
- On a scale of 1 (lowest) to 10 (highest), how would you rate your confidence in that you did well on the upcoming state test (CRCT)?
- What could your teachers do to make you feel more confident in your math abilities?

The interview will be recorded on a storage device using a computer and will last for approximately 45 minutes. It will take place during school hours but at a time that is determined as least disruptive to his/her schedule as possible. As a thank you gift, students that participate will receive a \$5.00 Walmart gift card at the conclusion of the interview.

Confidentiality

A pretend name and/or study number rather than the student's real name will be used on study records. At the beginning of the interview process, the student may select a pretend name if desired. The student's name, parent's name, or other facts that might point to students or their parents will not appear when the results of this study are presented or published. The school's name and the name of the city will also not be revealed. To maintain student privacy, recorded data will be saved on a USB memory card and will be stored in a secure location only accessible by the primary researcher.

Anonymity

Only the researcher will know specific facts about each student. Individual information such as race, gender, and grade level will be linked to pretend names only.

Benefits

There are no direct benefits of your child participating in this research beyond the knowledge that will be gained.

Risks

There are no foreseeable risks to study participants. The interviewer will be trained on how to conduct interviews in an appropriate and comfortable fashion.

Contact Information

Parents can contact the following individuals if they have any questions about this study:

- Principal Researcher: Dayton Hibbs at (770) 422-3500 during business hours or dayton.hibbs@student.shu.edu.
- Faculty Advisor: Dr. Martin Finkelstein at 973-275-2056 during business hours or martin.finkelstein@shu.edu.

For any questions about children's rights as research subjects or for any questions, concerns about the research, you may contact Dr. Mary Ruzicka, Director of the Seton Hall Institutional Review Board at (973) 313-6314 or irb@shu.edu.

By signing below, the parent agrees to allow his/her child to be asked if he/she would like to participate in this study. The child can still say no when approached. The parent also understands that the interview will be recorded.

Please return this form in the attached envelope to the school's front office. Once this form is received, a copy will be mailed home.

Name of Child

Name of Parent or Guardian

Signature of Parent or Guardian

Date

APPENDIX D

Student Letter of Solicitation

Date _____

Dear _____,

Your parents have provided me permission to ask if you would like to participate in an interview. During the interview, you will be asked questions about your experiences in math.

The decision to participate is completely up to you. If you decide to be interviewed, your grades will not be impacted in any way and you will receive a \$5.00 Walmart gift card.

The purpose of the interview is to discover ways teachers can help students perform better in math class. A few of the questions that will be asked are:

- What would you say is your best subject in school?
- How do you feel when you are given a math assignment?
- What could your teachers do to make you feel more confident in your math abilities?

The interview will last for about 45 minutes and take place during an elective class such as art, band, chorus, and or physical education (PE). I will make sure a time is selected that will work best with your schedule.

A research assistant (college graduate) will ask you the questions. The interview will be recorded using a computer but your responses will be kept private. The recorded information will remain in a safe place at all times and will only be reviewed by people helping with this research.

A pretend name will be linked to your responses. Your actual name will never be used. You will have the option to select this pretend name prior to the starting the interview.

Remember, you don't have to participate. If you do agree to participate in the interview, please sign the attached assent form. Thank you.

Sincerely,

Office Clerk

APPENDIX E

Student Assent Form



Student Assent Form

Some middle school students in the Marietta City School District are being asked to participate in an interview. The interviews will provide helpful information for a research study about math.

The grades of students that participate will not be impacted. In addition, the decision to participate is voluntary (student's choice).

Students that decide to participate will be asked questions related to their experiences with math. Their answers will help teachers learn how a student's experiences in mathematics can be improved. A few of the questions that may be asked include:

- What would you say is your best subject in school?
- How do you feel when you are given a math assignment?
- What could your teachers do to make you feel more confident in your math abilities?

A research assistant (college graduate) will conduct the interviews which will last for about 45 minutes. The interviews will take place during an elective period such as art, chorus, or band.

Students that participate will receive a \$5.00 Walmart gift card at the conclusion of the interview. Students do not have to participate if they wish not to.

A student can agree to participate in the study by signing this form.

Name of Student

Signature of Student

Date

APPENDIX F

Email; Permission to Use Interview Protocol

From: Ellen Usher [ellen.usher@uky.edu]
Sent: Monday, August 08, 2011 12:07 PM
To: Hibbs, Dayton
Subject: Re: 2008 Self-Efficacy Study

Hi Dayton,

Thanks for the kind words. You are certainly free to use the interview protocol. Sounds like an interesting study you have shaping up. I would love to know what you find!

Best of luck in your work.

Ellen

Ellen L. Usher
Assistant Professor
Co-Director, P20 Motivation and Learning Lab
Educational Psychology Program
249 Dickey Hall
University of Kentucky
Lexington, KY 40506-0017
Phone: (859) 257-8647

From: "Hibbs, Dayton"
To: "Usher, Ellen L."
Sent: Monday, August 1, 2011 8:14 PM
Subject: 2008 Self-Efficacy Study

Dr. Usher,

I'm currently in a doctoral program at Seton Hall University. While conducting research on my dissertation topic (student self-efficacy in mathematics), I discovered a qualitative study you published in 2008 (Sources of Middle School Students' Self-Efficacy in Mathematics: A Qualitative Investigation). I am very impressed with the student interview protocol you implemented. My intent is to interview students in grades 6-8 that have repeatedly demonstrated failure on high stakes testing in mathematics and would like to use the interview protocol you developed. Of course, I need to seek your permission before moving forward. With your blessing, hopefully I'll be able to expand on the current body of knowledge in the area of student self-efficacy and mathematics.

In advance, thank you for your consideration.

Kind regards: Dayton Hibbs

APPENDIX G

Shorthand Codes

Background

- Q.1.Background_Previous School
- Q.2.Background_Family
- Q.3.Background_About Yourself
- Q.3a.Background_Personality
- Q.3b.Background_Things Enjoy Outside School
- Q.3c.Background_Friends
- Q.3d.Background_People Admire
- Q.4.Background_Describe Yourself as Student
- Q.4a.Background_Best Subject/Favorite
- Q.4b.Background_Weakest Subject/Least Favorite
- Q.4c1.Background_Typical Grades
- Q.4c2.Background_Agree with Grades

Mathematics experiences and self-efficacy

- Q.5.Math Experience_Math Student
- Q.5a.Math Experience_Math Work Habits
- Q.5b.Math Experience_Math Ability
- Q.5c1.Math Experience_CRCT Recent Test
- Q.5c2.Math Experience_CRCT Previous Years
- Q.5c3.Math Experience_CRCT Make You Feel
- Q.5c4.Math Experience_CRCT Comments from Others
- Q.5d.Math Experience_Math Outside of School
- Q.5e.Math Experience_Math Setback
- Q.6.Math Experience_Math Story

Mathematics learning environment

- Q.7.Math Environment_Current Math Class
- Q.7a.Math Environment_Grouping of Students
- Q.7b1.Math Environment_Compare with Class
- Q.7b2.Math Environment_Compare with Grade
- Q.8.Math Environment_Teachers
- Q.8a.Math Environment_Teachers & Your Math Performance
- Q.8b.Math Environment_Teachers & Your Parents
- Q.8c.Math Environment_Teachers & How They Make You Feel
- Q.8d.Math Environment_Best Teacher
- Q.8e.Math Environment_Teacher & Confidence
- Q.9.Math Environment_Math Conditions

Mathematics and others

- Q.10.Math & Others_Recognized for Math Ability
- Q.11.Math & Others_Family

Q.11a.Math & Others_Family Members_Family Involvement
Q.11b.Math & Others_Family Members_Parents Tell You
Q.11c.Math & Others_Family Members_Siblings
Q.11d.Math & Others_Family Members_Parents Tell Teachers
Q.12.Math & Others_Friends
Q.12a.Math & Others_Friends' Performance
Q.12b1.Math & Others_Friends Say About Math
Q.12b2.Math & Others_Friends Say About Others
Q.12c.Math & Others_How Friends Describe You
Q.13.Math & Others_Those Admire Good in Math

Affective and physiological response to mathematics

Q.14a.Affective & Physio Response_Math Test
Q.14b.Affective & Physio Response_Math Assignment

Confidence

Q.15a.Confidence_Personal Rating
Q.15b.Confidence_Increasing Confidence

Other

Q.Other
Q.Background_Other
Q.Closing of Interview

APPENDIX H

Interview Protocol Coding Tables

The Interview Protocol Coding Tables provide example responses for the interview protocol examined in the analysis of this research study. The purpose of the tables is to provide the reader with a frame of reference for how the student responses were organized, coded, and interpreted. The codes are defined as follows:

- Positive (+1) – Participant’s response was associated with positive self-efficacy.
- Neutral (0) – Participant’s responses was inconclusive or not decisively positive/negative
- Negative (-1) – Participant’s response was associated with negative self-efficacy.
- Mixed (X) – Participant’s response included a contradiction (positive and negative); no value assigned.

Interview Protocol Coding Table

Interview Protocol: Describe yourself as a student.

Code	Participant	Response
Positive (+1)	Steve (6BM1)	“I’m a good student; an A/B student and I’m really smart because I mastered all my standards on the CRCT.”
Neutral (0)	Dwayne (6BM2)	“I’m a really active student.” “I get my work done when I want to get my work done.”
Negative (-1)	James B. (8HM2)	“Slacker, lazy.”
Mixed (X)	Anna (8HF0)	“I am not, I don’t study at all...but somehow I pull it off and I’m passing all of my classes.”

Interview Protocol: *Earlier you rated your math ability on a scale of one to ten. How would you rate your confidence?*

Code	Participant	Response
Positive (+1)	Jennifer (7BF1)	“Probably like a nine or eight.” {Student also agreed with the research assistant when asked if she felt confident that she could learn Mathematics really easily.}
Neutral (0)	James B. (8HM2)	“Six.” {Student also agreed with the research assistant when asked if he felt ‘kind of’ confident in Mathematics.}
Negative (-1)	Aaliyah (8BF2)	“Five...I don’t really apply myself to it.”
Mixed (X)	N/A	Contradictions were not discovered within individual student responses.

Interview Protocol: *What sorts of things do your teachers tell you about your performance in math?*

Code	Participant	Response
Positive (+1)	Joanna (6HF0)	"Well, my math teacher says like I have really good ability."
Neutral (0)	Nya (6BF1)	"They say I do good, sometimes."
Negative (-1)	Anna (8HFO)	"That I'm very lazy."
Mixed (X)	Steve (6BM0)	"They tell me that I do good in math but I need to study more because sometimes I got C's on my tests because I didn't study and I didn't know the answers."

Interview Protocol: *What do you think your teacher(s) would tell your parents about how you do in math?*

Code	Participant	Response
Positive (+1)	Robert (7HM0)	"That I'm pretty skilled in math. That I get good grades in there."
Neutral (0)	James (7BM2)	Nonchalantly stated - "That their child is doing alright."
Negative (-1)	James (8HM2)	"I can answer this {quickly replied}. The would be like your son James, he does bad in class...cause they have said that before."
Mixed (X)	Kayla (8BF1)	"I joke around but she really does her work. She struggles sometimes to understand it but she'll eventually catch on."

Interview Protocol: *Have you ever been recognized for your ability in math?*

Code	Participant	Response
Positive (+1)	John (8BM0)	"I won numerous of math awards when I was in elementary school. And I won two math awards in the past three years."
Neutral (0)	Nya (6BF1)	"I was recognized at the age of eight...I was designing clothes on a piece of paper."
Negative (-1)	Jennifer (7BF1)	"Ah, no."
Mixed (X)	N/A	Contradictions were not discovered within individual student responses.

Interview Protocol: *How do you think your friends would describe you in math?*

Code	Participant	Response
Positive (+1)	Michael (6BM1)	"Very good and a hard worker."
Neutral (0)	Robert (7HM0)	"I don't know. I don't have friends in most of my classes."
Negative (-1)	Aaliyah (8BF2)	"Shaky...I could use a lot more help."
Mixed (X)	LaBron (8BM1)	"They'll say I do good but sometimes I have a little bump. Like sometimes on the math things."

Interview Protocol: *Do you think members of your family are good at Mathematics*

Code	Participant	Response
Positive (+1)	Leslie (7HF2)	"My mom and my brother; yeah, they are."
Neutral (0)	None	N/A
Negative (-1)	James B. (8HM2)	"...so my mom doesn't like get what we are doing. I showed her one of my papers with fractions and letters. She was like, what is that? Like that's my math work; that is why I complain so much."
Mixed (X)	Joanna (6HF0)	"...like when she was a kid she did not do awesome at math. It was not her best subject. And like my dad, it was kind of his best subject in a way sometimes."

Interview Protocol: *Describe how most of your friends do in math.*

Code	Participant	Response
Positive (+1)	Bob (7HM1)	"Good"
Neutral (0)	Robert (7HM0)	Robert eluded this question as he stated earlier that he didn't speak with his friends about math because they were in different classes.
Negative (-1)	James B. (8HM2)	"They don't like it either." When asked if his friends were good at Mathematics he responded, "No."
Mixed (X)	Michael (6BM1)	"Some of them are faster than me, some of them are slower."

Interview Protocol: *When you are given a math test, how does that make you feel? How do you feel when you are given a math assignment?*

Code	Participant	Response
Positive (+1)	Robert (7HM0)	"I feel like pumped."
Neutral (0)	Steve (6BM0)	"I'd just be a little nervous."
Negative (-1)	John (8BM0)	"Discomfort, nervousness, and that's it."
Mixed (X)	Kayla (8BF1)	When asked about tests, she stated "I'll just get frustrated and just like put the test on the side of my desk." However, when asked about completing assignments such as math problems, she stated, "Yes, it is still like the main thing that I really get so it's like not a struggle. Piece of cake!"

APPENDIX I
Qualitative Coding Chart

Quantitative Coding Chart

Pretend Name	Unique Identifier	Grade Level	Race	Gender	Failure Category	M. E.		S. P.				V. E. (Peers)	V. E. (Family)	E. & P. States	Average
						M. E.	Confidence	S. P. (Teacher)	(T-tell-P)	S. P. (Recog.)	S. P. (Peers)				
Steve	6BM0	6	Black	M	0	1	1	X	0	1	1	1	1	0	0.75
Joanna	6HF0	6	Hispanic	F	0	1	1	1	1	1	1	1	X	X	1.00
Michael	6BM1	6	Black	M	1	1	1	1	1	1	1	X	1	1	1.00
Nya	6BF1	6	Black	F	1	1	1	0	1	0	1	X	1	X	0.71
Dwayne	6BM2	6	Black	M	2	0	1	1	X	0	0	-1	1	X	0.29
Robert	7HM0	7	Hispanic	M	0	1	1	X	1	1	0	0	1	1	0.75
Ashley	7BF0	7	Black	F	0	1	0	0	0	1	0	1	1	X	0.50
Bob	7HM1	7	Hispanic	M	1	1	1	1	1	1	1	1	-1	-1	0.56
Jennifer	7BF1	7	Black	F	1	1	1	1	1	-1	1	0	X	0	0.50
James	7BM2	7	Black	M	2	-1	-1	X	0	-1	0	1	-1	0	-0.38
Leslie	7HF2	7	Hispanic	F	2	X	-1	1	1	-1	1	-1	1	-1	0.00
John	8BM0	8	Black	M	0	1	1	0	X	1	1	1	1	-1	0.63
Anna	8HF0	8	Hispanic	F	0	X	-1	-1	-1	0	-1	1	X	0	-0.43
LaBron	8BM1	8	Black	M	1	1	1	1	X	0	X	1	1	1	0.86
Kayla	8BF1	8	Black	F	1	1	1	0	X	1	0	1	-1	X	0.43
James B.	8HM2	8	Hispanic	M	2	-1	0	1	-1	-1	-1	-1	-1	-1	-0.67
Aaliyah	8BF2	8	Black	F	2	-1	-1	1	X	-1	-1	1	1	-1	-0.25