IDENTIFYING EFFECTIVE MATH TEACHERS AND THE OVERALL IMPACT ON
STUDENT PERFORMANCE IN TWO TEXAS CHARTER HIGH SCHOOLS

by

Olivia Blackmon
A Thesis
Submitted to the
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in Partial Fulfillment of
The Requirements for the Degree
of
Master of Arts
Sociology

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By

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EWA Fellowship
Harvard University, 2007
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DEDICATION

I would like to dedicate this master's thesis to my husband, Dr. William H. Blackmon. There is no doubt in my mind that without his continued support, counsel, editing, tolerance and enthusiasm I could not have completed this project. I would also like to thanks my three wonderful children, Anna, Huit and Joseph who have been extremely patient and tolerant through my educational pursuits.

I would like to acknowledge the inspirational instruction and guidance of Dr. Patricia Masters, the statistical guidance of Dr. Gregory Guagnano and the initial impetus to study Education Theory given me by Dr. Gary Galluzzo. These professors have given me a deep appreciation and love for the beauty and detail of this subject.

I would also like to acknowledge the support and assistance given to me by The Thurgood Marshall College Fund (TMCF) and the two high schools that I worked closely with over the last few years. TMCF has been very generous in their support of my academic pursuits and many of the administrators have contributed ideas, feedback and advice.

Finally, I would like to thank my grandfather Joseph Gregorio, for his encouragement, support and determination I learned growing up.

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ABSTRACT

IDENTIFYING EFFECTIVE MATH TEACHERS AND THE OVERALL IMPACT ON STUDENT PERFORMANCE IN TWO TEXAS CHARTER SCHOOLS

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George Mason University, 2011

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Despite the reforms initiated by the *No Child Left Behind Act* in 2001, the United States of America still struggles with the gaps in achievement test scores in math and reading between children from white and minority ethnic groups. These gaps are considerably larger in low-income disadvantaged school systems, where school populations are heavily drawn from ethnic minorities, than in suburban districts; however, research has shown that having staff who can effectively teach in low-income school districts can reduce these gaps. In particular, studies have found teacher efficacy strongly correlates with higher minority achievement in low-income school districts.

This study examined the relationship between teacher efficacy in math teaching and student scores on the math section of the *Texas Assessment of Knowledge and Skills* (TAKS), through an in-depth examination of the achievement of students from different ethnic groups in two charter high schools in Houston, Texas. Quantitative data on teacher

efficacy in math teaching were collected from a sample comprising sixteen high school teachers from these two schools. The teachers' sense of self-efficacy was measured using the *Mathematics Teaching Efficacy Belief Instrument* (MTEBI), which reflects student engagement, commitment, approaches to teaching and overall perspectives of student conceptions of mathematics. The MTEBI was administered to the teachers in the fall of 2009.

Quantitative data on individual student performance data on the *Texas Assessment of Knowledge and Skills* (TAKS) (math section only) were collected from students in these two charter high schools for the 2008-2009 academic school year. Each student's individual record linked the student to his or her 2008-2009 academic year teacher, as well as containing the Identifying Effective Math Teachers 2 raw math score and key demographic data such as the student's race/ethnicity, age, gender and whether the student was eligible to receive free or reduced lunch.

The study presents descriptive statistics as well as the results of hypothesis testing using bivariate regressions to analyze the data. The study found that the MTEBI sub-scales teacher data was heavily skewed, with a positive skewness towards medium to high levels of *Personal Mathematic Teaching Efficacy* (PMTE) and *Mathematics Teaching Outcome Expectancy* (MTOE). The skewness of these two sub-scales created a non-normal distribution of MTEBI scores. Furthermore, the bivariate analysis found no significance between MTEBI scores and student achievement on the TAKS based on race/ethnicity, gender, free/reduced lunch, and at-risk students. Despite these studies findings, the literature reveals the teacher self-efficacy is a factor in student achievement.

CHAPTER 1: INTRODUCTION

Teacher quality is the single most important feature of the schools that drives student achievement. – Brookings Institution

The 1954, landmark Supreme Court decision, *Brown v. Board of Education* called attention to the disparity between the achievements of minority students and whites. Since 1954, the gaps between students in reading and mathematics have decreased, but significant disparities remain (Ready, Edley, and Snow, 2002). In 1973, white and African-American nine-year-olds (fourth-grade) had a mathematics gap of 35 points; by 2005 it had decreased to a 26 point gap and remain unchanged in 2007 (Perie, Grigg, and Donahue, 2005). At the same time, the gap between whites and African Americans in mathematics for 13-year-olds dropped from 46 to 33 point between 1973 and 2005 and dropped to 31 points in 2007. Similarly, the gap between nine-year-old whites and Hispanics decreased from 23 points to 20 points and by only eight points for 13-year olds during the same time period. These statistics reflect progress, but the achievement gaps continue to persist and much remains to be done.

In *The Condition of Education*, the National Center for Educational Statistics reported that the disparity in aggregated mathematics scores between whites and African Americans for eighth grade in 1990 was 33 points. In 2007 the disparity was 30 points (Planty, et al. 2008). In 2005, the point difference for 12th grade was 30 points as well. Hispanics showed a similar disparity compared to whites with a 24-point difference in

1990, and a 26-point difference on the 2007 mathematics fourth-grade assessments. This report confirms the disparities that exist in urban schools, where students are underperforming against their peers in suburban schools districts in all disciplines, but especially in math. There is also an urban gap; students at urban school districts achieve 11 points lower on math standardized tests compared to students at suburban school districts. A majority (64 percent) of K-12 students living in urban central city school districts are minorities (Jacob, 2007). These students are being hit with demographic obstacles (race/ethnicity and school district), which places them at a disadvantage of roughly a 40 point loss on standardized exams.

Poverty is also a factor in urban school districts. Poverty rates in urban school districts (13.6 percent) are more than double those of suburban school districts (6.0 percent) (Jacob, 2007). In schools where 75 percent of students were eligible for free or reduced-price lunch, students scored nearly 50 points below those enrolled at schools where 10 percent or less of students were eligible for free or reduced-price lunch. According to Silverman (Silverman, 2004), less than one-third of white high school students attend schools where students are poor, compared with two-thirds of both Hispanics and African-Americans.

Clearly, minorities still are underperforming as a whole across the nation on all sections of state and national standardized tests. Not only are they underperforming as a whole, but they have more disadvantages than their white peers as they heavily represented in at-risk urban school districts and reside in lower socioeconomic status (SES) communities. Teachers in these communities often have fewer qualifications and lack the ap-

propriate level of efficacy to reach these students, adding to these unfavorable circumstances. This places students at those schools at a higher risk for low performance levels, inadequate graduation rates and ultimately low matriculation rates into college.

This research paper will review minority math student achievement in low-income urban school district in Houston, Texas. It will identify how teacher efficacy can be a possible predictor of the achievement gaps. Educational researchers have examined other possible reasons that may lead to the disparities that exist among achievement gaps. These include: socio-economic status, school segregation issues, parental educational levels, and household structures. This paper will only briefly review the literature surrounding variables that can impact student achievement.

Context of the Problem

Scholars, education experts, elected leaders and countless others have grappled with the possible variables that have lead to the subpar achievement of minorities and low-income students in the U.S. for decades. These low achievement scores continue to mirror the results found in the *Coleman Report* (Coleman, et al. 1966), where socio-economic status was shown to be one of the most significant factors in school success. They argued that per-pupil expenditures, library size, and other school-quality related variables had little significance for student educational achievement. They found that out-of-school factors accounted for two-thirds of the variance in student achievement. For example, these out-of-school factors include struggling low-income neighborhoods, minority segregated schools, low parent education levels and single family households. Un-

like Lyndon Johnson's Great Society's solution to increase funding for low-income school districts, Coleman believed that equality would be met if schools were desegregated.

Other research efforts have followed to include, *A Nation at Risk* (The National Commission on Excellence in Education, 1983) an all-encompassing report released in 1983 that targeted poorly-performing minority students and the under-qualified teachers who staffed their schools. *The Black-White Test Score Gap* (Jencks and Phillips, 1998), reiterated some of factors in the *Coleman Report* and expanded this list to include: parenting practices, economic disparities, cultural influences, stereotype threat or acting white, and the roles of environmental factors. Again similar to *The Coleman Report* (1966), Phillips, Brooks-Gunn, Duncan, Klebanov, and Crane (1998) found that roughly two-thirds of the black-white student achievement gaps were due to family-related variables. Ferguson (Ferguson,1998) also concludes that factors that attribute to the black-white gap include "acting white," racial and ethnic disparities in home intellectual lifestyles and parent educational levels. He further concludes that only one-third of the achievement gap was due to school-related dynamics, teacher expectations, quality and teacher efficacy.

Despite these research efforts focusing on out-of-school factors, education reform policies have been centered around increasing per-pupil investment. Over the past 25 years, the U.S. has nearly doubled its per-pupil educational investment and yet improvements in student achievement and performance between minorities and whites remain negligible. Johnston and Vaidero (2000) stated that, "the gaps are so pronounced that in 1996, several national tests found African-Americans and Hispanic 12th graders scoring

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at roughly the same levels in reading and math as white eighth graders" (p. 18). To close these gaps, U.S. school reform policy has presented new approaches for assessments in standards of learning, innovative school models, and more rigorous curricula in math. However, without staffing schools with highly efficacious teachers specifically in math programs, these federal laws will be unsuccessful at making improvements on math student achievement gaps (Darling-Hammond, 2006a).

And yet, many students in U.S. school systems are still strongly outperformed by their peers today, often based solely on where they receive their education. As recently as 2007, Jacobs concluded in his study that, "teacher quality is unevenly distributed in schools, and the students with the greatest needs tend to have access to the least qualified and least effective teachers" (p. 13). The ongoing problems associated with low student achievement have spawned a plethora of new research that focuses on teacher efficacy, defined as a teacher's awareness and belief system that she/he can have an impact on student's achievement levels, both positively and negatively. Thus, this research explores the influences of teacher efficacy and the performance of minority high school students on Texas standardized tests.

Highlighting the Importance of Teacher Efficacy

Bandura's social learning theory states that a person's self-efficacy, belief systems or level of confidence will determine his or her ability to perform specific tasks successfully (1996). He concluded that teachers with a reported higher sense of self-efficacy tended to have more effort and motivation behind their work and tasks, thus producing their own desired outcome. Consistent with Bandura's notion of self-efficacy, Ross

(1998:57) reported that, "teachers who expect to do well set higher goals and persist through obstacles. Their effectiveness in the classroom increases, their attributions for success, and their own effort and ability contribute to higher teacher efficacy." Seifert goes on to elaborate that positive teacher and student interaction bolster's student success (Seifert, 2004). He states that "ultimately, the critical factor in the learning process may be how the teacher and students interact. Teachers who are perceived as being nurturing, supportive and helpful will be developing in students a sense of confidence and self-determination which will be translated into the learning oriented behaviors of the motivated student" (Seifert, 2004:46).

Many researchers have found strong correlations between the level of teacher efficacy (based on administered efficacy surveys) and the relationship to outcomes of student achievement. For example, Brophy (1998), Gibson and Dembo (1984), and Goddard, et al. (2004a) show strong correlations exist between high teacher efficacy and high student achievement. Those teachers who reported to have an elevated sense of self-efficacy typically augment instructional design to better meet individual student needs. Tucker, et al. (2005) found that teachers who reported a high sense of self-efficacy flourished more with minority students than with whites. Research conducted by Ashton and Webb (1986) found that high school students enrolled in courses with teachers that had a high sense of self-efficacy scored higher on state achievement tests. Conversely, students that were enrolled in courses with teachers that reported a low sense of self-efficacy scored lower on achievement tests.

Brophy (1998) found that research supports the relationship between teacher self-efficacy on elementary students, but their he found little evidence the same type of relationship exists at the high school level. Brophy also found that "females, who tend to have higher teacher efficacy than males, constitute a larger proportion of the workforce in elementary than in middle and high schools" (1998:54). In these findings, high school teachers are disproportionately males, and thus the teacher self-efficacy maybe lower, resulting in lower achievement levels of students. Most of the research conducted is on teacher self-efficacy in elementary schools. Less frequent in the literature are studies that support the relationship between high school math teachers' self-efficacy and its relationship to high school student achievement. From this research, there are gaps in the literature which indicate the importance of evaluating the correlations that exist between math teacher self-efficacy and student achievement at the high school level.

As this brief overview shows, teachers' efficacy may matter in student achievement, but we do not know much about the relationship at the high school level, specifically in mathematics. Therefore, this study proposes to test whether math teachers' self-efficacy will impact high school math student achievement. Teachers can self-evaluate and reflect on their personal perceptions of their ability to effectively teach math to assess if they are properly supporting and engaging students to improve their performance on standardized assessments.

Statement of the Problem

Based on Gibson and Dembo's (1984) research they found that, "teachers who believe student learning can be influenced by effective teaching (outcomes expectancy be-

liefs) and who also have confidence in their own teaching abilities (self-efficacy beliefs) should persist longer, provide a greater academic focus in the classroom, and exhibit different types of feedback than teachers who have lower expectations concerning their ability to influence student learning" (p. 571). Thus, previous research has found a strong association between high teacher efficacy and higher student achievement in racially diverse educational environments. Research regarding high school mathematics teacher efficacy and math student achievement is limited. Given the importance of teachers' self-efficacy on their ability to effectively teach to students, further analysis needs to be conducted to explore this at the high school level. The study aims to investigate high school math teacher efficacy levels based on the *Math Teacher Efficacy Belief Instrument* (MTE-BI) and the relationship to high school student academic performance on the *Texas Assessment for Knowledge and Skills* (TAKS) math section.

The hypothesis for this research is that there is a strong relationship between the level of math teacher efficacy and the impact it has on low-income minority student high school math scores. This study examines the relationship between math teacher efficacy based on *The Mathematics Teaching Efficacy Belief Instrument* (MTEBI) (Enochs, et al. 2000) and student performance on the math section of the state standard exam. Thus, the research addresses these major areas of teacher self-efficacy:

1. Examination of teachers self reported beliefs to positively impact student outcomes regardless of race, gender and socio-economic-status;
2. Examination of teacher self reported efficacy measured by, *The Mathematics Teaching Efficacy Belief Instrument* (MTEBI) (Enochs, et al. 2000)

These criteria are the basis for evaluating the problem: effects of teacher efficacy as it relates to the impact it has on student achievement in math, specifically in grades

nine through 12. Effects are measured by growth over a one-year period of time, based

on math student achievement as measured by the Texas state standardized test scores

(TAKS). One-year growth in student achievement is measured based on improvements

on the TAKS state standardized test scores from the previous year.

Rationale and Purpose of the Study

Changing the gaps between minorities and whites on achievement scores is a na-

tional problem, that each state is struggling with but especially in Texas where the mi-

norities have become the new majority.   Since 2000, the gaps have closed in math

achievement on the TAKS between minorities and whites; however, only minimally. The

gaps remain considerable, with a difference of 23 points between Hispanic and whites

and 29 points between African-Americans and whites (Education Trust, 2009a). *Their*

Fair Share written by the Education Trust (2008) summarizes my rationale for this paper,

"With all the progress, why are so many young Texans – especially Hispanics, African-

Americans and students from low-income families – still so far behind" (p. 1)?

Studies have shown that the most reliable predictor to determine student achieve-

ment is teacher efficacy (Coldarci, 1992). The purpose of this study was to explore

teacher efficacy as it relates to minority student achievement as measured by the TAKS

math section for high school students living in a low-income school district. Further-

more, the purpose of this study was to determine the factorial validity of math teachers

beliefs on their abilities and the impact on student achievement by using the *Mathematics*

Teacher Efficacy Beliefs Instrument (MTEBI). The data is evaluated using Hierarchical

Linear Modeling statistics to link the relationships that may exist between teachers' be-

liefs and efficacy on urban high school minority student achievement. The anticipated outcome of the studies result will hopefully illustrate that teachers' beliefs will have a positive or negative impact on student achievement.

The analysis and data will be obtained from two charter schools in a heavily populated minority school district in Houston, Texas. The two participating high schools (Jesse H. Jones High School and Royal High School) have provided full consent to review and evaluate their data. Math teachers at both schools will receive the *Mathematics Teacher Efficacy Belief Instrument* (MTEBI). All student level data will be obtained for achievement scores on the *Texas Assessment of Knowledge and Skills* (TAKS) math section. These charter schools are run by the Thurgood Marshall College Fund's High School Reform Project[1] which is funded by the Bill and Melinda Gates Foundation.

Thurgood Marshall College Fund (TMCF), a dedicated educator to helping minority students achieve has provided financial support for public school improvement initiatives in Texas. Through support from the Bill and Melinda Gates Foundation, TMCF provided two school reform programs in Houston, Texas. These reform projects focused on low-performing high schools and established and implemented a rigorous redesign initiative to promote student achievement. Each school received $5 million annually over a five-year period to improve accountability systems, student retention and increase the

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[1] The program, supported by a grant from the Bill and Melinda Gates Foundation, aims to create or redesign several small high schools. TMCF sites, located primarily in the south in economically distressed areas, were selected through a competitive process. These newly created and redesigned schools, located in Maryland, Texas, Louisiana, and North Carolina service more than 2,500 students. http://www.tmcfschoolreform.com/

amount of highly qualified teachers at each location. These schools provided a better opportunity for minority students to close their achievement gaps, earn a high school diploma and go onto college.

Significance of the Study

Teachers with a sense of high self-efficacy are more likely to believe that students that are low achievers typically need more attention and teacher effort (Ashton and Webb, 1986). Teachers with reported high self-efficacy often provide these students with proper support to achieve at greater levels (Ashton and Webb, 1986; Williams, 2003). Ashton and Webb (1986) indicated that "teachers with a high sense of efficacy were more likely than their low-efficacy counterparts to define low-achieving students as reachable, teachable and worth of their attention and effort. These teachers beliefs can make or break the learning process" (p. 29).   When low-income minority students have teachers with higher expectations, those students tend to reflect internally and change their own belief systems (Nieto, 1999). However, research has shown that teachers who teach minority students often have a pre-disposed (stereotype) negative perception of the expectations of those students (Singham, 2003).

Researchers have given rise to the issues surrounding increase in low teacher self-efficacy, particularly in predominately low-income and minority school districts. Teachers' in low-income and segregated school districts often have lower self-efficacy than those teaching in middle and upper income school districts. Thus, it is assumed that if math teachers have low self-reported teacher efficacy it may play a role in math student achievement, particularly of minorities. It is essential to teachers and educational leaders

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to identify key teacher characteristics that raise the achievement gap in low-income minority students. This is significant to research as it may provide insight into the need for restructuring teacher professional growth, training and educational programs.

Limitations

The focus of the study was to review only teachers' sense of self-efficacy and the possible impact it has on high school student achievement scores on the TAKS exam regardless of socio-economic-status, gender and race. An expanded study might explore all other areas impacting high school student achievement. Therefore, the following are possible limitations to this study which may impact the analysis of the results:

1. A pre-test and post-test on the students' math achievement was not developed, so an analysis of student maturation (growth) was not explored through this study. It might be important to look at academic growth throughout the year instead of reviewing just one state standard exam.
2. Student self-efficacy instrument to review the belief system of the student on their ability to effectively learn math.
3. Student level of testing anxiety was not documented during this study. This would be significant to understand a student's ability to take standardized tests.
4. Student historical data was not collected; therefore issues concerning learning disabilities, behavioral challenges, etc. were not properly evaluated and documented to describe pre-determined differences in student achievement data.
5. Convenience sampling techniques were used for this research project. Thus, this provides generalization limitations.
6. The study conducted only sampled math teachers from two charter schools in Texas, the sampling population was to small to provide statistically significant data.
7. Parental information such as educational level, employment history and native language spoken at the home, was not collected at the time of the survey. Therefore, outside (parental) variables may have directly correlated with student achievement.
8. Other school environment variables such as after-school help, tutoring assistance, etc. were not evaluated thus creating gaps in the amount of help a student received before or after class.
9. Family environment variables such as family support systems, etc. were not measured or accounted for.

10. Only one method of measuring teacher self-efficacy was used, perhaps other measures or instruments could have been used to test the validity of the METBI.
11. The research did not explore observational methods of teachers in the classroom teaching the math content, and the students reaction and participation levels within the classroom setting.

Nature of the Study

This study uses a quantitative approach to assessing teachers' sense of self-efficacy on minority math student achievement on the *Texas Assessment of Knowledge and Skills* (TAKS). Quantitative statistics such as: descriptive statistics (mean, median, mode, etc.), bi-variate analysis and Pearson correlations are used to statistically review the significance of the study.

The quantitative analysis assesses student data files (dependent variable) on the TAKS which were be collected for one academic year 2007 to 2008. The school level data obtained evaluated standardized test scores by grade level (nine, 10 and exit exam), race/ethnicity, gender, English Language Learner (ELL), Free Reduced lunch (yes/no). TAKS has proven to be a reliable form of measurement to review students' measurements on their math knowledge and skill sets.

The independent variable is the MTEBI survey instrument, which was administered to all math teachers' to assess their sense of self-efficacy. The survey borrows quantitative scales from the *Math Teaching Efficacy Beliefs Instrument* (MTEBI) questionnaire scale assessment (Enochs, et al. 2000). This survey evaluates teachers' self perceptions on their efficacy for teaching students in mathematics. Specifically, "their perceptions about their own capabilities to foster students' learning and engagement – which

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has proven to be an important teacher characteristic often correlated with positive student and teacher outcomes" (Shaughnessy, 2004:1). The basic principles that Enochs, et. al. (2000) include in this scale assess teachers models for teaching, mastery experience, verbal persuasion and how they teach self-regulation strategies.

The MTEBI has been proven to be both reliable and valid. The reliability of MTEBI was measured by Enochs, et al. (2000) and produced alpha coefficients of 0.75 for the *Mathematics Teaching Outcome Expectancy* (MTOE) scale and 0.88 for the *Personal Mathematics Teaching Efficacy* (PMTS).   By using factor analysis, the two scales – MTOE and PMTS – were considered independent of each other, reinforcing the reliability and validity of the MTEBI measurement tool. In order to provide validity of the survey tool, modeling fit procedures were used: chi-square statistics, Information Criteria (AIC) and Comparative Fit Index (CFI) which provided modifications to the model and the data. Enochs, et al. (2000) found consistency between self-efficacy and outcome expectancy as two independent factors. The reliability and validity of the MTEBI will be discussed further in the methods section.

Organization of the Remainder of the Study

Chapter 1 provides an overview to the background of the issue; statement of the problem; rationale and reasons for the research; research questions that will be addressed; implications and importance of the study; explanations of the terms used throughout the paper; assumptions and limitations to the research.

Chapter 2 presents a comprehensive review of literature that examines both a historical approach and current implications behind the minority achievement gaps. The lit-

erature review evaluates the various approaches to assessing teacher quality and teacher efficacy on student achievement.

Chapter 3 describes in detail the research methodology to include the population, the participants, survey instrument and data gathering techniques (quantitative), as well as the statistical analysis used to conduct the results for the research design.

Chapter 4 presents the overall evaluated findings based on the collected data from the research study. This section addresses the research questions and how the overall findings support evidence to the explanations behind the research questions.

Chapter 5 provides a synopsis of the study incorporating the research findings and offering conclusions to the results. Furthermore, this section gives recommendations for future studies on the minority student achievement gaps.

CHAPTER 2: LITERATURE REVIEW

Our education system is failing to support students; specifically those of color who are disadvantaged. This is evidence in the gap between minority and white test scores on national and state standardized tests (Rampey, et al. 2008). The minority achievement gap is the difference in K-12 test scores between minority (Black and Hispanic) and white students. These gaps were first reported in 1966 by *The Coleman Report* (Coleman, et al. 1966) and still persist today with some, but still insufficient improvements.

In 1966, Coleman reported that the number one factor impacting student achievement was home environmental variables including low socio-economic status (or lack of money/financial assistance), household structures (single vs. dual parent run households) and parental education level (specifically mother's educational level). Later in the 1990s Ferguson found that some of the variables that impacted student achievement also included school factors such as teacher expectations of their students, teachers' own self-efficacy levels and highly qualified teachers (HQT) (Appendix A).

This literature review, focuses on the relationship between teacher self-efficacy and student achievement because my hypothesis is that high teacher self-efficacy positively impacts student achievement on high school mathematics standardized tests regardless of the students race, gender and socio-economic status. Research shows that high

teacher self-efficacy leads to high student achievement, and low teacher self-efficacy

leads to low student achievement (Brophy, 1998; Gibson and Dembo, 1984; and God-

dard, et al. 2004a). Most of the research conducted using the *Mathematics Teacher Effi-*

*cacy Belief Instrument (*MTEBI) has focused primarily on math teacher self-efficacy and

math student achievement in elementary schools; however, there is little literature on the

relationship of teacher self-efficacy to student achievement in high school mathematics

(Enochs, et al. 2000). Therefore, this research attempts to find whether teachers with

high MTEBI self-efficacy scores have higher student achievement regardless of race,

gender and socio-economic-status (SES).

I first describe the achievement gaps on the *National Assessment of Education*

Progress (NAEP) over the last thirty-five years to show the existence and importance of

the minority achievement gap. I then describe how Bandura's social cognitive theory de-

fines self-efficacy and places it into context. Then, I review the literature on the relation-

ship between teacher self-efficacy and:

- adaptation of classroom environment and instruction;

- change in curriculum design;

- change in student self-efficacy;

- change in math student achievement; and

- placement of students in special needs classrooms.

Additionally, I review other contributing factors that impact student achievement:

- socio-economic status;

- school's racial segregation issues;

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- parental education level and household structures.

Next, I describe the various policy reform initiatives to close the achievement gaps, followed by how charter schools emerged and the opportunities it created for students in low-income school districts. Lastly, I talk about conclusions for future research.

Achievement Gaps on NAEP

The National Center for Education Statistics administers the *National Assessment of Educational Progress* (NAEP), a series of mathematics and reading national standardized tests, with scores ranging from 0 to 500 per section. The math section of the NAEP assesses students in grades four, eight and 12. Researchers can analyze NAEP results to examine scores across schools, districts, and states, and across student demographics. Analysis of NAEP results has shown achievement gaps across subgroups (race, socio-economic status and gender) since the inception of NAEP testing in 1973. Since 1980, state standards on education have increased substantially with the intent that students would score higher on the NAEP exams. This section shows that over the last thirty-five years, higher state standards have not yet led to higher achievement on NAEP specifically with minority students.

Campbell (2000) and McLaughlin (2008) both found small improvements in achievement gaps between minorities and whites in mathematics from 1973 to the mid-1980's. Campbell (2000) found that from 1973 to 1999, the minority math achievement gap closed slightly only at the *basic* skill level while remaining fairly stagnant at *proficient* and *advanced* skill levels. In the 1990s, the gaps increased again to return to a substantial difference in 2003 (26 points for reading and 20 points for math) between

African Americans and whites (McLaughlin, et al. 2008). Jaekyoung Lee (2006) observed that in 2005, African-American 13-year-olds average NAEP scores on math were approximately those of 9-year-old whites. He predicted that by 2014, less than 25 percent of African-American and/or low-income students would score higher than *proficient* on reading and math for NAEP.

The most recent report, *The Condition of Education* indicated that in 2007 the achievement gap for nine-year-olds between whites and African Americans was 26 points in math, which was considerably less than the gap in 1973 at 35 points but not an improvement over the 1990's gap of 32 points. Between 1973 and 2004, the achievement gap between whites and African Americans decreased by nearly 20 points for 13-year-olds. Also, 17-year-olds also saw a substantial decrease from a 40 point gap in 1973 to a 20 point gap in 1990 to a 28 point gap in 2004. The data showed the gaps have decreased somewhat since 1973, but since the 1990's, the gaps between minorities and whites have plateaued (Planty, et al. 2008).

As reported in the *Education Watch State Report: Texas,* in 2007, 17-year-old African American and Latino students scored the same on both the reading and math sections of the NAEP as 13-year-old white students. As show in Figure 1, the report showed that in 2007, 89 percent of African-American eighth-graders scored below or at the *basic* level in math, and only 11 percent scored at the *proficient* or *advanced* level. Latinos scored similarly with 85 percent below or at the *basic* level, and only 15 percent at the *proficient* or *advanced* level. Whites scored significantly better, with 60 percent below or

at the basic level and 40 percent at the *proficient* or *advanced* level (Education Trust 2009b).

NAEP Grade 8 Mathematics, 2007
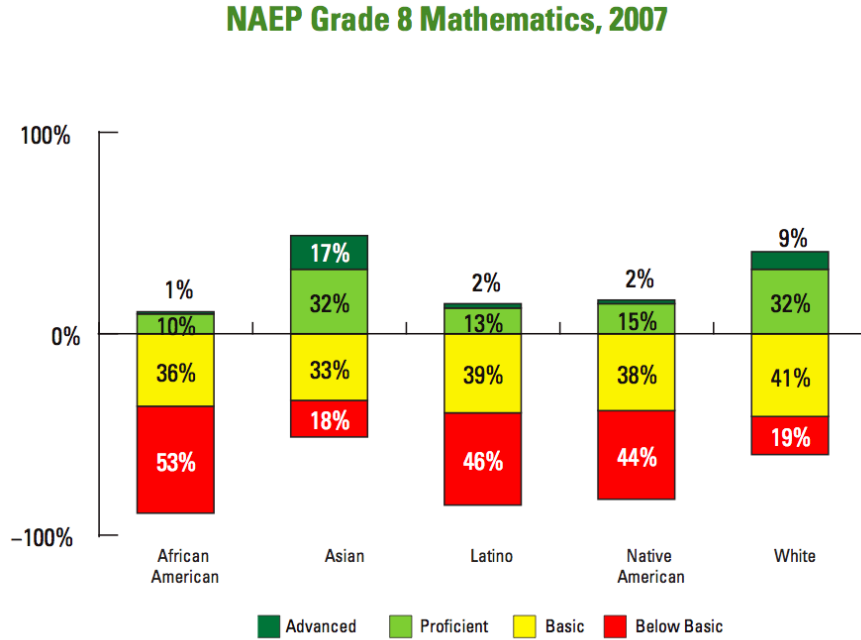
Figure 1: NAEP Math Scores for Eighth Grade in 2007

SOURCE: The Education Trust (2009)

The current gap between minorities and whites in mathematics has been an ongoing issue. Despite the school reform policies set out by the *No Child Left Behind Act* of 2001 (NCLB) and other government initiatives over the last 35 years, the data illustrate a lack of improvement on closing the achievement gaps on national standardized tests (NAEP).

Bandura's Social Cognitive Theory

Self-efficacy is a psychological concept that has been applied to studying teachers since the 1970s. Much of the educational research on teacher self-efficacy is based on Bandura's theoretical frameworks of social cognitive theory as it relates to self-efficacy (Bandura, 1993; Bandura, 1994; Bandura, 1997). *Self-efficacy* is defined as the "belief in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet situational demands" (Wood and Bandura, 1989:260). Self-efficacy is an internal belief pattern in which the individual perceives that they can perform at a certain level to obtain a defined goal.

In math teaching, higher self-efficacy can lead to more effort expenditure and persistence in the classroom; adaptations to curriculum design based on the needs of the student; positive and supportive appraisal affecting student achievement and shaping the students' belief systems (Bandura, 1986). Bandura explains that teachers with, "perceived self-efficacy contributes to the development of sub-skills, as well as draws upon them in fashioning new behavior patterns" (Bandura, 1986:395). These new behaviors are adjusted in order to best support the math students' classroom needs. Lastly, math teachers with higher self-efficacy are less likely to have disincentives and performance constraints, and do not behave in a predisposed judgmental manner towards their students.

The concept, *efficacy expectations,* is defined as "the individual's belief that he or she is capable of achieving a certain level of performance in that situation," while *outcome expectancies* is defined as "judgements about the likely consequences of specific

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behaviors in a particular situation" (Woolfolk Hoy and Hoy, 1990:88). Efficacy expectations can impact a teachers motivation, effort during instruction, strategies towards teaching and goal setting (Wood and Bandura, 1989; Bandura, 1997). For example, teachers that report a high sense of self-efficacy expectation typically have fundamental classroom behavioral patterns which include high levels of performance, adaptation to student learning capabilities, partaking in difficult tasks/goals, persistence with hard-to-reach students, and persistence and resilience, which produces higher student achievement. Whereas, *outcome expectancies* provides either a form of disincentives based on criticism and punishments; or a form of incentives such as recognitions, positive self-evaluations, physical or social rewards which can instill either positive or negative behavior (Bandura, 1993).

Bandura's (1997) social cognitive theory hypothesized that both behaviors and outcomes were determined based on a person's belief patterns and sense of self-efficacy. Bandura stated that when a person is faced with challenges, those belief patterns are important predictors of how they would react. Based on varying levels of self-efficacy, belief systems determine varying intensities of energy spent on the faced obstacle and during a course of action.

Bandura's theory states that a person's belief patterns are observed in their motivations to complete tasks and work. Thus, if a person has a high sense of self-efficacy, they likely have high levels of motivation. Teachers who report a high sense of self-efficacy have high-motivation and exhibit characteristics such as:

- confidence in their ability to perform tasks that are challenging,

- high levels of performance,

- verbal support,

- constructive (rather than destructive) criticism, and

- resilience in difficult situations, such as challenging learners and continually using peer and student praise to bolster the classroom environment (Bandura, 1993; Bandura, 1997).

Bandura identified four factors that can affect a teacher's self-efficacy: mastery experience, vicarious experience, social persuasions and psychological factors. Out of the four theoretical factors, Bandura stated that *mastery experience* possibly has the greatest impact on teachers. Mastery experience concerns the individual's life success factors (which may or may not include student achievement) that increase their self-efficacy, and failures that lower their self-efficacy. Bandura also stated that mastery experience can be attributed to prior personal attainment and can impact teachers' perceptions of their efficacy and student achievement .

Vicarious experience is a form of modeling or being taught through modeling other people's behaviors. For example, teachers can collaborate on effective approaches to teaching mathematics or by modeling effective strategies of successful teachers that they have observed.

Teachers can also be influenced by *social persuasions* – the external factors (principals, students, and parents) and encouragements or discouragements which can change their internal perspectives and confidence levels.

Lastly, *psychological factors*, such as depression, anxiety, mood instability, or situational stress within the context of the school climate, can impact the morale of administrators and trickle down to teachers and alter their perceptions of self-efficacy.

Bandura explained that a person manages their situation and interprets their efficacy levels based on the context of the environment and the situation. For example, teachers who have mastered instructional methods while teaching in suburban high schools may have a lower sense of self-efficacy when teaching in an urban neighborhood where their methods are inadequate for the new environment. However, if the teacher feels that he or she has the "conviction that they can successfully execute the behavior required" (Wood and Bandura, 1989) for that environment, it will ultimately have a positive correlation on student performance.

Studies have clearly illustrated the relationship that exist between teachers self-efficacy and their ability to affectively communicate and teach students (Brophy, 1998; Gibson and Dembo, 1984; and Goddard, et al. 2004a). Understanding the relationship that exist between teacher self-efficacy and student achievement may provide new insight into gaps that have occurred between minority students and their peers and how to hire new teachers or develop current teachers to increase teacher self-efficacy by targeting Bandura's four factors that affect self-efficacy. In the following sections, the literature explores the positive and negative effects of teacher self-effaicacy as it pertains to student

achievement. In particular, this literature review explores how teachers with higher self-efficacy adapt classroom instruction and curriculum design to suit the needs of their student.

Teacher Self-efficacy and Student Achievement

It is essential to educational leaders to identify key teacher characteristics that increase or decrease the achievement gap. Since teacher efficacy has been tied to student achievement, the next part of the literature review analyzes the relationships between teachers' sense of self-efficacy and student achievement.

Teacher self-efficacy is studied through a framework which general by includes teacher self-efficacy and personal teaching self-efficacy (Gibson and Dembo, 1984; Tschannen-Moran, et al. 1998). *General teacher self-efficacy* is defined as "teachers' judgements about their abilities to promote student learning" (Woolfolk, Hoy and Spero, 2005:347). General teacher self-efficacy is the belief that a teacher can directly influence the students' learning environment and achievement through teaching strategies and classroom management. The effectiveness of teachers will either ultimately provide support or undermine a student's learning capability. *Personal teaching self-efficacy* is a teachers' belief that his/her own aptitude and skills are effective strategies towards making a difference in student achievement.

In the following sections, I address the different ways teacher self-efficacy impacts student achievement. High teacher self-efficacy results in adaptations to the classroom environment to successfully teach the subject matter in an accessible way; students soak up the information and do well on standardized tests. Teachers with high self-effica-

cy tend to meet the needs of the students in the classroom by developing new approaches to teaching the curriculum. Teachers with high self-efficacy often reflect positive behavior which is then reflected in high student self-efficacy. Teachers with low self-efficacy usually blame students for their inabilities to succeed (lack of motivation and intelligence), which then instills anxiety and diminishes the students' ability to perform. The next sections provide a picture of how high teacher self-efficacy can elevate student achievement, while low teacher self-efficacy contributes to the low student achievement.

First Measurements of Teacher Efficacy.

In 1972, the RAND Corporation conducted the first Likert scale assessment of teacher self-efficacy on minority student achievement in reading programs in elementary and secondary education. Questions that appeared on this assessment included items like "when it comes down to it, a teacher really can't do much because a student's motivation and performance depends on his or her home environment," and "if I really try hard, I can get through to even the most difficult or unmotivated students" (McLaughlin and Marsh, 1978). Armor, et al. found that teacher self-efficacy was strongly related to student achievement on reading exams (Armor, et al. 1976). However, the scale was deemed by educational researchers as being too constricted and not having enough open-ended self-exploratory questions. Despite their criticisms of the RAND study, Ashton and Webb (1986) found a significant relationship between teacher self-efficacy and mathematics student achievement in elementary schools.

Mathematics Teaching Efficacy Belief Instrument (MTEBI).

The *Mathematics Teaching Efficacy Belief Instrument* (MTEBI) is a survey instrument that has proven to be an effective measurement to study teachers' self-efficacy.

Enochs, et al. (2000) created the *Mathematics Teaching Efficacy Belief Instrument*
(MTEBI) to measure two subscales: *Personal Mathematics Teaching Efficacy* (PMTE)
subscale and the *Mathematics Teaching Outcome Expectancy* (MTOE) subscale. In order
to determine the reliability and validity of the MTEBI measurement, Enochs, et al. (2000)
surveyed 324 pre-service teachers. With an alpha coefficient of 0.88 for the PMTE and
0.75 coefficient for the MTOE, the survey instrument proved to be both reliable and
valid. The reliability and validity of the measurement are discussed further in the
methods section.

In 2003, Alkhateeb and Abed conducted a pretest and posttest of the MTEBI. The
survey reported findings from 106 undergraduate elementary education majors. Three-
fourths were freshmen. All of the survey respondents were enrolled in a spring
elementary mathematics content course. The pretest was conducted on the first day of
class, and was used to determine an initial baseline for the student's mathematics teaching
efficacy belief. The posttest was conducted on the last day of class, and used to measure
any changes in self-efficacy that might have ensued from having taken the course. These
researches argued that, "preliminary results showed that the student's anticipatory beliefs
in teaching efficacy increased statistically over this mathematics content course wherein
active use of hands on manipulative materials was stressed. Thus, this course had a small
positive influence on… [participants'] beliefs in their ability to teach this mathematics
content effectively and their beliefs that effective instruction could aid children's
successful instruction of mathematics" (Alkhateeb and Abed, 2003:447-478). Based on
the pretest and posttest analysis, the researchers concluded that mathematics content

courses seem to positively improve students' mathematics teacher efficacy beliefs.

Swars, et al. (2006), employed the *Mathematics Teaching Efficacy Belief Instrument* (MTEBI) and the *Mathematics Anxiety Rating Scale* (MARS) to understand the relationship between mathematics anxiety and mathematic teacher self-efficacy. The survey was administered in a southeastern American university mathematics methods course. A total of 28 pre-service teachers (26 females and 2 males) responded to the MTEBI and MARS. In addition the administering the MARS and MTEBI, researchers conducted a semi-structured interview session with the two highest and lowest scoring participants on the MARS. This interview asked specific questions about their individual teaching capabilities and approaches (Swars, et al. 2006:306-307).

Swars found a statistically significant correlation between mathematics teacher self-efficacy and mathematic anxiety. Specifically, those participants who scored higher on the MARS scored lower on the MTEBI and conversely participants who showed to have lower mathematics anxiety scores scored higher on their mathematics teaching self-efficacy. With these strong correlations, found that pre-service teachers who scored high on the mathematics anxiety seemed more likely to lack the ability to be highly efficacious mathematics teachers; conversely teachers with lower mathematics anxiety were more likely to feel highly efficacious. The PTME subscale, found that, "the data indicate a significant, moderate negative relationship" (p. 310). However, Swars, et al. (2006) found no statistical significance between the MARS and the *Mathematics Teaching Outcome Expectancy* (MTOE) subscale score. This finding revealed that mathematics teaching anxiety did not impact teachers' outcome expectancy on their students' ability to

effectively learn math.

Relevant to the above study, in Gresham's (2008) research revealed critical internal psychological factors that can positively or negatively impact math teachers' subscale scores on the personal efficacy subscale of the MTEBI. Greshman found that higher anxiety levels of pre-service teachers may have lead to lower self-efficacy scores on the PMTE subscale. By adding supplemental questions on mathematical coursework in addition to the MTEBI; he concluded that pre-service teachers that take more mathematics methods coursework were less likely to have anxiety when teaching math. Those that took more methods courses also scored higher on the PMTE subscale. Swars also reached similar conclusions similar results using the MTEBI. He found that pre-service teachers' educational background in math strongly correlated with math teaching efficacy. In the study, Swars, et al. (2006) found that preservice teachers that disclosed negative experiences with math in school also scored low on the math teacher efficacy scale (Swars, et al. 2006).

Alkhateeb (2004) conducted another survey to study the reliability and validity of the MTEBI instrument in an Arabic translation. Due to educational differences between the Arabic and United States programs in education, he found that there were major differences in the outcomes of two items on the *Mathematics Teaching Outcome* subscales. The researcher suggested that these differences were attributed to the additional coursework that American students have in their educational programs. He concluded that, "the validity of a scale can not be extended to culturally different populations without empirical verification" (Alkhateeb, 2004: 834). These implications

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indicate that more cross-cultural and cross-educational research needs to be conducted in order to assess the reliability and validity of the MTEBI instrument.

Relevant to the previous study, Cakiroglu (2008) employed the MTEBI survey to evaluate cross-cultural differences between two independent university education programs - one in the midwest United States and one in Turkey. The purpose of the study was to assess the cross-cultural similarities and differences found between pre-service teachers mathematics teacher efficacy beliefs using the MTEBI. Each university had roughly an equal amount of total voluntary participants, the United States with 104 (91 females and 13 males) and the Turkish university with 141 (109 females and 32 males) (Cakiroglu, 2008:37).

The overall findings concluded that both the Turkish and American university students' had generally high subscale score for their *Personal Mathematics Teaching Efficacy* (PMTE) and a moderately high *Mathematics Teaching Outcome Expectancy* (MTOE) score. Interestingly, on the MTOE subscale the American students scored lower than the Turkish students, which is evidence that Turkish pre-service teachers had higher outcome expectancies of the effectiveness of their teaching in student learning (Cakiroglu, 2008:39). Furthermore, the study found no statistical significance between the two participant groups mathematics teacher efficacy belief PTME scores, illustrating that the Turkish and American university students do not significantly differ on personal self-efficacy (Cakiroglu, 2008:38). In addition, gender was not a statistically significant factor across both the PTME and MTOE subscales, specifically within and between the participant groups. Therefore, based on this research, gender does not play an important

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role in mathematics teacher efficacy beliefs. In conclusion, the researcher found that these scores may signify that both university programs have assisted in promoting students who were highly efficacious (Cakiroglu, 2008:38-40).

Using the MTEBI as one of five different survey instruments, Chahine (2008) conducted a mixed methodological (quantitative and qualitative) approach to study teachers and students. The approaches included questionnaires, interviews, classroom observations and student tests. The researcher used a pretest and posttest to study two different research questions. First, Chahine wanted to examine the outcomes of using a new Level 1 *Rational Number Project* (RNP) *Curriculum* for fifth grade math students studying basic fractions.   Secondly, Chahine wanted to evaluate the teachers' "psychological synopsis pre-implementation of the new RNP Curriculum; this includes identifying the repercussions of applying a research-based curriculum as well as the teachers' mathematical educational level" (Chahine, 2008:1).

The elementary schools that were selected for participation were located in suburban communities in Lebanon. Each of the five school participated in the Minaret Association, a charitable organization that has provided support to Lebanese communities throughout the last two decades. A total of 18 fifth-grade classrooms were chosen from the five schools. Students and teachers from the 18 classrooms were randomly selected and placed in either the *Traditional Lebanese Curriculum* (TRAD) or the control group, while the other students were placed in the RNP Curriculum design or the experimental group (Chahine, 2008:54-55).

A pretest and posttest MTEBI was administered to all teachers in both the RNP

Curriculum implementation and TRAD group to gauge teachers perceptions of self-efficacy before and after the implementation of the new curriculum/old curriculum. This method was utilized to specifically determine math self-efficacy changes before and after the RNP Curriculum and the TRAD group (p. 62). Chahine found that there was no statistical significant differences between the pretest and posttest MTEBI self-efficacy scores on either the TRAD or RNP group (p. 146). Thus, the RNP curriculum approach to math showed no influence on math teacher self-efficacy beliefs (Chahine, 2008:62, 146).

In 2008, Jansen used the MTEBI to survey secondary teachers in agricultural education with the hopes of proving the validity of the survey. Although the instrument was initially created to measure preservice teachers, Jansen wanted to find out if the measurement could be used for secondary education teachers. Jansen's research found that the MTEBI is a "very reliable and valid instrument for assessing teacher efficacy" (Jansen, 2008:28). This conclusion is important as it illustrates that the MTEBI can be used to determine teachers' self-efficacy in secondary education.

Adaptation of Classroom Environment and Instruction.

Shaping a classroom environment and instruction is in part determined by teachers' self-efficacy. Teachers with higher self-efficacy often devise adaptive and personalized instructional strategies that support the cognitive development of the students at their ability level, while teachers with lower self-efficacy weaken the classroom environment and impact students ability to absorb the information (Bandura, 1993).

Teachers with higher self-efficacy often have a high commitment to their profession and positively tackle the compounded challenges and struggles faced by disadvantaged school systems and classrooms (Guskey, 1988). By using non-traditional teaching strategies in these school systems, teachers with higher self-efficacy have been able to overcome the greatest student achievement obstacles in disadvantaged school districts. To overcome the challenges of disadvantaged school systems, teachers with higher self-efficacy are more likely to persist through obstacles and challenges met in these school districts by creating school environments that meet the needs of their students (Ross, 1998). Teachers who are highly efficacious tend to have more liberal educational views (non-traditionalist), and believe in the power of teaching, often creating and devising classroom instruction to reach hard to teach students (Woolfolk, Hoy, and Hoy, 1990). The study suggested that teachers who scored higher on the self-efficacy measurement were more likely to raise student skill sets, ultimately improving achievement outcomes.

Teachers with higher self-efficacy are more likely to believe that students who are low achievers typically need more classroom attention and teacher effort (Ashton and Webb, 1986). Research has indicated that "teachers with a high sense of efficacy were more likely than their low-efficacy counterparts to define low-achieving students as reachable, teachable, and worthy of their attention and effort. These teachers' beliefs can make or break the learning process in the classroom environment" (Ashton and Webb, 1986:47). Highly efficacious teachers identify students that are low-achievers and help shape the classrooms to better meet their needs.

DeForest and Hughes (1992) also found that teachers with higher self-efficacy adapt the environment and instruction to meet the needs of their students. Teachers who report higher self-efficacy exhibit positive attitudes and approaches during work, are persistent when faced with difficult situations (such as hard to reach students) and exert more effort in the classroom, spending more time constructing a positive and supportive environment for their students. They build successful classroom strategies to bolster student learning and achievement levels which have shown to promote students' high self-efficacy and high achievement.

Teachers with reported higher self-efficacy often provide low-achieving students with proper support to achieve at greater levels (Ashton and Webb, 1986; Zeichner, 2003). By adapting new classroom and instructional strategies for students, higher self-efficacy teachers provide comprehensible instruction, focus time on student-centered learning, and supply students with positive reinforcement (Woolfolk, Hoy, and Hoy, 1990). These teachers have less criticism during classroom instruction and take more time to work with the students to ensure they have mastered the information (Ashton and Webb, 1986). However, teachers with lower self-efficacy are more critical of their students, depend heavily on a reward system, rely on task-oriented objectives, spend less time on classroom instruction and give up quickly on their students if they can not learn the material at the pace set out by the teacher (Gibson and Dembo, 1984; Woolfolk, Hoy, and Hoy, 1990).

Gibson and Dembo (1984) observed teachers with higher self-efficacy changed their instructional design to meet the entire classes needs at once. Those with higher self-efficacy were reported to spend roughly 28 percent of their time in small group instruction, compared to 50 percent of lower self-efficacy teachers. This means that lower self-

efficacy teachers had to divide students into groups based on ability, and teach to those groups individually. Thus, lower self-efficacy teachers spent less time with each group; whereas higher self-efficacy teachers managed to teach the entire group or classroom at the same time. Gibson and Dembo (1984) also observed that higher self-efficacy teachers never criticized their students while four percent of lower self-efficacy teachers criticized their students. They concluded that both personal self-efficacy and teaching self-efficacy positively correlated with student achievement.

Conversely, Woolfolk, Hoy, and Hoy (1990) used an adapted version of Gibson and Dembo (1984) and found no correlation between personal and teaching efficacy. Using multi-regression analysis, no correlations were found between personal efficacy and pupil control ideology; also, bureaucratic orientation and motivation did not correlate with teaching or personal efficacy. However, what was similar to the Gibson and Dembo study was that negative reinforcements and criticisms were observed from teachers with lower self-efficacy while positive reinforcements and academic autonomy were observed from teachers with high self-efficacy.

In summary, a majority of the literature supports the theory that teachers with higher self-efficacy will adapt their classroom instruction to provide the best supportive environment for their students' needs. To meet the challenges faced in the classroom, higher self-efficacious teachers use non-traditional approaches, positive encouragement and are more likely to be committed to persist through opposition compared to lower self-efficacy teachers.

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Change in Curriculum Design.

Tucker bolstered the research findings discussed above and added that teachers with higher self-efficacy change the curriculum to meet the needs of disadvantaged students to provide a better hope for student achievement (Tucker, et al. 2005). As mentioned earlier, Tucker also found that teachers with lower self-efficacy blame outside circumstances for low-achievement scores and state that they follow the guidelines set out by the state for their curriculum design approach. This rigid structure format provides no flexibility and students often suffer from a curriculum designed to meet the average student.

This study concluded that, "By developing an understanding that multiple external factors (e.g., social, cultural, economic, political, school, neighborhood, family, parent) can impact the academic and social behaviors of children, teachers can come to appreciate that each child must be taught to achieve under whatever conditions exist." Thus, teachers can design a positive academic learning environment which can support self-empowerment of culturally diverse students. This adaptation of the environment creates positive experiences in the student and teacher through, "self-praise, adaptive skills, and success behaviors for social, academic, and life success (e.g., asking questions about what one does not understand, using good eye contact). When teachers feel competent to effectively teach all students in their classrooms, the academic achievement of culturally diverse youth will most likely increase" (Tucker, et al. 2005: 32-34). Thus, minority stu-

dents have positive attention, feel valued, supported and genuinely important to the teacher they begin to have positive experiences that impact student outcomes.

When teaching minority or low-income students, Wheatley (2000) reported most teachers are not prepared with curriculum strategies to motivate and support student growth in disadvantaged school districts. Wheatley concluded that "a belief that one simply does not yet know how to reach certain types of students (e.g., students of a specific age or cultural background) can promote reflection, assessment, and the learning of new methods for teaching those students" (p. 26). This is an important factor as most teachers are prepared to teach standard state curriculum, but that curriculum model does not usually apply to low-income school districts. When teachers go into these classrooms with certain expectations, those with low self-efficacy have difficulty reshaping the curriculum to improve student learning. However, Wheatley found that teachers with higher self-efficacy reshape the curriculum if students are not performing well and absorbing the information.

Good and Brophy (2003) also concluded that teachers with higher self-efficacy report that they shape their curriculum to support the needs of their students during any given year. Their study reported higher achievement scores when teachers continuously re-evaluated their curriculum strategies to positively enhance the student experience. Good and Brophy further reported that teachers with higher self-efficacy establish early curriculum intervention programs to assist students with learning deficiencies before problems end with student failure.

To summarize, teachers with higher self-efficacy adapt new curriculum design strategies to promote student success. However, teachers with lower self-efficacy are less likely to support students and improve classroom techniques. "For example, when teachers are less confident in their abilities (low teaching efficacy), they may feel less able to improve classroom techniques to improve the skills of low achieving students" (Jussim, et al. 1998:17). The next section will discuss the importance of those factors as they influence a student's self-efficacy by building it up or destroying it.

   Changes in Student Self-Efficacy.

Student self-efficacy is the student's internal belief that they are capable of achieving an aspiration or outcome. Students with higher self-efficacy are motivated to accomplish the goals they set, even if the task is difficult to achieve. Students with higher self-efficacy feel in control of their successes and failures instead of blaming external reasons. However, students with lower self-efficacy feel easily defeated by setbacks, are less likely to feel motivated or to exert effort and have low aspirations to achieve any goals. Bandura's (1993) four sources of efficacy (mastery experience, vicarious experience, verbal persuasion and emotional state) apply to student self-efficacy as well.

Bandura (1994) stated that positive learning environments that are conducive for higher self-efficacy students are created by teachers with higher self-efficacy. He found that regardless of whether the teacher taught to disadvantaged or advantaged students, teachers with higher self-efficacy create a classroom that motivates students and strengthens their cognitive growth. Teachers with lower self-efficacy use "custodial orientation that relies heavily on negative sanctions to get students to study" (Bandura, 1994:11).

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A student's autonomy in the classroom promotes intellectual self-efficacy as teachers with higher self-efficacy place emphasis on positive self reflection and social appraisal. During classroom instruction, teachers with lower self-efficacy often make whole group comparative evaluations, causing students who are not keeping up on material to rank themselves against other students and have internal negative projections.

Bandura (1994) found that teachers who enabled cooperative learning environments improved student self-efficacy and outcomes. "Cooperative learning structures, in which students work together and help one another also tend to promote more positive self-evaluations of capability and higher academic attainments than do individualistic or competitive ones" (p. 368).

Students react positively in these types of learning communities, which improve their self-esteem, their determination to succeed, and overall achievement growth. A longitudinal study conducted by Midgley, Feldlaufer and Eccles (1989) found that teachers with higher self-efficacy were likely to have students with higher self-efficacy. Similarly, students with lower self-efficacy were likely to be in classrooms with lower self-efficacy teachers. They concluded in their research that teacher's self-efficacy influenced student achievement, outcomes, classroom behavior and ultimately the student's internal belief system that they can accomplish anything.

Margolis and McCabe (2006:221) state that, "often the key to motivating and engaging struggling learners is to get them to believe that they can succeed". Teachers with higher levels of efficacy can encourage students to achieve at higher levels than they originally set for themselves, thus enhancing their success. Margolis and McCabe found

that teachers with higher self-efficacy promote students' self-efficacy by providing supportive, positive and creative classroom environments which enhance students' belief systems. Furthermore, teachers with higher self-efficacy assist struggling students by using moderately-difficult tasks, encouraging peer role models, teaching with specific learning strategies, capitalizing on student interests, allowing students to make their own choices, encouraging students to try and giving frequent focused feedback. Singham (2003) found that these teaching strategies for bolstering student achievement make a considerable difference in student self-efficacy. Conversely, negative attitudes and belief patterns are observable during classroom instruction, which play a major role in lowering students' belief patterns and self-esteem and ultimately impact their ability to perform on exams.

A study conducted by (Allinder, 1994) supported the assumptions that higher self-efficacy promotes student achievement through goal-oriented expectations. Allinder concluded that students assigned to teachers with higher self-efficacy had higher goals set for them, and scored higher on computational mathematics skills than students who were assigned to teachers with lower self-efficacy. Students and teachers that have higher self-efficacy also report elevated personal expectations of their goals. Again relating back to Bandura's (1997) findings that a person's motivation to achieve goals was based on efficacy expectations and outcome expectations.

Guskey (1986) found that high teacher self-efficacy developed positive student self-efficacy. Guskey's research illustrated that teachers with higher self-efficacy constructed their instructional design to meet the specific levels of the student. Positively

adapted content-based instructional changes increased student self-efficacy; whereas general uniform content teaching decreased some student self-efficacy.

In 1988, Guskey conducted a follow-up study to confirm his data found in 1986 (Guskey, 1988). He verified that teacher self-efficacy influenced not only student achievement but also student self-efficacy, teaching instructional methods and the types of positive or negative criticisms directed at students. Guskey found that teachers with higher self-efficacy had constructive criticism during instruction, whereas teachers with lower self-efficacy had demeaning and negative criticism during classroom instruction. This, in turn, impacted the way the students perceived their own abilities on doing well in class. Thus, teacher self-efficacy impacts a multidimensional environment for the student, leading to positive or negative outcomes to the students.

Effects of Teacher Efficacy on Students.

Bursal and Paznokas (2006) conducted a a study to determine the correlations between teachers' mathematics anxiety and their ability to confidently teach math and science to elementary students. They found that nearly half of teachers who reported a high level of anxiety around teaching mathematics reported that they could not effectively teach math; this low self-efficacy lessened the chance for their students to succeed in math classroom objectives (Bursal and Paznokas, 2006).

Raymond (1997) conducted a study which illustrated the relationship between novice math teachers' belief patterns and elementary student beliefs in math. Raymond found that both math teachers and math students have various levels of reported self-efficacy that can impact their abilities to teach or perform math functions. The study exam-

ined new elementary teachers beliefs about mathematics pedagogy. Efficacy belief sys-

tems for first-year teachers was connected to their ability to deal with stressful situations,

and additionally their complacency about their previous preparation and current school

support system. Lower efficacious novice teachers reported that they were less confident

in their teaching abilities, had little support, and were less likely to believe that they were

effectively teaching math students. On the other hand, high-efficacious teachers felt

competent and optimistic about their ability to impact math student achievement.

Furthermore, this analysis also reviewed how novice school teachers taught math

based on a more traditional approach to teaching practice to mathematics. Raymond

found that teachers beliefs about mathematics was observably different then there prac-

tices (or how they taught). Novice math teachers traditional instructional design ap-

proaches directly impact student beliefs and negatively or positively impacted outcomes.

(Raymond, 1997). A student's internal belief that they can perform well in math is culti-

vated, formed and grounded during their in-classroom school experiences.

Changes in Math Student Achievement.

The Mathematics Self-Efficacy Scale (MSES) was developed by Hackett and Betz

(1989) to measure students' mathematical self-efficacy and confidence levels when

taking exams and completing assignments and tasks. Mathematics self-efficacy is de-

fined by Hackett and Betz as "a situational or problem-specific assessment of an indi-

vidual's confidence in his or her ability to successfully perform or accomplish a particular

[mathematics] task or problem" (Hackett and Betz, 1989:262). Fear and anxiety of math-

ematics was found to strongly correlate to the level of confidence and self-efficacy in stu-

dent achievement on math exams (Taylor and Brooks, 1986; Ufuktepe and Ozel, 2002).

In a study using path analysis to review student levels of self-efficacy, Pajares and Miller

(1984) found that students with lower math scores reported more anxiety, less confidence

and low self-efficacy. Thus, students attitudes, anxieties, fears and confidence levels re-

lated to mathematics can greatly impact their abilities to perform on math problems, tests

and state standards.

Pajares and Miller (1994) added to Hackett and Betz's definition of math self-effi-

cacy, defining it as an "individual's judgments of their capabilities to solve specific math

problems, perform math-related tasks, or succeed in math-related courses" (p. 199). Pa-

jares and Miller (cf. Collins, 1982; Siegel and Galassi, 1985) found that math self-effica-

cy and student performance are strongly correlated. Furthermore, studies conducted by

Pajares and Miller showed that a student's confidence level and math self-efficacy strong-

ly predict math performance on standardized exams. Students with higher self-efficacy

persisted through and completed novel math problems, outperforming students with low-

er self-efficacy. Math self-efficacy illustrated a higher relationship to math student per-

formance than did math anxiety or aptitude measurements. Hackett and Betz (1989)

found that math self-efficacy was a stronger predictor of math anxiety than gender, race

or experience.

Math teachers play a major role in either promoting confidence or instilling fear

and anxiety into students performance on mathematics problems. By using two of the

RAND self-efficacy questions listed above as a basis, Ashton and Webb (1986) conduct-

ed a high school teacher self-efficacy study with 25 questions consisting of measures on

teacher efficacy, teacher stress/anxiety levels and personal teaching strategies and instructional methods. Teachers with higher self-efficacy tended to be more attentive to their students needs and created a low-stress, calming environment when teaching mathematics. Conversely, lower self-efficacy teachers were more likely to teach math based on teach-and-drill strategies, which was not necessarily what the students needed. In conclusion, the study found that math teachers' efficacy and strategies for teaching predicted student mathematic achievement.

Placement of Students in Special Needs Classrooms.

A special needs classroom provides students with a different approach to subject matter and instructional design altering coursework, exercises and techniques to support the students learning abilities at the given time. The legal definition for students with Special Educations Needs (SEN) addresses children who have learning challenges or specific disabilities which make standard state educational materials for children at the same age difficult for SEN students to comprehend.

Teachers are the primary liaison and referral person to place students in special needs classrooms, but are not necessary the best sources for making accurate assessments of student needs. Podell and Soodak (1993:247-253) stated that "in reviewing models of decision making, [...] most theorists posit that teachers' cognitions underlie their perceptions and actions. The cognitions include beliefs about teaching and intuitive theories about learners." Teachers' with lower self-efficacy often do not have positive beliefs in the ability for students to achieve, placing them in special needs classrooms.

They found that a possible reason for inaccurate student referrals to special needs classrooms was due to the teachers' own sense of their classroom effectiveness. Teachers with higher self-efficacy believed in their ability to motivate students and effectively change their outcomes. Teachers with lower self-efficacy allowed their racial, income and other biases and stereotypes to interfere with their decision making for placements, also known as "confirmation biases." Both Meijer and Foster (1993) and Podell and Soodak (1993) found that "teachers with greater personal efficacy are less likely to refer students [to special needs classrooms] with mild learning and behavior problems; Soodak and Podell found further that teachers who are least likely to refer students are high in both personal and teaching efficacy" (p. 248).

Podell and Soodak (1993) found in their study of 240 teachers that teachers with lower self-efficacy place more low-income students in special needs classrooms than teachers with higher self-efficacy who kept the majority of their low-income students in regular classrooms. Therefore, they concluded that low-income school district teachers' "decisions about poor children are susceptible to bias when teachers perceive themselves as ineffectual. Most vulnerable, it seems are poor students who are assigned to teachers with low personal efficacy" (p. 251). This suggests that students that are difficult to teach or those living in disadvantaged school districts should be assigned to teachers with higher levels of self efficacy to assist in solving the students' academic issues within the classroom rather than blaming the students or the uncontrolled environment.

Summary of Teacher Self-Efficacy.

National achievement gaps on standardized exams were brought to light in 1966 when *The Coleman Report* captured the nation's attention as statistics showed that children were not provided with an equal opportunity to education. The report brought awareness to the general public on the shortcomings of the educational system, specifically regarding the low achievement levels of minorities as well as the inadequate teaching staff among poor school districts. However, while achievement gaps on the NAEP have shown some fluctuations, they have not narrowed over the last 35 years.

Many educational researchers have addressed solutions to this issue, including the need for teachers with higher quality, higher content knowledge, better educational background and higher self-efficacy. The first part of my literature review illustrated how higher teacher self-efficacy can be a factor in alleviating the problem of student achievement. Teachers with higher self-efficacy adapt the classroom environment and instruction, change curriculum design, change student self-efficacy, improve math achievement and lessen anxiety/fear and take ownership for student achievement and keep them in the classroom instead of misplacing them in special needs programs. Each of these studies used Bandura's social cognitive learning theory to explain how efficacy impacts both the teacher and student.

Outside Variables that Affect Student Achievement

Explanations of the minority achievement gaps have been attributed to outside school factors such as socio economic status, school segregation issues, educational level of parents and children raised in single-parent households. These uncontrolled environ-

mental factors play a large roll in the inequitable distribution of education in low-income, minority populated school districts.

Socio-Economic-Status (SES).

As Ron Ferguson points out the achievement gap starts at the socio-economic level and then it is exacerbated by race. He believes that students in low-income school districts also have another obstacle to overcome - lack of school resources. Often funding for poorer school districts are so inadequate classrooms have insufficient materials, school supplies, technology, limited curriculum support, basic instructional materials and teacher shortages (Means, et al. 1991). These shortages will ultimately impact student outcomes.

In *If They'd Only Do Their Work!*, Darling-Hammond and Ifill-Lynch (2006) addressed low socio economic urban school districts and their "failure factories" of education. Roughly 50 percent of low socio-economic urban students drop out of high school without graduating, and 40 percent of all urban ninth graders will fail in least one subject. Particularly, African-American students tend to be in less-favorable situations – living in poverty and with a single parent – compared to their peers.

Darling-Hammond and Ifill-Lynch attributed a wide variety of circumstances at home to low student achievement, such as inadequate housing, poor healthcare and nutrition, and inadequate parental/guardian support. All of these factors correspond with low-income issues. Schools attribute their failing systems to poor teaching and at-home environmental factors. Since these outside factors cannot necessarily be fixed, Darling-Hammond and Ifill-Lynch (2006) suggested that teachers should "assign work that is worthy

of effort, make the work doable, find out what students need, help create space for home-work" (p. 10).

Rothstein (2004) found a strong relationship between African-American achieve-ment and parental income levels. In 2003, African-Americans' median family income was only 64 percent of white families, and their parental net worth was only 14 percent of whites' parental net worth (Rothstein, 2004). Because income can determine the location of a family's residence, it ultimately determines the school district and the likelihood of poverty. Income levels (specifically poverty levels) show some correlation on student performance on math sections of standardized tests.

School's Racial Segregation Issues.

Low-income districts continue to have segregation issues in schools and racial iso-lation within the educational system. Lee and Orfield (2007) stated that despite bussing efforts in urban schools, African Americans continue to be segregated from their white peers. Gary Orfield's, *The Civil Rights Project* reported that "re-segregation is now oc-curring in all sections of the country and is accelerating most rapidly when the most was achieved for black students in the South" (p. 14). Racial isolation is real and apparent, specifically when the average white student will attend a school where 77 percent of the student enrollment is white. Comparatively, they reported that Black and Latino students attend schools where more than half of their peers are minorities (52% and 55% respec-tively), and less than a third of their classmates are white. Nationally, the racial composi-tion of public schools suggests that these numbers are higher than expected, specifically since whites constitute a larger student portion of total enrollment.

An important trend highlighted is that black students that are in predominately (50 percent or higher) minority schools have increased since the 1980s. Schools in the northeast, midwest and west have become more segregated in 2005 than in 1968, and boarding states as well as southern states are approaching numbers seen in 1968. Schools that enroll 50 to 100 percent poor students have a racial breakdown of roughly 70 to 80 percent African-American students. According to Lee and Orfield (2007), poor schools often have limited resources, and inevitably, poor standardized test scores. Achievement gaps seen in testing scores predominantly exist between racial lines, where African Americans (especially males) fare worse than their white peers.

More recently, the National Center for Education Statistics (2010) reported that over 16,000 schools in the U.S. have at least 75 percent of students who are on free or reduced lunch. In 2008, those 16,000 schools represented 17 percent of schools in the U.S. an increase of 5 percent from 2000. According to Richard Kahlenberg, of The Century Foundation, a public research group in Washington, socioeconomic isolation continues to climb as the "separation of rich and poor is the fountainhead of inequality" (Khadaroo, 2010:1). Specifically, low-income school districts, "get worse teachers ... are more chaotic ... [have] lower levels of parental involvement ... and lower expectations than at middle-class schools – all of which translate into lower levels of achievement" (Khadaroo, 2010:1).

Minority students are the majority of students in high-poverty school districts where Hispanics make up 46 percent, followed by blacks at 34 percent, whites at 14 percent, and Asian/Pacific Islanders at 4 percent (National Center for Education Statistics,

2010). Those students attending high-poverty schools score lower on NAEP in math,

reading, English, and literature than their peers who attend low-poverty schools. For

example, in 2009 the average fourth-grade NAEP score for high-poverty schools was 223

compared to 254 for low-poverty schools. The average eighth grade NAEP score for

high poverty schools was 260 compared to low-poverty schools at 298. At the high

school level, graduation rates of high-poverty schools declined by nearly 20 percent over

the last eight years, from 86 of seniors graduating in 2000 to 68 percent in 2008.

Since 2006, the Federal Government's, *Teacher Incentive Fund* (TIF) has allocated

a substantial amount of funding for schools in high-poverty districts. Specifically, in

2010 the U.S. Department of Education increased the funding for TIF from 400 million

dollars to 437 million dollars to support improving teacher quality in low-income school

districts. Despite these efforts, teachers often have only a bachelor's degree and are not

certified; 21 percent of the teachers have less than three years of experience.

Parent Educational Level.

In Jencks and Phillips (1998) book, *The Black-White Test Score Gap*, they found

that the median black standardized test score was below 75 percent of their white peers.

Drilling deeper into those numbers, blacks who scored below whites had a parental edu-

cation level 3 grades below their white peers. Furthermore, they found a positive correla-

tion between parental educational level of African Americans and student achievement;

when parental educational level increased, so did student achievement. Conversely, Dun-

can and Magnuson (2005) found only a two percent increase in student achievement for

every year of education above high school the parent holds.

Household Structures.

Barton (2004) found that parents who were available to assist in their child's education often increased the child's achievement. The two-parent family structure enhanced the student's developmental and academic growth substantially. Based on data in 2000, Barton found that 75 percent of white students lived with both their parents, while only 65 percent of Hispanics and 38 percent of blacks lived with both their parents. Barton concluded that minorities who are single parents constantly struggle with meeting family responsibilities and are working ten to fourteen hours a day. With the amount of hours these single parent are working it is difficult for them to spend the time needed to support their children's educational growth and development. Barton concluded that having two parents in the same household likely gives the student more adult support on student academics. This study has found a strong relationship between single-parent households and low student achievement.

Policy Reform Initiatives: Closing the Achievement Gaps

A Nation at Risk: The Imperative for Educational Reform, a report that captured the nation's attention on the "rising tide of mediocrity" in 1983, stated that the United States was unsuccessful at providing all children with an equal opportunity to education (The National Commission on Excellence in Education, 1983). "All, regardless of race or class or economic status, are entitled to a fair chance and to the tools for developing their individual powers of mind and spirit to the utmost" (p. 2). The report brought awareness to the general public on the shortcomings of the educational system, specifically regarding the low achievement levels of minorities as well as the inadequate teach-

ing staff among poor school districts. Inventive approaches on educational reform policies emerged in order to raise the standards of education to new levels. Following the report, 44 states increased their graduation requirements with a particular focus on math and science, and a majority of states raised standards for teacher quality. School funding and budgets were placed in the hands of the district bureaucracies, and funds were channeled toward improving instruction, curriculum and teacher quality.

At an educational summit in Charlottesville, Virginia, the nation's governors and President George H. W. Bush agreed on educational reform goals published by the United States Department of Education in 1991 (U.S. Department of Education, 1991). After eight years of development, Goal 3 was set to provide a clear outline of what students were expected to master by graduation:

> By the year 2000, American students will leave grades four, eight, and 12 having demonstrated competency in challenging subject matter including English, mathematics, science, foreign languages, civics, government, economics, arts, history and geography, and every school in America will ensure that all students learn to use their minds well. (National Education Goals Panel, 1999)

With this new set of goals schools were expected to improve student achievement regardless of students racial or income status. Thus, schools were no longer allowed to justify low scores due to minority status or socioeconomic barriers.

Another reform policy to promote teacher quality and effectiveness emerged under President George W. Bush's administration. In 2001 when *The No Child Left Behind Act* (U.S. Department of Education, 2001) was enacted, it placed major emphasis on the effectiveness of teachers by setting new standards for qualified teachers. As a federal

law, it stressed the importance of academic content in teacher preparation and profession-

al development to recruit, retain and maintain highly qualified and effective teachers.

Each state was mandated to develop annual objectives and specific plans to ensure that

100 percent of all employed teachers meet the criteria to be considered a *Highly Qualified*

Teacher (HQT). These criteria include:

1. At least a bachelor's degree in the discipline they desire to teach;
2. State or national teacher's certification, excluding emergency[2] certifications or licenses; and
3. Content knowledge and proficiency in the core subject areas that the teacher is teaching in.

Each state was expected to distribute an annual survey to gauge the number of

teachers who met all three criteria, thus achieving HQT status. By 2006, each state was

required to have 100 percent of teachers with HQT status. However, most states have not

met this requirement. Uline and Johnson (2005) outlined how NCLB (2001) would close

the achievement gaps by directing the accountability on state education departments by

summarizing the goals:

1. Create a common understanding of what all students should know and be able to do-academic content standards;
2. Assess and monitor student learning of academic standards;
3. Provide students with highly qualified teachers;
4. Equip principals to serve as instructional leaders;
5. Target resources to support schools with the most needs;
6. Implement research-based instructional improvement strategies;
7. Disaggregate and report achievement and attendance in ways that help the public hold schools accountable for making progress toward school improvement goals;

[2.] Because of critical teacher shortages, some states extend temporary and emergency licenses that bypass state licensing requirements. These often are granted to individuals to teach in high-need subject areas such as mathematics, science, special education, or bilingual education, or for high-need geographic areas such as urban schools. http://www.teacherssupportnetwork.com/corporate/TeacherToolsAdviceArticle.do?id=16

8. Require school districts to provide additional staff resources to schools in need of improvement;
9. Create choice options to include public school choice and supplemental education for students attending schools that do not meet adequate yearly progress (AYP); and
10. Provide schools in need of improvement with support and assistance sufficient to make sustainable improvement in teaching and learning.

With these new mandates many, schools that housed predominantly minority students in low SES school districts were deemed as failing, or not meeting their *Annual Yearly Progress* (AYP) requirements. Schools in low-income districts had more significant gaps in student achievement and low scores on state standardized tests when compared to the national average. These low-achieving scores mirrored the results found in *The Coleman Report* (1966) where socioeconomic status emerged as the most significant factor in school success. Consequently, schools residing in low socio-economic environments often struggle with teacher staffing issues and are forced to hire low-quality and less effective teachers.

What is more ironic is that according to a study by the Education Trust, "math teacher quality is unevenly distributed in schools, and the students with the greatest needs tend to have access to the least qualified and least effective teachers" (The Commission on No Child Left Behind, 2007:3). Despite these new federal laws in 2004-2005, 10 percent of the teachers in high poverty schools did not meet the federal HQT standards (National Partnership for Teaching in At-Risk Schools, 2005). Specifically, teacher quality in math is unevenly distributed in the U.S. with the most qualified (those meeting HQT standards) flocking to suburban school districts, leaving urban and low-income districts, with unqualified math teachers. For example, in the 2003-04 school year, roughly a quar-

ter of all suburban schools had trouble staffing qualified math teachers, compared to one-third of all urban school districts (National Center for Education Statistics, 2006). Furthermore, Peske and Haycock (2006), who examined three states, reported that "children in high-poverty schools are much more likely than their more advantaged peers to be assigned to novice teachers, to teachers who lack subject matter knowledge and to teachers with lower academic skills" (p. 4).

The Center for Public Education (2009) provides the following recommendations to increase teacher quality and effectiveness, thus reducing the effects on achievement gaps between race and poverty levels:

- Inside schools, train teachers to diagnose students' weaknesses and focus on strengthening those areas (Wenglinsky, 2004)
- Use curricula shown to reduce gaps (Clewell, 2004; Schoenfeld and the Toolkit Team, 2005)
- Ensure all students have access to computers (National Science Board, 2006)
- Emphasize technology, including calculators, computers and other high-tech tools (High Tech High Digital Commons, 2006)

The Center's research suggests that raise overall science and math outcomes, the nation has to do the following (Center for Public Education, 2009):

- Provide all students with teachers who are qualified and knowledgeable in their subject areas, because they make the biggest difference in student achievement (National Commission on Mathematics and Science Teaching for the 21st Century, 2000; Education Trust, 2002)
- Provide teachers with professional development on content and how to help students learn it (Wenglinsky, 2002; Clewell, 2004; National Science Board, 2006)
- Use curricula shown to increase student achievement (Senk and Thompson, 2003; U.S. Department of Education, 2004; Schoenfeld and the Toolkit Team, 2005)

The No Child Left Behind Act, placed renewed accountability on teacher quality and state standards, with the hopes of reducing the achievement gaps between racial mi-

norities in lower-SES and urban school districts and their suburban counterparts. All schools were required to meet new standards and develop assessments to ensure that adequate yearly gains were met in reading, math and science for all races (U.S. Department of Education, 2001). Despite these national policies, most of the schools in low-income school districts were failing.

Charter Schools: Creating a Solution

The gap in minority student achievement has been a long standing U.S. issue. Gaps on mathematics, reading, writing and science have only minimally closed between African-Americans, Hispanics and their white peers. The scores closed substantially in the 1970s and mid-1980s, but gaps have risen in all subject areas from the 1990s to the present (Ferguson, 1991). As urban and inner city school districts continue to decline in all areas, specifically in educational resources, student aid begins to significantly deteriorate leaving them with unequal access and opportunities.

To create equal opportunities for students residing in failing inner city and urban school districts, a new type of schools has surfaced, known as the "charter schools". These schools emerged in the 1990s when businesspeople, educators, and parents were given the right to form and operate schools. "Chartering is the voluntary creation of public schools of choice that are accountable for results through a performance agreement - or charter - with a public agency, while being exempt from many regulations placed on traditional public schools" (Finn, et al. 2000:134). Exempt from laws that were placed on traditional school systems, charter schools were designed to promote innovation and increase school choice for all families regardless of income. The hope was that charter

schools would narrow the achievement gap by recruiting and maintaining highly quali-

fied and effective teachers in school districts that would not otherwise have them.

The Center for Education Reform reported that in 1991 Minnesota had two charter

schools and by 2006 that number increased to more than 3,600 throughout the nation

(Center for Education Reform, 2009).   The report also indicated that nearly 1 million

low-income and minority students were enrolled per year (Center for Education Reform,

2006).

Texas Charter Schools.

In 1995, the Texas State Legislature provided the opportunity for students and par-

ents to have freedom of school choice by making charter schools available throughout the

state (Texas State Law, 1995, SB 1). This policy was created for district officials to pro-

mote increased opportunities for school choice, by creating new schools that endorsed in-

novative learning environments and approaches, enhanced professional prospects, recruit-

ment of skilled teachers and an accountability system that would work.

Through this new legislation (Texas State Law, 1995, SB 1; Texas State Law,

2001, HB 6; Senate Reseach Center, 2001), Texas instituted four charter school

platforms:

1. Home-rule school district charter;
2. Campus or campus program charter;
3. Open-enrollment charter; and
4. College or university charter (SRI International, 2008).

Furthermore, according to Section 12.001 of the Texas Education Code, charter

schools' main focus was to perform the following:

1. Improve student learning;
2. Increase the choice of learning opportunities within the public school system;

3. Create professional opportunities that will attract new teachers to the public school system;
4. Establish a new form of accountability for public schools; and
5. Encourage different and innovative learning methods
(Texas Public Policy Foundation, 2007).

In 1996, the "first generation" of Texas charters included 17 schools with a total enrollment of 2,412; in 2005-2006 there were 239 schools with 89,171 students enrolled; in 2007-2008 roughly 113,760 students were enrolled (Texas Public Policy Foundation, 2008). National charter school demographics consist of 60 percent minority students, with 52 percent of students coming from low-income neighborhoods. In Texas, over 80 percent of students in charter schools are minorities, and 60 percent live in low-income school districts.

In 2009, a longitudinal student-level analysis of charter schools was conducted by Stanford University and the Center for Research on Education Outcomes (2009). This report, *Multiple Choice: Charter School Performance in 16 States* revealed that only 17 percent of charter schools gave excellent educational opportunities to minority and low-income students; 50 percent showed no difference and 37 percent had learning results that were worse than the traditional public schools. Nationally, 46 percent of charter schools math gains were "statistically indistinguishable from the average growth" compared to their peers; only 17 percent of charters had math growth that exceeded their peers; while 37 percent of students at charter schools had math gains below their peers (Center for Research on Education Outcomes, 2009).

Based on the CREDO report, Texas charter schools had "lower than average student growth in achievement than their peers in traditional schools" (2009:24). When

compared to the national charter school average, Texas had -.05 standard deviations on math and reading, and it was significant at the p level of 0.01. On reading, charter school growth in Texas was equal to the national average on the 2007 NAEP results and slightly above the national average for math. Specifically, Texas minority (African-American and Hispanic) students who attended charter schools had lower scores than their minority peers in public schools. However, Texas charter schools had a positive and significant impact on students living in poverty when compared nationally. Furthermore, the number of years a student is enrolled in a charter school greatly impacts his or her achievement levels. Charter school math learning gains showed a -.09 standard deviation behind their peers the first year of enrollment, compared to a .03 math gain after the third year of enrollment.

Thurgood Marshall College Fund: Supporting Charters in Texas.

As the demand for charters grows across Texas, financial need becomes more apparent with only two percent of the market share in Texas 2007-2008 academic year going towards charters (Texas Public Policy Foundation, 2008). Because charter schools cannot draw funding from local taxes, most of the support is from state and federal agencies and from private and corporate sponsorship. In 2007-08. Texas charter school students received 22 percent or $1,800 less per-pupil public funding than local public school districts.

Through the financial support of the Bill and Melinda Gates Foundation, the Thurgood Marshall College Fund established two charter high schools in the Houston area in conjunction with Prairie View A&M and Texas Southern University. Funding for each

school was provided for five years at $5 million per year. This gave each charter the ability to receive per-pupil funding that was comparable to surrounding school districts, which gave equal resources to the students. To ensure accountability measures, the Gates Foundation required performance benchmarks and a results-based accountability system every year.   Best practices and sound chartering systems were designed and implemented by TMCF and the universities to put into place at each of the schools. The schools encouraged and developed a well-defined parental and neighborhood community engagement at each of the high schools. These measures put into place by TMCF and the schools have successfully supported an increase in student achievement.

Conclusions for Further Research

In 1966, *The Coleman Report* (1966) gave new insight and direction into the reasons behind the educational gaps: mainly socio-economic-status and class differences. Since *The Coleman Report*, researchers have found other variables that explained the the achievement gaps between minorities and whites such as socio-economic-status, racial segregation in school districts, parent education levels, household structures, teacher quality and teacher self-efficacy.

Gaps appear in the literature on teachers' self-efficacy on minority, low-income and student achievement; particularly in charter schools, at the high school level within the context of mathematics. Further research is required to understand math teachers' personal self-efficacy and outcome expectancy and the impact it has on student achievement on state standardized exams. My research project explores additional reasons for the educational achievement gaps, specifically the roles that teachers play. The literature

suggests that teachers' self-efficacy is strongly associated with student achievement. The

goal of this research project is to determine if a teacher's self-efficacy can impact student

achievement on standardized exams, regardlesss of the students' race, gender and socio-

economic status.

CHAPTER 3: METHODOLOGY AND RESEARCH DESIGN

Introduction

The data for this investigation was gathered from two charter high schools (grades 9-12) in an urban community in Houston, Texas. This chapter outlines the research design and methodology used to determine if a relationship exists between teacher efficacy and minority student achievement in two charter high schools in Houston, TX. A quantitative approach is used to assess the relationship of the level of teachers' sense of self-efficacy through a self-assessment measurement tool (MTEBI) on student standardized test scores (TAKS). This study was a one-year investigation which assesses math teachers' sense of self-efficacy using the MTEBI standard evaluation survey. Participation in this survey was voluntary; and all of the teachers in the 2009-2010 Jones and Royal Charter High School mathematics department participated in the survey. George Mason University, Human Subjects Review Board (HSRB) approved this project before the survey was administered to the teachers and data was received on students.

Zarca, an online survey tool was used to survey teachers' perceived sense of self-efficacy using the MTEBI measurement tool. Both Jones and Royal High School submitted a detailed database (outline below) to the researcher, based on student level data gathered from the *Texas Assessment for Knowledge and Skills* (TAKS) math data-set for the 2008-2009 academic year. A regression analysis was used to evaluate teacher efficacy

based on the Math Efficacy Beliefs Instrument (Enochs, et al. 2000), and the impacts on minority student achievement on the math section of TAKS.

Research Questions

Based on the review of literature, researchers have reported a strong relationship between math teachers' self-efficacy and the impact it has on student math achievement outcomes in elementary school. This study is designed to extend our understanding of the relationships that may exist between high school math teachers' self-efficacy and charter high school student performance on the math section of the Texas state standards exam (TAKS).

The following research questions guide this investigation:

1. What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and the overall achievement of minority high school students as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
2. What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and achievement of African-American high school students as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
3. What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and achievement of Hispanic high school students as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
4. What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and achievement of white high school students as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
5. What is the relationship between high school mathematics teachers' level of outcome expectancy based on the MTEBI and the overall achievement of minority high school students as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
6. What is the relationship between high school mathematics teachers' level of outcome expectancy based on the MTEBI and achievement of African-American high school students as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?

7. What is the relationship between high school mathematics teachers' level of outcome expectancy based on the MTEBI and achievement of Hispanic high school students as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
8. What is the relationship between high school mathematics teachers' level of outcome expectancy based on the MTEBI and achievement of white high school students as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
9. What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and achievement of high school students on free or reduced lunch as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
10. What is the relationship between high school mathematics teachers' level of outcome expectancy based on the MTEBI and achievement of high school students on free or reduced lunch as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
11. What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and achievement of high school students that are considered "at risk", as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
12. What is the relationship between high school mathematics teachers' level of outcome expectancy based on the MTEBI and achievement of high school students that are considered "at risk" as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?

Sample Population: Why Texas?

Minorities in Texas are falling behind their peers in reading and math ability and graduation rates faster than any other state. In Texas, only 16 percent of African-Americans in eighth grade score as proficient or higher on the math section of the *National Assessment of Educational Progress* (NAEP) exam compared to Hispanics at 23 percent and whites at 53 percent. Over one-third of African-Americans and 30 percent of Hispanics scored below basic on the NAEP math section, compared to only 10 percent of whites. Test scores show similar results on the *Texas Assessment of Knowledge and Skills* (TAKS) math section where 42 percent of African-Americans and 36 percent of Hispanics did not meet the standard, compared to 17 percent of whites. Two-thirds of African-

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Americans and Hispanics will be graduate on time from high school compared to 81 percent of whites (Education Trust, 2009a).

Ethnic minorities represented the majority (62 percent) of students enrolled in Texas public K-12 schools in 2005-2006. Hispanics represented 44 percent, African-Americans represented 15 percent and whites represented 37 percent. Over the next twenty years, the Census projects a 29 percent increase of the Hispanic population and a 15 percent increase of African-Americans in Texas. As the population of Texas continues to shift, the educational gaps in Texas need to be addressed and analyzed and programs need to be established to support the needs of minority students (Education Trust, 2009a).

School Sample Population.

The Bill and Melinda Gates Foundation sponsors school reform initiatives and charter schools throughout the nation. From these initiatives, Thurgood Marshall College Fund (TMCF) received sponsorship from the Gates Foundation for six school reform projects. Each of the schools received $5 million per year over the course of five years. To receive the grant, the schools had to meet the following criteria for the Gates Foundation school reform initiatives:

> • a significant population (51 percent or higher) of children receiving free or reduced lunch;
> • a population with a majority (51 percent of higher) of minority students; and
> • open enrollment for all neighborhood children (meaning that there are no entrance exams, magnet school, etc.).

Two of these six schools were selected for the research sample population. The schools that were being studied are Jones High School in Houston and Royal High School in Pattison. Both schools are located in ethnically diverse neighborhoods consist-

ing of over 65 percent minorities. Both the schools serve disadvantaged communities with high poverty rates (over 60 percent of population living in poverty).

The population for this study consisted of 9th through 12th grade math teachers and math students at Jones High School and Royal High School. Each of these schools is in an urban school district, one in Houston and the other in Pattison. Classrooms at both schools consist of over two-thirds of the population being minority (Hispanic and African-American), and nearly half who are on free or reduced lunch. There are a total of 842 students at Jones High School and 469 students at Royal High. This sample population aided the researcher to intentionally examine minority students living in low-income school districts in relation to how teachers' reported their self-efficacy.

Both schools reported student level data on the math section of the TAKS for the academic school year 2008-09. Sixteen math teachers (eight from each school) were asked to participate in the online *Mathematics Teacher Efficacy Belief Instrument Survey*. Participation from the teachers was voluntary and the sample of both the teachers and students was considered a non-probability convenience sample.

Jones High School.

In 2008, Jones High School reported that its student population was 69 percent African-American and 30 percent Hispanic. Out of the 842 students, 75 percent were on free or reduced lunches, 80 percent were considered at-risk, and 8 percent had Limited English Proficiency (LEP).   Teacher profiles for this school indicated that 79 percent were African-American and 5 percent were Hispanic. Roughly 60 percent of all teachers

had over 11 years of teacher experience, and 36 percent hold a masters degree, dropping from 52 percent in 2003-2004.

Despite the qualifications of teachers and their years of experience, the 2003-2004 academic school year this school has not met the criteria for adequate yearly progress (AYP). Since 2003-2004, less than a third of all students taking the TAKS passed the grade 9 mathematics section. In 2007-2008, only 38 percent of grade 11 62 percent failed to pass in 2007-2008 academic year for grade 11. The Improving America's Schools Act (IASA) defines a schools Adequate Yearly Progress (AYP) as: "In a manner that 1) results in continuous and substantial yearly improvement of each school and local education agency sufficient to achieve the goal of all children … meeting the state's proficient and advanced levels of achievement; [and] 2) is sufficiently rigorous to achieve the goal within an appropriate timeframe" (Elmore and Rothman, 1999:85).

Royal High School.

Royal High School reported its student population was 49 percent Hispanic and 33 percent African-American. Over half (66 percent) of all students were on free or reduced lunches, half were considered at-risk, and 7 percent had Limited English Proficiency (LEP). There are 43 teachers, and the student to teacher ratio is fairly low at 11.2. The majority of the teachers at Royal High School are African-American or Hispanic with at least 2 years of experience in their subject area; 9 percent were labeled as beginning teachers.

Much like Jones High School, minorities continue to fall behind in math and reading. The data shows that African-Americans scores are on the Reading/ELA and Mathe-

matics fall 10 percent points between 2007 and 2006; however, scores in Science and So-

cial Studies increased by nearly 20 percent. In the 2007-2008 academic year, only 42

percent of African-Americans passed the math section of the TAKS compared to 54 per-

cent of Hispanics and 70 percent of whites. The dropout rates for African-Americans in

2005-2006 were extremely low for all grades at 2.3 percent. Higher than the national av-

erage, 78 percent of African-Americans graduated within four-years, while 22 percent

dropped out.

Instrumentation and Data Collecting Techniques

    Access to Data Files.

Before the student level data was collected and the teacher survey was released,

George Mason University's Human Subjects Review Board (HSRB) approved the re-

search. In accordance with the HSRB, permission was received from the principals,

teachers signed a consent form, and all parents at each school received a letter describing

the research study and the participation of the students. The parent form follows the pro-

tocols set out by Family Education Rights and Privacy Act (FERPA) regulations to ensure

educational records have limited access to the general public and student records are held

private. Consent forms sent to the teachers described the purpose of the research, re-

search procedures, risks involved, benefits for involvement, confidentiality and contact

information for the HSRB and the researcher. Both parents and teachers were informed

that their participation was voluntary, and at any time their information could be removed

from the study.

Teacher Survey.

In October 2009, sixteen math teachers (eight from each school) received an e-mail with a link to the online *Mathematics Teacher Efficacy Belief Instrument* (MTEBI) survey. Zarca, an online survey tool, was the instrument for the likert scale survey and the open-ended questions for data collection (Appendix D). The survey was accessible online for a period of six weeks, and e-mail reminders were sent out weekly to teachers that had not completed the survey. The survey requested that the teachers reflect on their 2008-2009 academic year when answering all questions.

The survey asked the teachers to review their perceptions and evaluation of their own teaching experience by identifying their level of agreement based on the survey questions. The survey uses the questions from the *Math Efficacy Beliefs Instrument* (MTEBI) questionnaire with a five-point scale Likert item assessment (Enochs, et al. 2000). which evaluates teachers' self-perceptions on their efficacy for teaching students. Specifically, "their perceptions about their own capabilities to foster students' learning and engagement – which has proven to be an important teacher characteristic often correlated with positive student and teacher outcomes" (Shaughnessy, 2004:154). This scale assesses teachers' models for teaching, their mastery experience, their verbal persuasion and how they teach self-regulation strategies.

The survey has 21 questions – 13 of the questions deal with *Personal Mathematics Teaching Efficacy* (PMTE) and eight questions deal with *Mathematics Teaching Outcome Expectancy* (MTOE). The PMTE has eight negatively worded questions and five positively oriented questions; scores can range from a low of 13 to a high of 65. The

MTOE has eight positively worded; self-efficacy scores can range from a low of 8 to a high of 40. The analysis used in this study follows a three step process which is outlined below; no modifications were made (Enochs, et al. 2000).

Step 1. Item Scoring: Teachers select from the following scale for each of the 21 questions on the survey: Strongly Agree = 5; Agree = 4; Uncertain = 3; Disagree = 2; and Strongly Disagree = 1.

Step 2. Reversed scoring is used to produce consistent values between positively and negatively worded items. Reversing items 3, 6, 8, 15, 17, 18, 19 and 21 produce high scores for those high (and low scores for those low) in efficacy and outcome expectancy beliefs.

Step 3: To properly measure *Personal Mathematics Teaching Efficacy Beliefs*, two scaled items are placed arbitrarily throughout the survey and included in items 2, 3, 5, 6, 8, 11, 15, 16, 17, 18, 19, 20 and 21.

The open-ended qualitative section on the teacher survey provides teachers with an opportunity to reveal their opinions not expressed on the quantitative section of the survey. It was hoped the written voice of the teacher will reflect and support the answers on the quantitative section of the survey. Qualitative data will be used only as anecdotal, and is not analyzed. To review the entire survey, see Appendix: D Teacher Survey.

Student Aggregated Data.

The *Texas Assessment for Knowledge and Skills* (TAKS) is intended to measure students' knowledge and skills developed throughout the school year in grades 9, 10, and 11. Students are measured during these grades in English Language Arts, Mathematics,

Social Studies and Science. Overall Student data from the math section of the *Texas Assessment for Knowledge and Skills* (TAKS) was sent in aggregated form via a database, from the administration at each of the two high schools. Additionally, student aggregated math scores were reported by their math teacher in 2008-2009 academic year. This was key to this research topic, as it enabled the research to link student achievement on the TAKS with their teachers' level of self-efficacy during the 2008-2009 academic year.

The mathematics section of the TAKS aggregated student dataset received had the following student data variables:

(i) Student Demographic Data
1. Grade Level
2. Gender
3. Race/Ethnicity
4. Economically Disadvantaged
5. Title I Part A
6. Migrant
7. LEP
8. Bilingual
9. ESL
10. Special Education Gifted/Talented
11. At-Risk and Career/Technical Education

(ii) Mathematics Item Assessment

Each aggregated reported received a raw score on each of the ten items listed below. However, for the function of this research project, only the total scores of the ten items was assessed.

1. Functional relationships;
2. Properties and attributes of functions;
3. Linear functions;
4. Linear equations and inequalities;

5. Quadratic and other nonlinear functions;

6. Geometric relationships and spatial reasoning;

7. Two-and-three dimensional representations;

8. Measurement and similarity;

9. Percents/proportions/probability; and

10. Statistics and mathematical process and tools

Assumptions

Outlined below are the researchers' assumptions in regards to the data collection

of TAKS and MTEBI the researcher had before conducting the research.

- *Texas Assessment of Knowledge and Skills* (TAKS) is a dependable and valid measurement on minority student achievement on the math section of the state standardized exam.
- Teachers responding to the MTEBI will answer truthfully about their own personal belief systems.
- The *Mathematics Teaching Efficacy Belief Instrument* (MTEBI) is a reliable measure of math teachers' sense of self-efficacy by evaluating student engagement, commitment, approaches to teaching, and overall perspectives of student conceptions of mathematics.

Data Analysis

Having described the independent variable as teacher self-efficacy and the dependent variable student achievement, this section describes how the specific data will be measured in the study. Descriptive statistics will be used to measure central tendency and standard deviation will be used to measure the variability among the mean. The mean, median and mode will offer a descriptive depiction of the data in the research study. To understand the relationships that exist between student achievement and teacher efficacy, correlational statistical models are used as well as more advanced statistical methods, including multi-regression statistical modeling. Pearsons correlation coefficient is used to determine the relationship between student achievement and teacher efficacy. Student

variables such as: race/ethnicity, gender, economically disadvantaged, LEP (Limited English Proficiency), and at-risk will be used for control variables.

The effectiveness of teachers was measured their students ability to perform on the state standardized exam (TAKS). Aggregated student scores will be separated for ninth, tenth and exit exam math TAKS scores. The scores will be assessed across the entire distribution at each grade level and then categorized into peer groups based on key demographics such as gender, race, economically disadvantaged, migrant, LEP, bilingual, ESL, special education and at-risk students.

Teachers' self-efficacy scores was determined based on the MTEBI scoring system (previously described), and teachers' will be categorized into high, medium and low self-efficacy. Aggregated student scores based on separated demographics will be linked back to the teachers that the students had during academic year 2008-2009. Thus, measurements and analysis will only be made for those students that passed through the teachers classrooms.

Student achievement was measured on an ordinal scale using basic statistical analysis - such as mean, median and mode. The analysis for students math achievement scores on the TAKS will be made for 2008-2009 academic year and broken down by gender, race/ethnicity, students on free or reduced lunch and students that are considered "at risk". The main modeling technique will be a regression analysis to see the relationship between how the value of the dependent variable (student test scores) changes with the independent variables (teacher quality and teacher efficacy). Furthermore, this type of analysis will be used for possible prediction techniques to assess which independent vari-

ables are related to the dependent variable and to understand the depth of the relation-
ships that may exist.

It is important to note that, a key concern is that only 14 teachers responded to the
survey, thus there might not be enough data to run a reliable statistical model. Unless the
scores are dramatic, more than likely the statistical applications will not reach signifi-
cance. Another key issue in the measurement is the effect of student mobility (transfer-
in, transfer-out and dropouts) in the overall computation of the raw scores and within av-
erages. *The No Child Left Behind Act* (2001) created a decision rule for student mobili-
ty, whereas a students data will be attributed to the school if they spend at least 85 percent
of their academic year there. For research purposes, student data will remain in the data-
base as long as the student has spent at least 85 percent of the academic year in the
school. Therefore, this methodological design tracks student mobility and data will be
extracted and excluded from the analysis in order to complete the standardized regression
analysis using the coefficients. Similarly, teacher's attrition rates within the first year of
85 percent or less time spent at the school, will also be excluded from the data analysis.

Reliability

Reliability of measurement is defined by (Gall, et al. 2007) as the degree of regu-
larity that the same results will be obtained during studies with similar conditions. Both
MTEBI and TAKS have gone through substantial reliability testing to ensure that the in-
struments are useful in predicting outcomes. TAKS predicts student achievement out-
comes (mean, range, median, mode, etc.) on various subject matters (math, English, writ-
ing, science and history).   Researchers can use TAKS scores to find averages for sub-

groups (such as: race/ethnicity, gender, income, etc.). MTEBI predicts the level of teacher efficacy based on a series of questions administered to the teachers. Both instruments were developed by highly skilled and qualified educational content developers, committees, teachers and Texas Education Agency staff members (TAKS only), who attempted to adhere to the measurement standards of survey research.

The *Texas Assessment on Knowledge and Skills* is peer reviewed for measurement standards and technical quality, ensuring that similar results will be obtained for students. TAKS uses reliability as one of its critical technical characteristics because it can make strong and valid conclusions based on their data sets. TAKS used the Kuder Richardson Formula 20 (KR20) to test the "dichotomously scored items and the stratified coefficient alpha" (Texas Education Agency, 2008). In 2008, TAKS math reliability measurements ranged from 0.87 to 0.90. Based on these statistical scores, TAKS is an extremely reliable measurement tool.

The MTEBI tool was developed by Enochs, et al. (2000) to predict "teachers who believe student learning can be influenced by effective teaching (outcomes expectancy beliefs) and who also have confidence in their own teaching abilities (self efficacy beliefs) should persist longer, provide a greater academic focus in the classroom and exhibit different types of feedback than teachers who have lower expectations concerning their ability to influence student learning" (Gibson and Dembo, 1984:570). To test the predictability of teacher efficacy based on the MTEBI instrument, (Enochs, et al. 2000) recruited pre-service math elementary teachers in Wisconsin, California, South Carolina and Michigan with a sample size of 324 teachers (58 male and 266 females). The relia-

bility of MTEBI was measured by Enochs, et al. and produced alpha coefficients of 0.75 for the *Mathematics Teaching Outcome Expectancy* (MTOE) scale and 0.88 for the *Personal Mathematics Teaching Efficacy* (PMTE) (Enochs, et al. 2000). By using factor analysis, the two scales – MTOE and PMTS – were considered independent of each other, reinforcing the reliability and validity of the MTEBI measurement tool.

Validity

Tuckman (1999:32) stated that "validity of an instrument or study is the extent to which it measure what it is purports to measure". Validity establishes how strong and valid the conclusions are that the researcher postulates. Cook and Campbell state that validity is the, "best available approximation ot the truth or falsity of a given inference, proposition or conclusion" (Cook and Campbell, 1979:82). Basically the researchers is attempting to know if there analysis and conclusions are valid and correct.

In order to create a subject-specific math based efficacy scale, Enchos, et al. (2000) modified the original Science Teaching Efficacy Beliefs Instrument (STEBI-A) (Riggs and Enochs, 1990). Enochs, et al. (2000) measured the validity of MTEBI by using the formal version of the Huinker and Madison (Huinker and Madison, 1997) instrument. A factorial validity measurement was used for both the STEBI-A and the MTEBI. Enochs, et al. took the statistical testing one step further, and relied on confirmatory factor analysis (CFA) (Enochs, et al. 2000). CFA "relies on a specific hypothetical or expected factor structure and serves to confirm its presence (or lack thereof) in the data set at hand…it provides a more flexible, theoretically guided technique to assist in the validation of measurement instruments than does exploratory factor analysis" (2000:199). In

order to provide validity of the survey tool, modeling fit procedures were used: chi-square statistics, Information Criteria (AIC) and Comparative Fit Index (CFI) which provided modifications to the model and the data. Enochs, et al. (2000) found consistency between self-efficacy and outcome expectancy as two independent factors. Statistics illustrated that the instrumentation used (MTEBI) can effectively and validly predict math teacher efficacy.

Texas Assessment for Knowledge and Skills (TAKS) illustrates an in-depth overview of the validity measurements used in their analysis of student achievement. *Texas Assessment for Knowledge and Skills* (TAKS) suggests that validity, "is interested in making proper interpretations of a test score, so test makers are responsible for accumulating evidence that support the intended interpretations and uses of the scores" (Texas Education Agency, 2008:27). After conducting extensive studies on other similar student achievement tests (ACT and SAT) TAKS found evidence basis for test content on standards-referenced assessments which are tied to Texas curriculum. In their validity testing that the results are in fact used, "to make inferences about students' knowledge and understanding of the Texas Essential Knowledge and Skills and end-of-course (EOC) assessments", however, "the search for validity evidence is a never-ending process, and future technical reports will include additional information in this regard" (Texas Education Agency, 2008).

In addition to understanding the TAKS and MTEBI validity measurements, it is also important to assess the internal and external reliability of this study. (Gerlach and Bieger, 1996) reviewed the importance of internal validity to ensure the research was ac-

curately collectedly and correctly interpreted to reflect the outcomes of the people being

studied. The research attempted to minimize the threats to internal validity by using

(Gerlach and Bieger, 1996) suggestions:

> • gather as much information on the subjects and the environment to obtain a clear understanding of the participants being studied;
> • choose an appropriate research method based on the participants and the re search question; and
> • ensure that the environmental conditions are standardized.

External validity is essential to studying any population as it pertains to giving

conclusions and generalizations to the groups that you are studying, and how it applies to

similar groups . The population studied was a selection of non-probability convenience

sampling methods of only 16 math teachers. Teachers selected for this study included

those from two charter schools, making the sampling population convenient but small

and not a fair representative sample of the general or national math teacher community.

Over 1,300 students were selected from an over-sampled population of African-American

and Hispanic and low-income students. Major threats to external validity occurred dur-

ing this study to include small sample sized groups and sub-groups as well the subjects

were non-randomized and they were only volunteer participants.   The study's results and

conclusions could be difficult to replicate and the generalizability of the research is not

valid.

Summary

The research methodology illustrated in this chapter reviewed the study's design

to address the relationships that exist between teacher efficacy and quality on minority

student achievement.   This section re-stated the problem, identified the research ques-

tions, explained the research subjects, reviewed the methodology, design procedures, data

gathering techniques, instruments and the reliability/validity of the TAKS and the MTE-

BI. The following chapter discuss the data analysis by tables and figures to conceptualize

the meaningful results.

CHAPTER 4: RESULTS

Introduction

The purpose of this quantitative research study was to examine the relationship

between teacher self-efficacy and teacher outcome expectancy regarding mathematics

achievement on the *Texas Assessment of Knowledge and Skills* (TAKS) for 9th, 10th and

11th grade students in two charter schools. The purpose of this chapter is to review the

data analysis results to address the following research questions:

1. What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and the overall achievement of minority high school students as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
2. What is the relationship between high school mathematics teachers' level of outcome expectancy based on the MTEBI and the overall achievement of minority high school students as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
3. What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and achievement of high school students on free or reduced lunch as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
4. What is the relationship between high school mathematics teachers' level of outcome expectancy based on the MTEBI and achievement of high school students on free or reduced lunch as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
5. What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and achievement of high school students that are considered "at risk" as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?
6. What is the relationship between high school mathematics teachers' level of outcome expectancy based on the MTEBI and achievement of high school students that are considered "at risk" as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?

The organization of this chapter follows the order the data was analyzed: descriptive statistics were used to calculate the means for the population sample - teacher and student demographics; outcome expectancy subscores by race, gender, age and teaching experience; personal self-efficacy subscores by race race, gender, age and teaching experience; and TAKS scores for each school by race/ethnicity, gender, free or reduced lunch, and at-risk students. Bi-variant regression analysis was used to evaluate the relationship between outcome expectancy and personal self-efficacy scores against student TAKS scores. For the regression analysis, statistical significance was based on an alpha level of .05. The Statistical Program for the Social Sciences (SPSS) version 17.0 was used to calculate the statistical results.

Population Sample: Student Demographics

The *Texas Assessment for Knowledge and Skills* (TAKS) is intended to properly measure students' knowledge and skills developed throughout the school year in grades 9, 10 and 11. Students are measured during these grades in English Language Arts, Mathematics, Social Studies and Science. Student achievement data was measured by each school mean scaled score on the grade 9, 10 and 11 mathematics section of the 2008-2009 TAKS exam. Each school provided overall aggregated student data by grade level, and student data grouped by each mathematics teacher.

TAKS reports two scores to the students - the raw score and the scale score. The raw scale is the total number of correctly answered questions and is only used to give the the actual question(s) that the student answered correctly vs. not correctly. The scaled score is a conversion of the raw score into scale which "is common to all test forms for

that assessment" (TAKS, 2009). Furthermore, the "scale scores can be interpreted across different sets of test questions. Scale scores allow direct comparisons of student performance between specific sets of test questions from different test administrations. The scale score takes into account the difficulty level of the specific set of questions on which it is based. It quantifies a student's performance relative to the passing standards or proficiency levels" (TAKS, 2009). For the purpose of the study, the scale measurement was used to interpret the data.

Each school reported both the raw score and corresponding scale score. Scores ranged for grade 9 from a minimum scale score of 1,063 (0 correctly answered questions) to a maximum of 2,955 (52 correctly answered questions), grade 10 from a minimum scale score of 1,269 (0 correctly answered questions) to a maximum of 2,781 (56 correctly answered questions) and grade 11 from a minimum of 1,297 (0 correctly answered questions) to a maximum of 2,816 (60 correctly answered questions). Texas state standard levels for grades 9 to 11 on the TAKS math section in 2008-2009 academic year was 2,100 or above and commended performance level was 2,400 and above.

Ninth Grade Students.

The ninth grade participants at Jones High School consisted of 161 students with an average scale score of 2,100. Forty-five percent met the state standard for mathematics, while only 14 percent achieved commended performance levels of 2,400 and above. The participants were 44 percent (n=71) females and 56 percent (n=89) males. Note: One person did not report their gender). Overall females outperformed males by 20 points, and half of the females met the standard requirements for math. The

majority of the 9th grade population was Hispanic (62 percent), followed by African-

Americans (23.5 percent) and Whites (13.6 percent). Whites out performed Hispanics by

nearly 100 points, while Hispanics outperformed African-Americans by nearly 100

points. Sixty-seven percent of students were classified "at-risk"; those at-risk scored

almost 300 points less than those not at-risk.

Table 1: Summary Report for Jones High School Grade 9 Student Math Performance, 2008-2009

	Number of Students Tested	Percent of Students	Average Scale Score	Percent Met Standard ***	Percent Commended Performance *****
All Students	161		2,100	45%	14%
Gender					
Male	89	55.63%	2,089	42%	12%
Female	71	44.38%	2,109	49%	14%
Total	160*	100.00%			
Race/Ethnicity					
Native American	0	0.00%	--	--	--
Asian	0	0.00%	--	--	--
African American	38	23.60%	2,016	34%	5%
Hispanic	101	62.73%	2,106	44%	13%
White	22	13.66%	2,219	73%	32%
Total	161	100.00%			
Economically Disadvantaged					
Free Meals	99	61.49%	2,071	39%	10%
Reduced Meals	13	8.07%	2,096	38%	15%
Other	0	0.00%	--	--	--
No	49	30.43%	2,161	59%	20%
Total	161	100.00%			
At-Risk					
Yes	109	67.70%	2,009	28%	1%
No	52	32.30%	2,292	81%	40%
Total	161	100.00%			

* Data does not add up to total of 161 because one student did not report their gender.
*** Met Standard level (Panel Recommendation): 2100 or above
***** Commended Performance Level: 2400 and above

There were slightly more students in 9th grade at Royal High School with 194.

The average scale score of Royal High School was 89 points less (2,011) than Jones High School (2,100). Only 26 percent at Royal met the state standards with 2 percent achieving commended performance levels. At Royal High School, the African-American population represented the majority at 71.5 percent followed by Hispanics at 27.9 percent. Only a quarter of African-Americans met the state standards, and they scored 21 points less than their Hispanic peers within their school (2,006 verses 2,027 respectively). There were 14 percent more students at Royal High School that were considered at-risk than at Jones High School. The average score gap between those at risk and not at risk was 69 points at Royal High School, far smaller than at Jones High School. These scores might suggest to significant differences between the two schools; however, without the student case level data, no statistical tests can be run on the two reported aggregated mean scores.

Table 2: Summary Report for Royal High School Grade 9 Student Math Performance, 2008-2009

	Number of Students Tested	Percent of Students	Average Scale Score	Percent Met Standard ***	Percent Commended Performance *****
All Students	194		2,011	26%	2%
Gender					
Male	93	47.94%	2,008	26%	3%
Female	101	52.06%	2,013	27%	0%
Total	194	100.00%			
Race/Ethnicity					
Native American	0	0.00%	--	--	--
Asian	0	0.00%	--	--	--
African American	138	71.50%	2,006	25%	1%
Hispanic	54	27.98%	2,027	30%	4%
White	1	0.52%	--	--	--
Total	193	100.00%			
Economically Disadvantaged					
Free Meals	74	38.34%	2,016	31%	3%
Reduced Meals	12	6.22%	2,010	25%	0%
Other	55	28.50%	2,032	31	2
No	52	26.94%	1,987	15%	0%
Total	193	100.00%			
At-Risk					
Yes	157	81.77%	1,997	22%	1%
No	35	18.23%	2,066	46%	3%
Total	192	100.00%			

*** Met Standard level (Panel Recommendation): 2100 or above

***** Commended Performance Level: 2400 and above

Tenth Grade Students.

Tenth graders at Jones High School consisted of 119 students with an average scale score of 2,133, which was slightly higher than 9th graders at Jones. Over half of the students (58 percent) met standards; however, fewer students in 10th grade achieved commended performance compared to 9th graders (7 percent versus 14 percent respectively). Unlike freshman, males slightly outperformed females by 13 points. Hispanics represented the majority of students at 52 percent followed by African-Americans (28.8 percent) and Whites (18.4 percent). Hispanics outperformed their peers and earned 12 points higher than Whites on average. This sharply contrasts with 9th grade performance where Whites earned 100 points higher than Hispanics, which can possibly allude to the fact that the achievement gaps may have closed in 10th grade. Despite the fact that Hispanics outperformed Whites, 68 percent of Whites met standards, compared to 60 percent Hispanics and half of African-Americans. At-risk students met standards only 42 percent of the time compared to those who were not at risk at 88 percent.

Table 3: Summary Report for Jones High School Grade 10 Student Math Performance,

2008-2009

	Number of Students Tested	Percent of Students	Average Scale Score	Percent Met Standard ***	Percent Commended Performance ****
All Students	119		2,133	58%	7%
Gender					
Male	55	46.22%	2,140	60%	9%
Female	64	53.78%	2,127	56%	5%
Total	119	100.00%			
Race/Ethnicity					
Native American	0	0.00%	---	---	---
Asian	1	0.84%	---	---	---
African American	34	28.57%	2,085	50%	0%
Hispanic	62	52.10%	2,160	60%	11%
White	22	18.49%	2,148	68%	5%
Total	119	100.00%			
Economically Disadvantaged					
Free Meals	62	52.10%	2,103	48%	5%
Reduced Meals	10	8.40%	2,130	50%	0%
Other	0	0.00%	---	---	---
No	47	39.50%	2,174	72%	11%
Total	119	100.00%			
At-Risk					
Yes	78	65.55%	2,076	42%	1%
No	41	34.45%	2,242	88%	17%
Total	119	100.00%			

*** Met Standard level (Panel Recommendation): 2100 or above

***** Commended Performance Level: 2400 and above

Similar to differences seen in 9th grade, Royal High School had a lower average scaled scored by nearly 100 points (2,042) compared to Jones and only met the state standard one-third of the time. Royal High School had a larger population of 10th grade African-Americans (69 percent) compared to Jones, but fewer Hispanics (30 percent) and only 1 White student. African-Americans and Hispanics average scale scored was roughly the same at 2,041 and 2,052 respectively. However, Jones had far more students that were considered economically disadvantaged (60 percent) compared to Royal (36 .7 percent). Again, these scores might allude to significant differences between the two schools; however, without the student case level data no statistical tests can be ran on the two reported aggregated mean scores.

Interestingly, Royal's students who received free-meals scored higher than students that did not receive free-meals, by 16 points. This is an interesting finding because it shows students who are economically disadvantaged are scoring higher on state exams, which is contrary to literature review findings (Rothstein, 2004 and Darling-Hammond and Ifill-Lynch, 2006). Eighty-six percent of Royal High Schools students were considered at-risk, and earning almost 200 points less than those that were not at-risk. Students that were not at-risk met standards 70 percent of the time, compared to a little over a quarter of students that were at-risk.

Table 4: Summary Report for Royal High School Grade 10 Student Math Performance,

2008-2009

	Number of Students Tested	Percent of Students	Average Scale Score	Percent Met Standard ***	Percent Commended Performance *****
All Students	168		2,042	33%	1%
Gender					
Male	94	55.95%	2,025	29%	0%
Female	74	44.05%	2,063	38%	3%
Total	168	100.00%			
Race/Ethnicity					
Native American	0	0.00%	---	---	---
Asian	0	0.00%	---	---	---
African American	115	69.28%	2,041	31%	2%
Hispanic	50	30.12%	2,052	38%	0%
White	1	0.60%	---	---	---
Total	166	100.00%			
Economically Disadvantaged					
Free Meals	51	30.72%	2,036	35%	0%
Reduced Meals	10	6.02%	1,995	30%	0%
Other	57	34.34%	2,077	37%	4%
No	48	28.92%	2,020	27%	0%
Total	166	100.00%			
At-Risk					
Yes	141	85.98%	2,018	27%	0%
No	23	14.02%	2,200	70%	9%
Total	164	100.00%			

*** Met Standard level (Panel Recommendation): 2100 or above

***** Commended Performance Level: 2400 and above

Eleventh Grade Students.

Roughly 76 percent of all 11th graders met state math standards and nearly a quarter received commended performance at Jones High School, which is higher than the state averages. Females met the state standard 86 percent of the time, compared to males at 68 percent. This may indicate that students matriculating into Jones High School their freshman year developed the math skills necessary to meet standards beyond the average of the state. Thus, this could imply that Jones mathematics program development has in fact assisted students in improving their math skills to attain higher level state performance. African Americans represent a small portion of the students (4 percent) and 100 percent met the state standards. Hispanic 11th graders represent nearly 70 percent of the student population, and met state standards 2 percentage points more than Whites. Again, this could mean that Jones High School is closing the minority achievement gaps within their school setting. Students receiving the free lunch program scored 40 points higher than those on the reduced-lunch plan and 27 points higher than those not on a lunch-plan. These findings conflict with results found in the literature, where students who are economically disadvantaged typically earn lower scores on state standardized exams compared to their peers (Rothstein, 2004; Darling-Hammond and Ifill-Lynch, 2006). Jones High School continues to have a large gap (241 points) in average test scores between at-risk and not at-risk students.

Table 5: Summary Report for Jones High School Grade 11 Exit Level, Student Math

Performance, 2008-2009

	Number of Students Tested	Percent of Students	Average Scale Score	Percent Met Standard ***	Percent Commended Performance *****
All Students	175		2,245	76%	27%
Gender					
Male	98	56.00%	2,200	68%	18%
Female	77	44.00%	2,303	86%	38%
	175	100.00%			
Race/Ethnicity					
Native American		0.00%			
Asian	6	3.43%	2,265	83%	33%
African American	7	4.00%	2,211	100%	14%
Hispanic	121	69.14%	2,228	75%	24%
White	41	23.43%	2,301	73%	37%
	175	100.00%			
Economically Disadvantaged					
Free Meals	44	52.38%	2,192	70%	23%
Reduced Meals	10	11.90%	2,158	50%	10%
Other	0	0.00%	---	--	--
No	30	35.71%	2,165	70%	13%
	84	100.00%			
At-Risk					
Yes	110	62.86%	2,156	66%	4%
No	65	37.14%	2,397	92%	66%
	175	100.00%			

* Met Standard level (1 SEM): 2015 or above

** Met Standard level (1 SEM): 2058 or above

*** Met Standard level (Panel Recommendation): 2100 or above

**** THECB Higher Education Readiness Standard Level: or above

***** Commended Performance Level: 2400 and above

       While Jones did remarkably well on meeting Texas state standards, only 56 percent of students at Royal made the mark. Females outperformed males by 45 points, and met state standards 15 percent more than their male counterparts. Similar to Jones, African-American and Hispanic students in the 11th grade were more likely to meet standards compared to freshman and sophomores. Again, these scores might allude to significant differences between the two schools; however, without the student case level data no statistical tests can be ran on the two reported aggregated mean scores.

Table 6: Summary Report for Royal High School Grade 11 Exit Level, Student Math

Performance, 2008-2009

	Number of Students Tested	Percent of Students	Average Scale Score	Percent Met Standard ***	Percent Commended Performance *****
All Students	121		2,123	56%	2%
Gender					
Male	54	44.63%	2,098	48%	0%
Female	67	55.37%	2,143	63%	3%
	121	100.00%			
Race/Ethnicity					
Native American	0	0.00%	---	---	---
Asian	1	0.83%	---	---	---
African American	85	70.83%	2,119	56%	1%
Hispanic	34	28.33%	2,138	59%	3%
White	0	0.00%	---	---	---
	120	100.00%			
Economically Disadvantaged					
Free Meals	28	23.33%	2,114	50%	4%
Reduced Meals	6	5.00%	2,109	50%	0%
Other	41	34.17%	2,112	63%	0%
No	45	37.50%	2,143	56%	2%
	120	100.00%			
At-Risk					
Yes	102	85.71%	2,111	51%	2%
No	17	14.29%	2,197	88%	0%
	119	100.00%			

* Met Standard level (1 SEM): 2015 or above

** Met Standard level (1 SEM): 2058 or above

*** Met Standard level (Panel Recommendation): 2100 or above

**** THECB Higher Education Readiness Standard Level: or above

***** Commended Performance Level: 2400 and above

Population Sample: Teacher Demographics.

A total of 14 of the 16 (87.5 percent) mathematics teachers at both schools participated in the study. The teachers' personnel files provided demographic and background information and were combined with their MTEBI survey results. All of the high school math teachers taught more than one grade level during the 2008-2009 academic year. Of the 14 teachers that responded, eight taught 9th grade math, eight taught 10th grade math and seven taught 11th grade math.

For the total sample, the mean number of years teaching was 5.85 years (SD +/- 5.98) ranging from 1 to 25 years. Skewness on years of teaching experience represented a negative shaped curve with a skewness of 2.79 and a kurtosis of 9.11. With the large amount of skewness, the researcher divided teaching experience into three categories: 0 to 5 years (beginning teachers), 6 to 10 years (tenured teachers), 11 or more years (mid-career or veteran teachers). After collapsing teaching experience into career levels, over half were beginning teachers and over a third were considered tenured. Only one teacher had more than 25 years experience. The majority of teachers had a bachelor's degree and one-third had a graduate degree or beyond. Comparing teacher demographics to those from the Houston school districts, teachers employed at these charter schools had less classroom experience, but were educated at roughly the same level.

More specifically, teachers employed at these two schools had a mean of 4.29 (SD +/- 6.21) teaching mathematics, skewness of 3.23 and a kurtosis of 11.276 . The average

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teacher taught math 4.43 years (SD +/- 5.06 S.D.) to at-risk-students with a skewness of

2.48 and a kurtosis level of 7.29. Teachers at both schools taught mathematics to at-risk

student on average for 4 years (SD +/- 5.1), with a skewness of 2.706 and a kurtosis of

8.33. On average all teachers had at least 20 credit hours (SD +/- 8.7 S.D.) of

mathematics in undergraduate, while those that completed graduate school had only 3.2

(SD +/- 6.9). All of the variables had a high level of skewness and kurtosis which implies

that the distribution to the mean is not a normal distribution. Since both the skewness

and the kurtosis are positive for all variables, this conveys that there is a positive

skewness and that the tails of the distribution are heavier than for a normal distribution.

Table 7: Characteristics of Teacher Participants

Factor	N	Percent
Race		
African-American	9	64.2%
Hispanic	3	24.4%
White	2	14.2%
Gender		
Male	6	42.8%
Female	8	57.1%
Age		
26-30	3	24.4%
31-40	4	28.6%
41-50	5	35.7%
51-60	1	7.1%
61 and older	1	7.1%
Education		
Bachelor	9	64.2%
Graduate	5	35.7%
Teaching Experience		
Beginner (1-5 years)	8	57.1%
Tenured (6-10 years)	5	35.7%
Mid-career (11-15 years)	0	0.0%
Veteran (16+ years)	1	7.1%
Total Years Teaching Math		
Beginner (1-5 years)	12	85.7%
Tenured (6-10 years)	1	7.1%
Mid-career (11-15 years)	0	0.0%
Veteran (16+ years)	1	7.1%
Total Years Teaching At-Risk Students		
First-year	1	7.1%
Beginner (1-5 years)	10	71.0%
Tenured (6-10 years)	2	14.2%
Mid-career/Veteran (11+ years)	1	7.1%

Fifty-seven percent (8) of the respondents were females. Of those respondents that were females, half were between 41 to 50 years old, 37.5 percent were 31 to 40 and 12.5 percent were 51 and older. Of the female respondents, half were African-American, 25 percent were Caucasian and 12.5 percent were Hispanic. Male participants represented 42.8 percent of the sample and were considerably younger than the females with half of all male respondents between the ages of 26 and 30, 16.6 percent were between 31 to 40, 16.6 percent were between 41-50 and 16.6 percent were 61 or older. Two-thirds (66.6 percent) of the male respondents were African-American and the other third were Hispanic.

Men were less educated than females with only 16.6 percent having a graduate degree compared to 50 percent of females. Females typically had more teaching experience than their counterparts with 50 percent having 0 to 4 years of experience, 37.5 percent with 5 to 7 years of experience and 12.5 percent with over 25 years experience. Compared to males with 50 percent having 0 to 4 years experience, 33 percent with 5 to 7 years experience and 16.6 percent with 8 years of experience.

Teacher Self-Efficacy Scores

MTEBI sub-scales: PMTE and MTOE were grouped into three categories: low, medium and high. The researcher divided the scores for the PMTE into a low range (13 to 30), medium (31 to 48) and high (49 to 65); while MTOE ranged from 8 to 19 for a low score, 20 to 29 for medium and 30 to 40 for high. Frequencies, standard deviations and overall percentages of the overall sub-scales (personal mathematics teaching efficacy

and outcome-efficacy) are illustrated in the table below. PMTE had a mean score of 46

with a SD of +/- 5.65, median of 47, a skewness of -0.123 and a kurtosis of -0.523.

MTOE score mean was 29.5 with a SD of +/-8.244, median of 29 a skewness of -0.538

and a kurtosis of -0.659. The negative skewness and kurtosis of both the PMTE and

MTOE sub-scales implies that the distribution are not symmetric or normally distributed,

which illustrates that the distribution is "lighter" in the tails of the distribution.

Furthermore, a *t* test failed to reveal a statistically reliable difference between the mean

number of PMTE scores (M = 46.43) and 1, $t(13) = 30.73$, $p < .05$, $\alpha = .05$. Lastly, a *t*

test failed to reveal a statistically reliable difference between the mean number of MTOE

scores (M = 29.50) and 1, $t(13) = 13.839$, $p < .05$, $\alpha = .05$.

Table 8: Overall Average of PMTE and OMTE Sub-scales

	N	Minimum	Maximum	Mean	Std. Deviation
Outcome Expectancy	14	15	40	29.5	8.244
Personal Mathematics Teaching Efficacy belief (SE)	14	36	56	46.43	5.653

Specifically, five teachers fell into the high range (scoring 49 to 65) of personal

mathematics teaching self-efficacy, eight teachers were in the medium (scoring 31 to 48),

while no teachers had a low score between 13 and 30.   The average PMTE score at Jones

was slightly higher than Royal, 49.13 compared to 42.83 respectively. These scores re-

flect that Jones teachers score in the high range of self-efficacy compared to Royal at the medium range. These findings are interesting, as at first glance it may allude to differences between teachers' internal belief patterns at the two separate schools, which can likely impact student scores and outcomes. However, upon further investigation, an independent sample t-test revealed that there was no significant differences between Jones and Royal High School mean PMTE scores. The results of the study indicated that Royal High School PMTE scores ($M = 49.13$, $SD = 4.291$) was not more significant than PMTE scores Royal High School ($M = 42.83$, $SD = 5.492$), $t(14) = 2.324$, $p < .05$.

More variance between low, middle and high levels occurred in the MTOE subscale. Seven teachers scored in the high range (30 to 40 points), 4 in the medium range (20 to 29 points), and 3 in the low range (8 to 9). Similar to the PMTE score differences between the schools, Jones High School teachers tended to be in the high to medium range, while Royal had more teachers in the medium to low range. Jones High School average for MTOE was nearly three points higher than Royal High School, which may indicate that Jones teachers had higher outcome expectancy (MTOE) than Royal. However, upon further investigation, an independent samples test revealed that there was no significant differences between Jones and Royal High School mean MTOE scores. The results of the study indicated that Jones High School MTOE scores ($M = 30.75$, $SD = 6.671$) was not more significant than MTOE scores Royal High School ($M = 27.83$, $SD = 5.492$), $t(14) = 0.600$, $p < .05$.

Table 9: Mathematics Teaching Efficacy Belief Instrument: Sub-scale (PMTE and

OMTE) Scores, 2009-2010 Academic Year

High School:	Personal Mathematics Teaching Efficacy Scale	Personal Mathematics Teaching Efficacy Scale	Outcome Expectancy Scale	Outcome Expectancy Scale
Jones	High	51	High	36
Jones	High	54	High	30
Jones	High	49	Medium	29
Jones	High	56	Medium	27
Jones	Medium	44	High	39
Jones	Medium	46	High	38
Jones	Medium	48	Medium	28
Jones	Medium	45	Low	19
Average Score for Jones:		**49.13**		**30.75**
Royal	High	50	High	30
Royal	High	49	Medium	29
Royal	Medium	40	High	40
Royal	Medium	41	High	37
Royal	Medium	36	Low	16
Royal	Medium	41	Low	15
Average Score for Royal:		**42.83**		**27.83**
Overall Average Score:		**43.70**		**27.73**

A close look at Personal Mathematic Teaching Efficacy (PMTE).

The table below represents the means and standard deviations by gender, race, age

range, educational background and teaching experience for *Personal Mathematic*

Teaching Efficacy (PMTE) at both schools. Standard deviations appeared to be large for

all respondents, indicating that total scores for the group were not clustered around the

mean and skewness occurred.

Female teachers scored on average slightly lower than males. White teachers had a higher sense of PMTE than any other race/ethnicity, followed closely by African Americans. Teachers with a bachelor's in this study had the lowest mean PMTE score of 46, while those holding a masters degree or beyond had on average 47. These results are consistent with the literature - that higher educated teachers will have higher self-efficacy scores. However, upon running a bi-variant analysis there was not a significant relationship between gender and PMTE or MTOE at the alpha .05 level.

Under teaching experience, the researcher grouped teachers into beginning teachers (0 to 5 years of experience), tenured teachers (6 to 10 years) and mid-career/ veteran teachers (11 or more years). Based on this grouping, tenured teachers had the highest PMTE score (49 points) when compared to beginning teachers (45 points), while veteran teachers scored in the middle (46 points). These results are consistent with the literature which indicates the more experience teachers have the higher there efficacy scores will be. However, upon running a bi-variant analysis, there was not a significant relationship between teacher years of experience and PMTE or MTOE at the alpha .05 level.

Table 10: Personal Mathematic Teaching Efficacy Scale and Demographic Variables

	N	Efficacy Score Range	Mean	SD
Gender				
Male	6	40 to 56	47.67	6.121
Female	8	36 to 54	45.5	5.503
Race/Ethnicity				
African-American	9	41 to 54	47	4
Hispanic	3	36 to 56	44	11
White	2	45 to 50	48	4
Age Range				
26 to 30	3	41 to 49	46	5
31 to 40	4	36 to 50	43	6
41 to 50	5	41 to 56	49	6
51 to 60	1	46	46	0
60 and older	1	51	51	0
Degree Level				
Bachelors Degree	9	36 to 56	46	7
Graduate Degree	5	41 to 51	47	4
Teaching Experience				
Beginner (1-5 years)	8	36 to 54	45	6
Tenured (6-10 years)	5	41 to 56	49	6
Mid-career and Veteran (10 or more years)	1	46	46	0

When controlling for gender, males and females had roughly the same PMTE measurements thus it appears that gender did not play a role PMTE measurements. To validate this finding, a bivariate regression was employed, and as seen in the Table 11 be-

low, findings reveal that the gender does not play a statistically significant role in PMTE scores.

Table 11: Bivariate Regression for PMTE by Teacher Gender (n=14)

	Teacher Gender						
	Male (n=6)		Female (n=8)				
Teacher Efficacy Variable	Mean	Standard Deviation	Mean	Standard Deviation	F	df	*p*
PMTE Subscale Score	47.67	6.12	45.50	5.50	.48	1, 12	.500

As Table 8 above revealed that the masters degree teacher group had the highest personal efficacy (PMTE) with 47 points and tenured (6 to 10 years) teacher group had the highest PMTE score of 49 points. The efficacy scores reflected that teachers between the age of 41 to 50 with little or no experience had the highest level of PMTE scores. However, after running a bivariate regression analysis, Table 12 below exhibits no significant relationship between education level, age and years of experience and PMTE scores.

Table 12: Bivariate Regression for PMTE by Teacher Quality (n=14)

	Highest Degree			Undergrad Math Credits[†]			Graduate Math Credits		
Teacher Efficacy Variable	F	df	*p*	F	df	*p*	F	df	*p*
PMTE Subscale Score	.03	1, 12	.863	.02	1, 11	.904	.02	1, 12	.882

	Total Yrs Teaching			Total Yrs Teaching Math		
Teacher Efficacy Variable	F	df	*p*	F	df	*p*
PMTE Subscale Score	.29	1, 12	.599	.00	1, 12	.945

White teachers had the highest level of PMTE scores for both schools, followed by African-Americans and Hispanics. However, it is important to note that only two White teachers participated in the study compared to nine African-Americans. In testing this conclusion, a bivariate regression was also applied. As Table 13 below reveals, there was no significant relationship observed between teacher race and PMTE scores.

Table 13: Bivariate Regression for PMTE scores by Teacher Race (n=14)

	Teacher Race								
	White (n=2)		African American (n=9)		Hispanic (n=3)				
Teacher Efficacy Variable	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	F	df	*p*
PMTE Subscale Score	48	4	47	4	44	11	.32	2,11	.732

A close look at Mathematic Teaching Outcome Expectancy (MTOE).

Table 14 below represents the means and standard deviations by gender, race, age range, educational background and teaching experience for outcome expectancy (MTOE) at Royal and Jones High School.

Table 14: Mathematics Teaching Outcome Expectancy (MTOE) Scale and Demographic Variables

	N	Efficacy Score Range	Mean	SD
Gender				
Male	6	15 to 40	29.33	8.595
Female	8	16 to 39	29.63	8.568
Race/Ethnicity				
African-American	9	15 to 39	31	9
Hispanic	3	16 to 40	28	12
White	2	19 to 30	25	8
Age Range				
26 to 30	3	15 to 29	24	8
31 to 40	4	16 to 40	31	11
41 to 50	5	19 to 37	28	6
51 to 60	1	38	38	0
60 and older	1	36	36	0
Degree Level				
Bachelors Degree	9	15 to 40	27	9
Graduate Degree	5	28 to 39	34	5
Teaching Experience				
Beginner (1-5 years)	8	16 to 40	31	8
Tenured (6-10 years)	5	15 to 36	25	8
Mid-career (11-15 years)	no data	no data	no data	no data
Veteran (16+ years)	1	16	16	0

When controlling for gender, males and females had roughly the same MTOE measurements thus it appears that gender did not play a role MTOE measurements. To validate this finding, a bivariate regression was employed, and as seen in the Table 15

below, findings reveal that the gender does not play a significant role in MTOE scores.

Table 15: Bivariate Regression for MTOE by Teacher Gender (n=14)

	Teacher Gender						
	Male (n=6)		Female (n=8)				
Teacher Efficacy Variable	Mean	Standard Deviation	Mean	Standard Deviation	F	df	*p*
MTOE Subscale Score	29.33	8.60	29.63	8.57	.00	1, 12	.951

As Table 10 above revealed, teachers with a masters degree had the highest outcome expectancy (MTOE) score with 34 points and beginning (0 to 5 years) teacher group had the highest MTOE score of 31 points. The efficacy scores reflected that teachers between the age of 31 to 40 with little or no experience had the highest level of MTOE scores. After running a bivariate regression analysis, the Table 16 below exhibits no significant relationship between education level, age and years of experience and MTOE scores.

Table 16: Bivariate Regression for MTOE by Teacher Quality (n=14)†

	Highest Degree			Undergrad Math Credits[†]			Graduate Math Credits		
Teacher Efficacy Variable	F	df	p	F	df	p	F	df	p
MTOE Subscale Score	2.60	1, 12	.133	.00	1, 11	.960	1.51	1, 12	.243

	Total Yrs Teaching			Total Yrs Teaching Math		
Teacher Efficacy Variable	F	df	p	F	df	p
MTOE Subscale Score	.16	1, 12	.699	.47	1, 12	.504

While White teachers had the highest level of PMTE scores, they had the lowest MTOE scores. Teachers that were African-American had the highest level of MTOE scores followed by Hispanics. As literature has illustrated, this may indicate that white teachers had lower outcome expectancy of their minority students than African-Americans or Hispanics (England, 2006; Goddard and Skrla, 2006; Mashburn, et al. 2006; Oates, 2003). In testing this conclusion, a bivariate regression was also applied. As Table 17 reveals, there was no significant relationship observed between teacher race and MTOE scores.

Table 17: Bivariate Regression for MTOE scores by Teacher Race (n=14)

	Teacher Race								
	White (n=2)		African American (n=9)		Hispanic (n=3)				
Teacher Efficacy Variable	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	F	df	*p*
MTOE Subscale Score	25	8	31	9	28	12	.60	2,11	.566

Findings for Research Questions

The bivariate regression analysis between high school mathematics teachers' scores on the PMTE and high school students mathematics scores based on race/ethnicity, gender, free or reduced lunch and at-risk students was found not to be significant at the alpha level of .05. The bivariate regression analysis between high school mathematics teachers' score on the OMTE and high school students' mathematics scores based on race/ethnicity, gender, free or reduced lunch and at-risk students was found not to be significant at the alpha level of .05. Appendix J has a more detailed explanation of the bivariate analysis on each variable.

Additional Findings.

Data for the PMTE and MTOE scores were not normally across the mean; specifically the PMTE scores were heavily weighted towards the high level of self-efficacy. PMTE scores were heavily skewed to the left creating an asymmetrical distribution. The skewed distribution was due to the upper bounds of survey responders who rated at the medium to high end of the score range. The Pearson omnibus normality test, which com-

bines skewness and kurtosis was used to determine the total amount that the distribution deviated from the standard bell curve. This test revealed that both the PMTE and OMTE scores deviated substantially from the normal shaped bell curve. Outliers were not the culprit of the skewness for both the PMTE and OMTE scores, as it was likely attributed to the small amount of responders.

An analysis of variance and a bivariate analysis require that the distribution be normally distributed. Since the PMTE and OMTE scores revealed a non-normal distributed data, the parametric tests (ANOVA or bivariate analysis) were not likely the appropriate statistic analysis to run. With the low level of responders and the high level of skewness, data will likely reveal insignificant results. Thus, the fishers exact t-test - a nonparametric analysis was used to assess the statistical significance in this small sample sizes. It was used to examine the level of significance of the association between PMTE and OMTE scores on students standardized exams. However, the test revealed no significant correlations.

Next, the researcher divided teachers into low, medium and high PMTE and MTOE scores and compared their students' mean math scores; this illustrated little to no differences. Teachers who reported high-self efficacy (PMTE) had a mean 9th grade math score 3.9 percent higher than those with low self-efficacy (PMTE) score and 2.6 percent higher for 10th grade math; however, 1.5 percent lower for 11th grade math. While teachers who scored at the medium level on the MTOE scale produced the highest mean scores for grade 9 and 10; teachers who scored the highest on the MTOE score had only slightly higher student achievement at the grade 11 level that those who scored low

on the MTOE scale. These additional findings provide no supplementary evidence that

teacher self-efficacy or outcome expectancy impacts on student achievement. The table

below illustrates these inconclusive findings.

Table 18: Teachers' PMTE and OMTE Level Scores by Grade Level

PMTE Level	Grade 9 Mean	Grade 10 Mean	Grade 11 Mean
PMTE Level: Medium	2,044	2,071	2,188
PMTE Level: High	2,124	2,125	2,154
Percent Change between High and Medium	3.90%	2.60%	-1.50%
MTOE Level: Low	1,978	2,014	2,223
MTOE Level: Medium	2,115	2,148	2,023
MTOE Level: High	2,106	2,094	2,240

A Chi Square analysis was used for further investigation into the relationship of

the independent and dependent variables, even though it would not provide any informa-

tion about the direction of the relationship, or would give statistical information if a rela-

tionship existed between PMTE or MTOE and student achievement. In the evaluation

the PMTE and MTOE scores were recoded into ordinal variables, with categories of low,

medium and high. The analysis found no statistical significance at the alpha level of .05

Summary

Due to relatively small sample sizes, the PMTE and MTOE sub-scales of self-

efficacy based on the MTEBI did not produce any significant relationship on student

achievement by grade level, race/ethnicity, gender, socio-economic-status or at-risk

students. The analysis of data is not clear as to if teacher self-efficacy or outcome expectancy sub-scales positively or negatively relate to math student achievement. A larger sample size of in-service mathematics teachers is needed in order to find significant inter-correlational relationships between PMTE and MTOE sub-scales and mathematic student test scores to determine if self-efficacy has any impact on outcomes.

CHAPTER 5: DISCUSSION AND CONCLUSIONS

The United States has attempted to close the achievement gaps by reforming educational policy, such as the (U.S. Department of Education, 2001). *The No Child Left Behind* (NCLB) was charged with the responsibility to reduce the achievement gaps by ensuring that students met national proficiency standards in English/language arts and mathematics by 2014. Despite the adoption of this adaptive nationwide policy, the achievement gaps continue to exist between our nation's low-income and minority students and their middle- or upper-income white peers.

Literature points to teachers' self-efficacy as one of the main variables associated with student achievement gaps. In particular, teachers reporting a higher self-efficacy have higher student achievement regardless of students' gender, race/ethnicity, socio-economic-status, or at-risk factors (Tucker, et al. 2005). Ashton and Webb (1986) found that high school language arts and math teachers with a high sense of self-efficacy bolstered student achievement on Metropolitan Achievement tests. This thesis attempted to replicate the above findings that teachers with higher math self-efficacy on the PMTE and MTOE sub-scales would produce higher student achievement on standardized tests such as TAKS.

There was little variance in *Personal Mathematics Teaching Efficacy* (PMTE) scores with the majority of teachers reporting in the middle range of self-efficacy. The in-

sufficient variability among PMTE scores and the low number of teachers reporting self-efficacy greatly restricted the ability for the regression analysis to determine a relationship between PMTE scores and student achievement. Circumstances that might have factored into the lack of variance include the low number of survey responses from the teachers.

Another factor influencing the higher levels of self-efficacy (PMTE) scores might be the release date of the MTEBI survey. The MTEBI was distributed in the beginning of the school year, where teachers might have a higher sense of self-efficacy as they may have not encountered any major student achievement issues. While the MTEBI, PMTE sub-scale has proven to be a valid and reliable instrument of measurement to predict self-efficacy (Enochs, et al. 2000), teachers might have responded overly optimistic about their sense of self-efficacy, creating an inflated self-efficacy score.

While not statistically significant, more variance occurred in the *Mathematic Teaching Outcome Expectancy* (MTOE) scores, with 7 teachers responding in the high range, 4 in the medium and 3 in the low. Interestingly, the variance occurred between schools, instead of within schools. For example, Jones High School teachers tended to be in the high to medium range of MTOE, while Royal had more teachers in the medium to low range MTOE. The between-school variance might be attributed to the fact that Jones High School math students on average score nearly 100 points higher than Royal High School math students. Therefore, teachers' outcome expectancy of their students might be higher at Jones as they expect more from their students than teachers at Royal whose students are scoring lower.

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Purpose of the Study

The purpose of this study was to explore high school mathematics teacher self-efficacy and outcome expectancy and mathematics achievement of 9th, 10th, and 11th grade on the *Texas Assessment for Knowledge and Skills* (TAKS). The purpose of this study was to determine the factorial validity of math teachers' beliefs on their abilities and the impact on student achievement by using the *Efficacy Beliefs Instrument* (MTE-BI). In doing so, the MTEBI survey (Appendix D) was used to determine the level of teachers' self-efficacy and outcome expectancy. The data was evaluated using bivariate regression analysis to assess the strength of the relationship between teachers' self-efficacy and outcome expectancy on high school minority student achievement. This examination reflects the possibility that teachers' self-efficacy and outcome expectations can assist in closing the achievement gaps, in which (U.S. Department of Education, 2001) has attempted to do for nearly a decade now.

The literature review revealed that teachers' self-efficacy and outcome expectancy could positively effect student achievement. Based on the studies reviewed in this paper, it was hypothesized that a strong correlation would exist between math teachers' self-efficacy and outcome expectancy on math student achievement on TAKS.

Summary of Findings and Conclusions

The statistical findings failed to confirm that there is an effect between high school math teacher self-efficacy (PMTE) and outcome expectancy (MTOE) and high school math student achievement on the TAKS based on race/ethnicity, gender, lunch status and at risk students. All of the bivariate correlations between personal math teaching

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efficacy (PMTE) and outcome math teaching expectancy (MTOE) in relation to math student achievement by race/ethnicity, gender, lunch status and at risk students were found to be non-linear; thus there was a non-existent correlation between the independent and dependent variables.

While these are the findings, the literature shows strong correlations and predictor models between high teacher self-efficacy and high student achievement and low teacher self-efficacy and low student achievement (Berman, et al. 1977; Ashton and Webb, 1986; Raymond, 1997; Brophy, 1998; Goddard, et al. 2004a; Woolfolk, Hoy, and Spero, 2005; Bursal, and Paznokas, 2006). Therefore, the findings from this thesis were not consistent with the literature on teacher self-efficacy, which indicated a positive linear relationship between teacher self-efficacy and student achievement in elementary school settings (Berman, et al. 1977; Gibson and Dembo, 1984; Ashton and Webb, 1986; Raymond, 1997; Brophy, 1998; Goddard, et al. 2004a; Woolfolk, Hoy and Spero, 2005; Bursal and Paznokas, 2006).

More specifically, Berman, et al. (1977) found a strong positive correlation between high teacher self-efficacy and student achievement, when they evaluated 100 Title III Elementary and Secondary Education Act (ESEA) school projects. Furthermore, Ashton and Webb (1986) reported that high school students scored higher on the Metropolitan Achievement test in both language arts and mathematics when they were paired with teachers who reported having high self-efficacy. Raymond (1997) found that lower efficacious teachers reported that they were less confident in their teaching abilities, had little support, and were less likely to believe that they were effectively teaching math students.

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Based on this study, teachers who had lower self-efficacy were more likely to have low achieving students. On the other hand, high efficacious teachers felt competent and optimistic about their ability to impact math student achievement (Raymond, 1997) and were more likely to have higher academically achieving students. Lastly, Tucker, et al. (2005) found a strong positive relationship between teacher self-efficacy and minority student achievement.

Findings from previous studies would support the hypotheses in this thesis that self-efficacy impacts student achievement. However, to replicate the results and conclusions found in the literature, a larger teacher sample size would be necessary. Non-linear results of this thesis might have occurred because of the small sample size of the teacher responses (n = 14) and the skewness of the distribution. With a bivariate analysis, small sample sizes, take away degrees of freedom, and making it challenging to produce statistical significance. Due to the relatively small sample size, nonparametric analysis (fisher's t) was used to determine significant relationships; however, the findings suggest the null hypothesis could not be rejected. Comprehensive results produced from this study did not generate any reliable or predictable findings that would suggest high school mathematics teachers' self-efficacy or outcome expectancy had an influence on high school mathematic student achievement.

Recommendations

As stated previously, the purpose of this study was to investigate the relationship(s) that existed between high school math teachers' self-efficacy and outcome expectancy and its effects on high school math student achievement based on race/ethnicity,

gender, lunch status and at risk students in two charter schools in Houston, Texas. Results from this research could have assisted in providing strategies to promote positive learning environments for minorities, those with low SES and at risk-students, which could have contributed to ultimately raising the achievement bar for students in these communities. The literature recommends that there is a "need for more research to explore what other personal or external factors relate mathematics instructional practices" (Brown, 2005: 239).

Furthermore, based on the research analysis, charter schools in the Houston area out-perform their local traditional public schools. Since students score higher on standardized tests at these charter schools, parents want their children to attend them. Parents, students and teachers make the choice to apply to the specific charter school, unlike traditional local schools where students are placed based on zip-code and teachers are placed based on central office assignments. Research has suggested that mismatches (???) often occur in low-SES districts where teachers have lower efficacy scores and students have lower standardized test scores. From a quantitative perspective, it is important to include all TMCF charter schools in this type of analysis for the next phase of this study. Using the same design as in this research project, I would recommend that a complete analysis of all of the charter schools (12 total) in the six-TMCF regions be evaluated.

Since this thesis only provides a quantitative focus for assessing self-efficacy and student achievement based on a one-year analysis, I have provided some recommendations for future research derived from the analysis and results of this study.

1. When replicating this study, it is important to have a larger sample size of high school math teachers and a larger student population. A larger population might have revealed more statistical significance between the independent and dependent variables.
2. This study analyzed two under-achieving/performing charter schools in Houston, Texas. Future studies could explore a range of low, middle and high academically achieving schools to see differences between MTEBI sub-scores and student achievement.
3. An additional study could include a pre-test (at the beginning of the academic year) and post-test (at the end of the academic year) on students' math achievement, to analyze student maturation (growth) throughout the academic year, instead of capturing data based on one form of standardized exams.
4. Student self-efficacy instrument could be administered at the beginning and end of the academic year, to review the belief system of the student on their ability to effectively learn math. This student self-assessment would gauge the students belief systems within the learning environment. Furthermore, assessing and evaluating student math anxiety might illustrate students with higher levels of anxiety perform poorly on exams. Understanding math anxiety and how it relates to self-efficacy could shed light on other possible variables impacting lower student achievement due to low belief patterns in the ability to achieve.
5. This study only examined student gender, race/ethnicity, lunch status and at-risk students. Further demographic data on student educational history, family background (education of parents, language spoken at home, household structures, etc.) and behavioral or psychological challenges would provide a more in-depth data on student achievement.
6. A pre-test (at the beginning of the academic year) and post-test (at the end of the academic year) to measure PMTE and MTOE scores of teachers to evaluate any variance in the scores.
7. Collecting teacher demographic data, such as gender, race/ethnicity, education, and years teaching, might relate to levels of self-efficacy and outcome expectancy. For example, teachers with higher levels of educational and more teaching experience could have a higher level of self-efficacy and outcome expectancy.
8. A mixed method design to include both quantitative and qualitative measures. For example, observational methods of teachers in the classroom teaching the math content, and the students reaction and participation levels within the classroom setting would provide additional information.

Implications for Practice

Math teachers' mastery of the content, academic skills, experience and pedagogical skills (such as certifications) can greatly impact the classroom environment, especial-

ly in mathematics. Some studies found that teacher quality as it pertains to background education and certifications has a strong correlation on teacher efficacy (Strauss and Sawyer, 1986). Several researchers have found positive correlations between elementary math pre-service training/quality and teacher efficacy levels (Gibson and Dembo, 1984; Ross, 1992; Raymond, 1997; Brophy, 1998; Goddard, et al. 2004b). In addition, teachers' sense of mastery increases efficacy (Bandura, 1977; Goddard, 2002; Goddard, et al. 2004b).

The literature on teacher quality indicates the strong need for students to have experienced and educated math teachers in their classrooms. A 2008 report by The Education Trust entitled *Their Fair Share: How Texas-Sized Gaps in Teacher Quality Shortchange Low-income and Minority Students* reported that, "having a high-quality teacher[3] throughout elementary school can substantially offset or even eliminate the disadvantage of a low-socioeconomic background" (Education Trust, 2008:4). Yet, they found that in Texas not only are many math teachers of poor and minority students not experienced in education, those students are "far less likely than others" to even have a certified math teacher (Education Trust, 2008:7).

The Education Trust (2008) reported that teacher quality is the single greatest factor in impacting student achievement, particularly minorities. Tucker, et al. (2005) found

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[3.]   According to No Child Left Behind Act (2001), the criteria to be considered a Highly Qualified Teacher are: 1. At least a bachelor's degree in the discipline they desire to teach; 2. State or national teacher's certification, excluding emergency certifications or licenses; and 3. Content knowledge and proficiency in the core subject areas that the teacher is teaching in.

that teachers with high level of self-efficacy have higher achievement scores specifically with Black and Hispanic students than their White peers. Similarly, Collier found that "teachers with high levels of efficacy are more successful with teaching students of all ethnic backgrounds" (Tucker, et al. 2005:32). Implications from these studies reveal that teacher self-efficacy can conceivably improve achievement among Black and Hispanic students.

This evidence-based research implies that the relationship between teacher self-efficacy and student achievement should create new solutions for educational leaders to establish teacher-focused programs to close the minority achievement gap. Evidence from research studies found that teachers with high self-efficacy improve student achievement, create inventive instructional design strategies, have lower special educational referrals and positive classroom management strategies (Berman, et al. 1977; Ashton and Webb, 1986; Soodak and Podell, 1998). First, undergraduate/graduate teacher programs should recognize the importance of teacher efficacy and its relationship to student achievement as it is key for these programs to implement curriculum to bolster pre-service teachers self-efficacy before teachers enter into the work force. Second, schools recruiting teachers should evaluate levels of self-efficacy as a key characteristic before hiring. Lastly, administrators should proactively understand the value between teacher self-efficacy and student achievement when determining their school improvement and evaluation plans. For instance, professional development plans would be useful for teachers that might score low on self-efficacy or outcome expectancy.

Achievement gaps on standardized exams continue to illustrate the disparities that exist between minorities and their white peers. The above implications for future practice establish a set of possible concepts to improve student achievement by examining teachers' self-efficacy. As educational leaders and policy makers attempt to identify key variables to minimize the achievement gap, they should examine teacher self-efficacy to develop pre-service teachers in undergraduate/graduate programs, to properly recruit teachers, to promote positive change in school improvement plans and to analyze the effectiveness of in-service teachers' professional development. Even though this study did not illustrate a statistical relationship between teacher self-efficacy or outcome expectancy and student achievement, it did not invalidate the previous research that there is a strong relationship.

Conclusions

The Condition of Education reported that the average mathematics score in 2009 for high-poverty schools were much lower than low-poverty school districts. The average 4th-grade math score in 2009 for high-poverty schools was 223 compared to low-poverty schools which was 254. Average 8th-grade student score from high-poverty schools was 260, compared to low-poverty schools which was 298. Racial differences on NAEP math scores reflect continued achievement gaps; specifically 4th-grade Whites on average scored 248 compared to Blacks at 222, Hispanics at 227. Gaps persist at the 8th-grade level when Whites score on average 293 compared to Blacks at 261 and Hispanics at 266 (National Center for Education Statistics, 2010).

Similarly, the National Center for Education Statistics (2010:25) reported that, "significant score gaps between White students and their Black and Hispanic peers in 2009. Because all three racial/ethnic groups have made progress, neither the White-Black nor the White-Hispanic score gap in 2009 was significantly different from the corresponding gaps in 2007 or 1990." According to these alarming statistics, achievement gaps continue to persist regardless of the policies attempting to improve them. This calls attention for educational leaders and policy makers to continue to search for the reasons behind the gaps such as teacher efficacy and outcome expectations as possible solutions to decrease achievement gaps.

Even though the results of this study did not illustrate a statistical relationship between teacher self-efficacy or outcome expectancy and student achievement, it did not invalidate the previous research that there is a strong relationship. It is appropriate to re-evaluate and explore high mathematics teacher self-efficacy and student achievement in a more extensive context to include a larger sample size for future analysis.

Additionally, collective teacher self-efficacy, while not in the scope of this research, may also provide additional insight into the relationship that exists with student achievement, as this thesis revealed that mean ratings for PMTE and OMTE scores were in the medium to high end of the scale range, while very few teachers rated themselves in the low range. These findings allude to the linkage found between collective teacher efficacy and student achievement. Goddard, et al. (2004a) found that, "the judgment of teachers in a school that the faculty as a whole can organize and execute the courses of action required to have a positive effect on students" (p.4). Additional studies have also

concluded that collective teacher efficacy has a strong relationship on student achievement (Bandura, 1993; Goddard, et al. 2000; Goddard, 2001). Thus, it might also be worthwhile to consider teachers' collective efficacy, its effects on individual teachers' self-efficacy and its relationship to student achievement.

There is a great deal of information about teacher efficacy available from a quantitative perspective, so the study could be expanded to discover qualitative measures impacting teacher self-efficacy. Qualitative methods such as focus groups, case studies, interviews and observations might provide a different angle into understanding the relationship between teacher self-efficacy and student achievement. Drawing upon previous findings that teacher self-efficacy positively influence student achievement, any research that can identify quality factors or demographic factors that tend to correlate to higher self-efficacy might be a useful tool for school districts looking to place those teachers who will be most effective in a low-income or heavily minority student population that is under-achieving.

In the age of accountability marked by the U.S. Department of Education (2001), all of these variables are of vital importance to our country's low-income and minority students. Any information that gives both teachers and students their best chance for success should improve hiring and placement of teachers in districts that are in the most need. Further research in the areas of efficacy and expectations would furnish new awareness into the gaps in order to promote positive changes to university teacher education programs, pre-service training, mentoring, effective teacher development programs

and so forth in order to close achievement scores between minorities and Whites and low-

income and middle/upper-income students.

APPENDIX A: DEFINITION OF TERMS

Definitions of the following terms have been made to provide clarity and operationally for the purpose of the study.

Attribution Theory. This social psychology theory reviews how people describe their own behaviors, attitudes (self-attribution) and perceptions and how those characters influence motivation. Weiner a leading psychologist who linked psychology and education together, incorporated self-efficacy and cognitive theory to predict a student's self-awareness on his or her academic accomplishment or failure (Weiner 1986).

Achievement Gap. An achievement gap describes differences on measurements seen on various dropout rates, grade point averages (GPAs), state and national standardized tests, ACT and SAT scores, college enrollment and so forth. These disparities are observed between groups based on demographics such as gender, race/ethnicity and socio-economic status (SES).

Adequate Yearly Progress (AYP). This measurement was defined by NCLB which establishes state standardized tests to compare how public schools students are achieving academically to other schools within the school district (U.S. Department of Education 2001).

Charter School. An independent K-12 public school program which is construct-ed and operated by community leaders, educational leaders, organizations, teachers and parents.

Expectancy Theory. A theory based on motivation developed by Victor Vroom of the Yale School of Management. In an educational organization, this theory predicts a teacher's perceptions result from their own motivations. The premise is that a teachers perception puts forth more effort during teaching than their students are more likely to succeed.

High School. A school that typically consists of grades 9 through 12.

Highly Qualified Teacher. NCLB created a federal definition of "highly quali-fied" teachers by setting a criteria which included a minimum of full state certification, a bachelor's degree and level of proficiency in the subject matter the teacher is teaching in (U.S. Department of Education 2001).

Mathematics Self-efficacy. A math teacher's belief system that their ability to per-form specific tasks such as teaching math, will ultimately result in higher achieving stu-dents in mathematics.

Minority. A sociological group that typically is classified as disadvantaged in re-gards to workforce, economic status, education and so forth. Characteristically sub-groups that fall into minorities represent a population that is a numeric minority as well.

Pedagogy. This is the method and principles teachers use during instruction.

Socio-Economic-Status (SES). This is a measurement used both in economics and sociology to define various interconnected characteristics of an individual such as economic status, educational level, income, occupation, etc.

Social Cognitive Theory. Bandura, a theorist, developed this theory based on the construct of social, cognitive and environmental factors (Bandura 1993). In social cognitive theory, Bandura identified that a teacher's level of self-efficacy would predict the observer's (student's) level of academic performance.

Teacher Efficacy. A teacher's belief system that his or her ability to perform specific tasks will ultimately produce higher achieving students.

Teacher Efficacy Scale. A teacher's "judgement of his or her capabilities to bring about desired outcomes of student engagement and learning" (Tschannen-Moran and Woolfolk Hoy 2001).

Teacher Expectation: Good (1987) finds that, "teachers form expectations of and assign labels to people based upon such characteristics as body build, gender, race, ethnicity, given name and/or surname, attractiveness, dialect, and socioeconomic level, among others. Once we label a person, it impacts how we act and react toward that person". Therefore, those labels that a teacher places on a student creates a sterotype which assumes and predicts the students outcomes.

Teacher Self-Efficacy: The "belief in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet situational demands" (Wood

and Bandura 1989). Self-efficacy is an internal belief pattern in which the individual per-

ceives that he/she can perform at a certain level to obtain a defined goal.

Texas Assessment of Knowledge and Skills (TAKS). The TAKS is the Texas re-

quired state standardized achievement exam for students in grades three through 10 and a

12th grade exit exam. TAKS measures students' knowledge based on achievement levels

on the following sections reading, English/language arts, math, science and writing.

TAKS primary function is to measure students ability to learn at grade level and thus to

progress on to the next grade. This exam provides a gauge for teachers to adapt methods

and strategies, school administrators to modify curriculum and valuable data for school

district leaders and educational professionals.

APPENDIX B: TEACHER PERSONNEL FILE DATA COLLECTION

This is not a survey; this is data collected from teacher files.

Unique Teacher Identifier Number

School Information

Official school name:

Address:

City:

State:

Zip code:

School district:

Teacher Demographic Data

Age:

Gender:

Race/Ethnicity:

Education Background

      1. Level (bachelors, masters, doctorate);

      2. College name;

      3. Major field of study and Minor field of study;

      4. Concentration of study;

      5. Date of graduation;

      6. Total credit hours (in undergraduate) for subject area currently teaching; and

      7. Total credit hours (in graduate) for subject area.

Teacher Experience

1. Total years teaching;

2. Total years teaching content material (math);

3. Total years teaching disadvantaged students; and

4. Total years teaching content material (math) to disadvantage students.

Institution Data

1. Teacher start date;

2. Total length of time teaching at this institution;

3. Total length of time in teaching; and

4. Subjects that the teacher teaches (example: Math – Algebra, Geometry, etc.).

Praxis Scores

1. Total attempts at taking the Praxis exam before passing; and

2. Praxis Exam Test Scores: Mathematics

Certifications

1. Is the techer considered a Highly Qualified Teacher (HQT)?;

2. Texas or standard state licensure;

3. Probationary;

4. Emergency;

5. Temporary or provisional;

6. Alternative certification program; and

7. Content area certification

APPENDIX C: STUDENT PROFILE AND EXAM SCORES

*This is not survey, but data collected from the students records.

Unique Student Identifier Number

School Information

Official school name:

Address:

City:

State:

Zip code:

School district:

Student Demographic Data

      1. Age;

      2. Gender;

      3. Race/Ethnicity;

      4. Is this student an English Language Learner? Yes/No; and

      5. Is this student on free or reduced lunch? Yes/No

TAKS student data (by demographic - listed above):

      1. Freshman year: student math score in 2008-09;

      2. Sophmore year: student math score in 2008-09;

      3. Junior year (if student took TAKS): student math dcore in 2008-09;

APPENDIX D: TEACHER SURVEY

Email Paragraph (this is the e-mail that will be sent to all teachers):

Dear {{Title}} {{Teacher}},

As you are aware, the Thurgood Marshall College Fund RADICAL program supports your school's reform initiatives with funding from the Bill and Melinda Gates Foundation. We have administered the survey to all teachers throughout the six school reform programs. This questionnaire asks about your perceptions, assessments and ways TMCF can support the school through salary increases, benefit increases and free professional development avenues. The survey will take approximately five to 10 minutes to complete. All data will be reported in aggregated form and you will not be identified.

If you have any questions, please feel free to call me directly at 571.205.9467

Thank you,

Olivia Blackmon

Director of Research

Thurgood Marshall College Fund

Opening Paragraph (this will be on the front of the survey)

Dear {{Title}} {{Teacher}},

Thank you for taking the TMCF 2009 Teacher survey. This survey will take approximately five to 10 minutes to complete. All data is confidential. You have unique identifier. When you respond to this questionnaire please reflect on the 2008-2009 academic year.

At any time you can close out of the survey, and return at a later time. You can also scroll back to previously answered questions. If you have any questions please feel free to call me at: 571.205.9467 or email me at oblackmon@me.com

Thank you,

Olivia Blackmon

Director of Research

Thurgood Marshall College Fund

Unique Identifier Number

School Information

Official school name:

Your Sense of Efficacy Scale

Please indicate the degree to which you agree or disagree with each statement below by circling the appropriate letters to the right of each statement.

SA	A	UN	D	SD
Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree

1. When a student does better than usual in mathematics, it is often because the teacher exerted a little extra effort.
2. I will continually find better ways to teach mathematics
3. Even if I try very hard, I will not teach mathematics as well as most other subjects.
4. When the mathematics grades of students improve, it is often due to their teacher having found a more effective teaching approach.
5. I know how to teach mathematics concepts effectively.
6. I will not be very effective in monitoring mathematics activities.
7. If students are underachieving in mathematics, it is most likely due to ineffective mathematics teaching.
8. I will generally teach mathematics ineffectively.
9. The inadequacy of a student's mathematics background can be overcome by good teaching.
10. When a low-achieving child progresses in mathematics, it is usually due to extra attention given by the teacher.
11. I understand mathematics concepts well enough to be effective in teaching elementary mathematics.

12. The teacher is generally responsible for the achievement of students in mathematics.
13. Students' achievement in mathematics is directly related to their teacher's effectiveness in mathematics teaching.
14. If parents comment that their child is showing more interest in mathematics at school, it is probably due to the performance of the child's teacher.
15. I will find it difficult to use manipulatives to explain to students why mathematics works.
16. I will typically be able to answer students' questions.
17. I wonder if I will have the necessary skills to teacher mathematics.
18. Given a choice, I will not invite the principal to evaluate my mathematics teaching.
19. When a student has difficulty understanding a mathematics concept, I will usually be at a loss as to how to help the student understand it better.
20. When teaching mathematics, I will usually welcome student questions.
21. I do not know what to do to turn students on to mathematics.

APPENDIX E: SAMPLE LETTER FOR PARENTS

Sample Letter for all Parents

School Letterhead

October 1, 2009

Dear Parent or Guardian:

My name is Olivia Blackmon and I am conducting a research study in your child's class. I am interested in studying the relationship between student achievement on the math section of the *Texas Assessment for Knowledge and Skills* (TAKS) and math teacher quality/ teacher efficacy.

I am working in conjunction with your school (XXX) to conduct this research. As you are aware, each student takes the *Texas Assessment of Knowledge and Skills* (TAKS) at the end of ninth, tenth, and twelth grades. Student level data is reported back to the school with key demographics by race/ethnicity, gender, age and other categories set by the federal government. These reports help the school track changes in student achievement year-by-year by academic disciplines such as math, reading and writing.

For this research, I will be looking at math TAKS scores for each student at the school from 2006-2009. In addition, data on English Language Learner (ELL), gender, race/ethnicity and student income level (based on free-lunch or reduced lunch) will be collected for this research.

To protect your child's privacy, principals at each school will remove all student identification which includes but is not limited to: social security number, date of birth, name, address, etc. before the researcher receives the student achievement data from them. No other demographic data (for example: parent education, single-parent, age) will be part of the data

Your child will not be surveyed, interviewed or observed during the process of this research project. All data in the research analysis will be reported in aggregated form. Your child will not do anything outside of his or her normal classroom activities and there is no risk to your child.

If you have any questions or concerns about the study, or if you would like to withdraw your child from the study, please contact me at:

Olivia M. Blackmon

olivia.blackmon@me.com

571-205-9467

If you have questions about your rights as a research participant, please contact:

George Mason University Office of Research Subject Protections

hsrb@gmu.edu

703-993-4121

Sincerely,

Olivia M. Blackmon

APPENDIX F: INFORMED CONSENT - TEACHERS

School Letterhead

Identifying Effective Teachers
and the Overall Positive
Impact on Student Performance
INFORMED CONSENT FORM: Teacher Personnel Files

October 1, 2009

Dear Teacher,

RESEARCH PROCEDURES

This research is being conducted to examine the relationship between the quality of math teachers and the predictability of state exam scores in mathematics on the *Texas Assessment for Knowledge and Skills* (TAKS). The study is an in-depth examination of Thurgood Marshall College Fund's two high school reform projects in Texas: Jesse H Jones High School and Royal High School. It will compare the schools' scores in the context of the surrounding public school system. The analysis will review how specific subject content areas in teachers' backgrounds can directly impact the achievement gaps with gender and minorities.

Data on math teacher personnel files will be collected by the administration, including:

      1. Demographic information – age, gender and race/ethnicity;

      2. Education background – degree, major, credit hours in subject, and date of graduation;

      3. Total number of students by class for years 2006-07, 2007-08 and 2008-09;

      4. Total pass rates by class for years 2006-07, 2007-08 and 2008-09;

      5. Average student grade by race/ethnicity and gender for years 2006-07, 2007-08 and 2008-09;

      6. Teacher starting date at the school;

       7. Praxis exam scores; and

       8. Teacher certifications.

Before the researcher receives the information from the administration, the administration will remove your name, social security number, date of birth, etc. Your file will be tracked by a unique identifier given by the administration. You will receive your unique identifier so that you can access the online survey. Each teacher's unique identification will be used to track their classroom and students' outcomes over three years from 2006-07 to 2008-09. The teacher's unique identifier will also be correlated with their students' identification codes to track student outcomes based on the teachers they were assigned to in a given year.

RISKS

There are no foreseeable risks for participating in this research.

BENEFITS

There are no direct benefits to you for participating in the research.

CONFIDENTIALITY

The data in this study will be confidential. All data forwarded to the researcher will have names removed and anonymous identifiers in place of names. All data will be stored in the researcher's office in a file drawer with a lock/key device. All data will be examined only by the researcher, Olivia Blackmon, a PhD student at George Mason University. If you agree to participate in this study, please sign the consent form and return it to Olivia Blackmon.

PARTICIPATION

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.

CONTACT

This research is being conducted by Olivia M. Blackmon at George Mason University and overseen by Dr. Patricia Masters at George Mason University.

If you have questions about the research, please contact:

Olivia M Blackmon

olivia.blackmon@me.com

571-205-9467

or:

Dr Patricia Masters

pmasters@gmu.edu

If you have questions about your rights as a research participant, please contact:

George Mason University Office of Research Subject Protections

hsrb@gmu.edu

703-993-4121

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT

I have read this form and agree to participate in this study please check the box below, sign and date it.

I have read this form and agree to participate in this study.

Print Name:

Sign Name:

Date

APPENDIX G: INFORMED CONSENT THURGOOD MARSHALL COLLEGE FUND

Identifying Effective Teachers

and the Overall Positive

Impact on Student Performance

INFORMED CONSENT FORM: Thurgood Marshall College Fund

RESEARCH PROCEDURES

This research is being conducted is to examine the relationship between the quality of math teachers and the predictability of student in classroom semester and final grades, pass rates and state exam scores in mathematics. The study will focus an in-depth examination of Thurgood Marshall College Fund's two high school reform projects. Royal High School and Jesse Jones High School in Texas have given me full permission to conduct this research.

The research will compare the school scores against the context of the surrounding public school system. The analysis will review how specific subject content areas in teacher background can directly impact the achievement gaps with gender and minorities.

If you agree to participate, you will be asked to provide the following data:

> 1. Individual student math and science scores on the following:

>> a. Semester grades

>> b. Final grades

>> c. Pass rates

>> d. State exam scores

> 2. Teacher personal files

> 3. Release an online qualitative survey to teachers

Both student and teacher data will be reported to me by a unique identifier and all names and/or social security numbers will be removed.

RISKS

There are no foreseeable risks for participating in this research.

BENEFITS

The benefits to you include:

1. An analysis of your student achievement

2. An analysis of the relationship between student achievement and teacher achievement

3. An analysis of teacher efficacy on student achievement.

In addition, the benefits to TMCF include:

1. A complete overview of the success your school reform has had on student achievement

2. An analysis to provide to grand holders for additional financial funding to your school.

CONFIDENTIALITY

The data in this study will be confidential. All data forwarded to my attention will have names removed and unique identifiers in place of names. All data will be stored in my office in a file drawer with a lock/key device. All data will only be examined by Olivia Blackmon, PhD student at George Mason University. The qualitative survey will request the teacher to input their unique identifier which will be correlated with their personal data file. For coded identifiable data (1) all names will not be included on the surveys and other collected data; (2) a code will be placed on the survey and other collected data; (3) through the use of an identification key, the researcher (Olivia Blackmon) will be able to link the survey to the identity; and (4) only the researcher (Olivia Blackmon) will have access to the identification key.

PARTICIPATION

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.

CONTACT

This research is being conducted by Olivia M. Blackmon at George Mason University and overseen by Dr. Patricia Masters at George Mason University. I may be reached at 571.205.9467 for questions or to report a research-related problem. You may also reach Dr. Patricia Masters at pmasters@gmu.edu. You may contact the George Mason University Office of Research Subject Protections at 703-993-4121 if you have questions or comments regarding your rights as a participant in the research.

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT

I have read this form and agree to participate in this study (for nonexempt research projects, include this statement and a place for the participant's signature and the date of signature).

_____

Name

_____

Date of Signature

_____

Date of Signature

Thurgood Marshall College Fund

Version date: 6.16.09

APPENDIX H: INITIAL SURVEY LETTER TO TEACHERS

Identifying Effective Teachers

and the Overall Positive

Impact on Student Performance

INFORMED CONSENT FORM

RESEARCH PROCEDURES

UNIQUE IDENTIFIER: XXXX

This research is being conducted to examine the relationship between the quality of math teachers and the predictability of state exam scores in mathematics on the Texas Assessment for Knowledge and Skills (TAKS). The study is an in-depth examination of Thurgood Marshall College Fund's two high school reform projects in Texas: Jesse H Jones High School and Royal High School. It will compare the schools' scores in the context of the surrounding public school system.   The analysis will review how specific subject content areas in teachers' backgrounds can directly impact the achievement gaps with gender and minorities.

If you agree to participate, you will be asked 21 scaled questions based on the *Mathematics Teaching Efficacy Beliefs Instrument* (MTEBI). Your data is confidential and at no time will the survey ask for your name; instead you are given a unique identifier which is XXX. The online survey will take approximately 15 to 20 minutes to complete. You do not have to finish the survey all at once. You can log out at anytime and re-enter into the survey by using your unique website URL, which is XXX

RISKS

There are no foreseeable risks for participating in this research.

BENEFITS

There are no direct benefits to you for participating in the research.

CONFIDENTIALITY

While it is understood that no computer transmission can be perfectly secure, reasonable efforts will be made to protect the confidentiality of your transmission. All data forwarded to the researcher will have names removed and anonymous identifiers in place of names. All data will be stored in the researcher's office in a file drawer with a lock/key device. All data will be examined only by the researcher, Olivia Blackmon, a PhD stu-

dent at George Mason University. If you agree to complete the survey, please enter your unique identifier listed at the top of the consent form on the first page of the online survey.

PARTICIPATION

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you decide not to participate or if you withdraw from the study, there is no penalty or loss of benefits to which you are otherwise entitled. There are no costs to you or any other party.

CONTACT

This research is being conducted by Olivia M. Blackmon at George Mason University and overseen by Dr. Patricia Masters at George Mason University.

If you have questions about the research, please contact:

Olivia M Blackmon

olivia.blackmon@me.com

571-205-9467

or:

Dr Patricia Masters

pmasters@gmu.edu

If you have questions about your rights as a research participant, please contact:

George Mason University Office of Research Subject Protections

hsrb@gmu.edu

703-993-4121

This research has been reviewed according to George Mason University procedures governing your participation in this research.

CONSENT

The George Mason University Human Subjects Review Board has waived the requirement for a signature on this consent form. However, if you wish to sign a consent, please contact:

Olivia M Blackmon

olivia.blackmon@me.com

571-205-9467

APPENDIX I: REMINDER EMAIL FOR TEACHER SURVEY

Welcome and thank you for participating in the

Teacher Efficacy Survey!

Dear {UserData:FIRSTNAME} {UserData:LASTNAME},

This is just a friendly reminder that you have been identified to be part of a select group of mathematics teachers to complete a survey on your beliefs and perceptions of teaching. The survey due date is XXX

As you are aware, Thurgood Marshall College Fund's RADICAL program supports your school's reform initiatives through funding by the Bill and Melinda Gates Foundation. We have administered the survey to all math teachers throughout the two school reform programs. This questionnaire asks about your perceptions, assessments and ways TMCF can support the school through salary increases, benefit increases and free professional development avenues. The survey will take approximately five to ten minutes to complete. All data will be reported in aggregated form and you will not be personally identified.

If you agree to participate, you will be asked 21 scaled questions based on the *Mathematics Teaching Efficacy Beliefs Instrument* (MTEBI). Your data is confidential, at no time will the survey ask for your name; instead you are given a unique identifier which is XXX. The online survey will take approximately 15 to 20 minutes to complete. You do not have to finish the survey all at once. You can log out at anytime, and re-enter into the survey by using your unique website URL.

If you have any questions, please feel free to call me directly at 571.205.9467

Thanks,

Olivia Blackmon

APPENDIX J: BIVARIATE ANALYSIS FOR EACH VARIABLE

Research Question One

What is the relationship between high school mathematics teachers' level of personal

self-efficacy based on the MTEBI and the overall achievement of minority high school

students as measured by the math section of the *Texas Assessment of Knowledge and*

*Skill*s (TAKS)?

    Grade 9.

      The bivariate regression analysis between teachers' level of PMTE and African-

American student achievement on the TAKS was found not to be significant $F(1, 7)$ 2.32,

$p =.170$, $r2 = .251$. The bivariate regression analysis between teachers' level of PMTE

and Hispanic student achievement on the TAKS was found not to be significant $F(1, 7)$

3.02, $p =.600$, $r2 = .041$. The bivariate regression analysis between teachers' level of

PMTE and White student achievement on the TAKS was found not to be significant $F(1,$

3) 3.16, $p =.613$, $r2 = .095$.

    Grade 10.

      The bivariate regression analysis between teachers' level of PMTE and African-

American student achievement on the TAKS was found not to be significant $F(1, 5)$ 5.77,

$p =.482$, $r2 = .103$. The bivariate regression analysis between teachers' level of PMTE

and Hispanic student achievement on the TAKS was found not to be significant $F(1, 4)$

.006, $p =.941$, $r2 = ..002$. The bivariate regression analysis between teachers' level of

PMTE and white student achievement on the TAKS was found not to be significant F(1, 1) .090, p =.814, r2 = .083.

Grade 11.

The bivariate regression analysis between teachers' level of PMTE and African-American student achievement on the TAKS was found not to be significant F(1, 5) .748, p =.427, r2 = .130. The bivariate regression analysis between teachers' level of PMTE and Hispanic student achievement on the TAKS was found not to be significant F(1, 5) 3.219, p =.133, r2 = .392. The bivariate regression analysis between teachers' level of PMTE and white student achievement on the TAKS was found not to be significant F(1, 1) 3.889, p =.299, r2 = .795.

Research Question Two

What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and the achievement high school students by gender as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?

Grade 9.

The bivariate regression analysis between teachers' level of PMTE and female student achievement on the TAKS was found not to be significant F(1, 7) .339, p =.579, r2 = .046. The bivariate regression analysis between teachers' level of PMTE and male student achievement on the TAKS was found not to be significant F(1, 7) .636, p =.451, r2 = .083.

Grade 10.

The bivariate regression analysis between teachers' level of PMTE and female student achievement on the TAKS was found not to be significant F(1, 6) 4.311, p =.083,

r2 = .418. The bivariate regression analysis between teachers' level of PMTE and male student achievement on the TAKS was found not to be significant F(1, 6) .010, p =.923, r2 = .002.

Grade 11.

The bivariate regression analysis between teachers' level of PMTE and female student achievement on the TAKS was found not to be significant F(1, 5) 2.482, p =.176, r2 = .332. The bivariate regression analysis between teachers' level of PMTE and male student achievement on the TAKS was found not to be significant F(1, 5) 1.962, p =.220, r2 = .282.

Research Question Three

What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and achievement of high school students on free or reduced lunch as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?

Grade 9.

The bivariate regression analysis between teachers' level of PMTE and students TAKS scores on free or reduced lunch was found not to be significant F(1, 7) .890, p =.377, r2 = .113. The bivariate regression analysis between teachers' level of PMTE and students TAKS scores not on free or reduced lunch was found not to be significant F(1, 7) .110, p =.760, r2 = .014.

Grade 10.

The bivariate regression analysis between teachers' level of PMTE and students TAKS scores on free or reduced lunch was found not to be significant F(1, 6) .229, p

=.649, r2 = .037. The bivariate regression analysis between teachers' level of PMTE and students TAKS scores not on free or reduced lunch was found not to be significant F(1, 4) .668, p =.460, r2 = .143.

Grade 11.

The bivariate regression analysis between teachers' level of PMTE and students TAKS scores on free or reduced lunch was found not to be significant F(1, 5) 2.875, p =.151, r2 = .365. The bivariate regression analysis between teachers' level of PMTE and students TAKS scores not on free or reduced lunch was found not to be significant F(1, 5) .770, p =.420, r2 = .134.

Research Question Four

What is the relationship between high school mathematics teachers' level of personal self-efficacy based on the MTEBI and achievement of high school students that are considered "at risk", as measured by the math section of the *Texas Assessment of Knowledge and Skills*(TAKS)?

Grade 9.

The bivariate regression analysis between teachers' level of PMTE and students TAKS scores that were considered "at-risk" was found not to be significant F(1, 7) .847, p =.388, r2 = .108. The bivariate regression analysis between teachers' level of PMTE and students TAKS scores there were not considered to be "at-risk" was found not to be significant F(1, 7) .070, p =.800, r2 = .010.

Grade 10.

The bivariate regression analysis between teachers' level of PMTE and students TAKS scores that were considered "at-risk" was found not to be significant F(1, 6) .594,

p =.470, r2 = .090. The bivariate regression analysis between teachers' level of PMTE

and students TAKS scores there were not considered to be "at-risk" was found not to be

significant F(1, 6) .166, p =.698, r2 = .027.

Grade 11.

The bivariate regression analysis between teachers' level of PMTE and students

TAKS scores that were considered "at-risk" was found not to be significant F(1, 5) 3.420,

p =.124, r2 = .460. The bivariate regression analysis between teachers' level of PMTE

and students TAKS scores there were not considered to be "at-risk" was found not to be

significant F(1, 5) .1.667, p =.253, r2 = .250.

Research Question Five

What is the relationship between high school mathematics teachers' level of outcome

mathematics teacher expectancy (MTOE) based on the MTEBI and the overall

achievement of minority high school students as measured by the math section of the

Texas Assessment of Knowledge and Skills (TAKS)?

Grade 9.

The bivariate regression analysis between teachers' level of MTOE and African-

American student achievement on the TAKS was found not to be significant F(1, 7)

1.441, p =.269, r2 = .171. The bivariate regression analysis between teachers' level of

MTOE and Hispanic student achievement on the TAKS was found not to be significant

F(1, 7) 1.618, p =.244, r2 = .188. The bivariate regression analysis between teachers'

level of MTOE and White student achievement on the TAKS was found not to be

significant F(1, 3) 2.664, p =.201, r2 = .470.

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Grade 10.

The bivariate regression analysis between teachers' level of MTOE and African-American student achievement on the TAKS was found not to be significant $F(1, 5)$ 1.533, $p = .271$, $r2 = .235$. The bivariate regression analysis between teachers' level of MTOE and Hispanic student achievement on the TAKS was found not to be significant $F(1, 4)$ 1.263, $p = .324$, $r2 = .240$. The bivariate regression analysis between teachers' level of MTOE and White student achievement on the TAKS was found not to be significant $F(1, 1)$ .242, $p = .709$, $r2 = .195$.

Grade 11.

The bivariate regression analysis between teachers' level of MTOE and African-American student achievement on the TAKS was found not to be significant $F(1, 5)$ .052, $p = .829$, $r2 = .010$. The bivariate regression analysis between teachers' level of MTOE and Hispanic student achievement on the TAKS was found not to be significant $F(1, 5)$ .060, $p = .817$, $r2 = .012$. The bivariate regression analysis between teachers' level of MTOE and White student achievement on the TAKS was found to be significant $F(1, 1)$ 406, $p = .032$, $r2 = .998$.

Research Question Six

What is the relationship between high school mathematics teachers' level of outcome expectancy based on the MTEBI and the achievement high school students by gender as measured by the math section of the *Texas Assessment of Knowledge and Skills* (TAKS)?

Grade 9.

The bivariate regression analysis between teachers' level of MTOE and female student achievement on the TAKS was found not to be significant $F(1, 7)$ .219, $p = 1.827$,

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r2 = .207. The bivariate regression analysis between teachers' level of MTOE and male

student achievement on the TAKS was found not to be significant F(1, 7) 2.009, p =.199,

r2 = .223.

Grade 10.

The bivariate regression analysis between teachers' level of MTOE and female

student achievement on the TAKS was found not to be significant F(1, 6) .239, p =642, r2

= .038. The bivariate regression analysis between teachers' level of MTOE and male

student achievement on the TAKS was found not to be significant F(1, 6) .526, p =.496,

r2 = .081.

Grade 11.

The bivariate regression analysis between teachers' level of MTOE and female

student achievement on the TAKS was found not to be significant F(1, 5) .143, p =.721,

r2 = .028. The bivariate regression analysis between teachers' level of MTOE and male

student achievement on the TAKS was found not to be significant F(1, 5) .023, p =.886,

r2 = .005.

Research Question Seven

What is the relationship between high school mathematics teachers' level of outcome

expectancy based on the MTEBI and achievement of high school students on free or

reduced lunch as measured by the math section of the *Texas Assessment of Knowledge*

and Skills (TAKS)?

Grade 9.

The bivariate regression analysis between teachers' level of MTOE and students

TAKS scores on free or reduced lunch was found not to be significant F(1, 7) 2.969, p

=.129, r2 = .298. The bivariate regression analysis between teachers' level of MTOE and

students TAKS scores not on free or reduced lunch was found not to be significant F(1, 7)

1.121, p =.325, r2 = .138.

Grade 10.

The bivariate regression analysis between teachers' level of MTOE and students

TAKS scores on free or reduced lunch was found not to be significant F(1, 6) .777, p

=.412, r2 = .115. The bivariate regression analysis between teachers' level of MTOE and

students TAKS scores not on free or reduced lunch was found not to be significant F(1, 4)

.498, p =.519, r2 = .111.

Grade 11.

The bivariate regression analysis between teachers' level of MTOE and students

TAKS scores on free or reduced lunch was found not to be significant F(1, 5) .012, p

=.916, r2 = .002. The bivariate regression analysis between teachers' level of MTOE and

students TAKS scores not on free or reduced lunch was found not to be significant F(1, 5)

.018, p =.899, r2 = .004.

Research Question Eight

What is the relationship between high school mathematics teachers' level of outcome

expectancy based on the MTEBI and achievement of high school students that are

considered "at risk" as measured by the math section of the *Texas Assessment of*

Knowledge and Skills (TAKS)?

Grade 9.

The bivariate regression analysis between teachers' level of MTOE and students

TAKS scores that were considered "at-risk" was found not to be significant F(1, 7) .783,

p =.406, r2 = .101. The bivariate regression analysis between teachers' level of MTOE

and students TAKS scores there were not considered to be "at-risk" was found not to be

significant F(1, 7) .070, p =.800, r2 = .010.

Grade 10.

The bivariate regression analysis between teachers' level of MTOE and students

TAKS scores that were considered "at-risk" was found not to be significant F(1, 6) 1.233,

p =.309, r2 = .170. The bivariate regression analysis between teachers' level of MTOE

and students TAKS scores there were not considered to be "at-risk" was found not to be

significant F(1, 6) .624, p =.460, r2 = .094.

Grade 11.

The bivariate regression analysis between teachers' level of MTOE and students

TAKS scores that were considered "at-risk" was found not to be significant F(1, 5) .143,

p =.721, r2 = .028. The bivariate regression analysis between teachers' level of MTOE

and students TAKS scores there were not considered to be "at-risk" was found not to be

significant F(1, 5) .047, p =.837, r2 = .009.

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CURRICULUM VITAE

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