The Effect of Teacher Degree Level, Teacher Certification, and Years of Teacher Experience on Student Achievement in Middle School Mathematics

Annette K. Sauceda
B.A., West Virginia University, 2003
M.A., West Virginia University, 2003

Submitted to the Graduate Department and Faculty of the School of Education of
Baker University in partial fulfillment of the requirements for the degree of
Doctor of Education in Educational Leadership

_____
Susan Rogers, Ph.D.
Major Advisor

_____
Harold Frye, Ed.D.

_____
Russ Kokoruda, Ed.D.

Date Defended: May 4, 2017

Abstract

The purpose of this study was to determine if there was a difference in student growth on the sixth, seventh, and eighth grade mathematics Measures of Academic Progress (MAP) among types of teacher certification, teacher degree levels, and years of teaching experience in a suburban school district in Kansas. The population consisted of middle school students and middle school mathematics teachers employed by the school district during the 2011-2012 academic year. Nine one-factor analyses of variance (ANOVAs) were conducted using student growth scores (fall 2011 to spring 2012) as the dependent variable and years of teaching experience, teacher degree level, and teacher certification as the independent variables. A post hoc analysis was conducted when an ANOVA produced a significant finding. Analyses revealed statistically significant differences in six of the nine research questions. Sixth grade students with teachers who were K-6 or K-9 certified had higher growth in mathematics than students with teachers who were certified in mathematics. Seventh grade students with teachers who were K-9 certified had higher mathematics growth than students with teachers who held other certifications. Seventh grade students with teachers who held a master's degree or higher had higher mathematics growth than students with teachers who held only a bachelor's degree. The mean growth of eighth grade students with teachers who had a bachelor's degree was higher than the mean growth of eighth graders with teachers who had a master's degree or higher. Sixth grade students with teachers who had 0-5 years of experience had lower mathematics growth than students with teachers who had more than five years of experience. Seventh grade students who had teachers with more than 30

years of experience had higher mathematics growth than students who had teachers with 30 years of experience or less.

Because the findings were mixed, it is important to continue to research which teacher qualifications have a positive relationship with student achievement. Students deserve high-quality teachers in each classroom, each year. School administrators are responsible for hiring the most qualified individuals for each position, and the results from studies such as this can help lead them in the decision-making process.

Dedication

This study is dedicated to my students and colleagues: past, present, and future. I dedicate this completed dissertation and degree to my mother, Sheila Fordyce-Hartley. She has taught me to be a strong, independent woman and I will be forever grateful for the love and support she has given me.

Acknowledgements

This completed dissertation would not be possible without the guidance and support of several family members, friends and colleagues. First, I would like to thank my husband, Tony, for the many evenings and weekends that he had "Boys Day" and allowed me to work on this dissertation. Without your support, this dream would not have come true.

I would also like to thank several colleagues who supported me through this journey. Thank you, Dr. Kokoruda and Dr. Hanna for being my Directed Field Experience mentors. Thank you, Scott Currier, Diana Tate, Steve Heinauer, and Sue Denny for being encouraging bosses who gave me pep talks when I needed them. I would like to thank Elizabeth Parks for guiding me through the data collection process, Jill Bergerhofer for her expertise of the MAP assessment, and Barb McAleer for her experience with the mathematics curriculum. I have always looked up to all of you and hope to make a positive influence on students and education like you have.

Many thanks go to Dr. Hole and Dr. Waterman for helping me analyze and understand the statistics of this study, and Dr. Frye and Dr. Kokoruda for being on my dissertation committee. Most of all from the bottom of my heart, I would like to thank Susan Rogers for never giving up on me. You pushed me when I needed to be pushed and encouraged me when I needed encouragement. I would not have completed this dissertation without your support and guidance. Thank you for making this possible!

Table of Contents

List of Tables

Chapter One

Introduction

In 2001, the United States Congress enacted the No Child Left Behind Act (NCLB), which redefined the federal government's role in the framework of K-12 education. The goal behind NCLB was to improve student academic achievement and teacher performance to ensure all students reached proficiency in mathematics and reading by 2014 (Gingerich, 2003). NCLB required school districts across the nation to monitor student achievement and to measure Adequate Yearly Progress (AYP) (United States Department of Education, 2002). The Kansas Department of Education (KSDE) (2010a) stated that, "AYP is the process for making judgment as to whether or not all public elementary and secondary schools, districts, and states are reaching the annual targets to ensure that all students achieve the state's definition of proficiency by 2013-2014" (p. 2).

While NCLB drove the nation's focus on student achievement, it also drove school districts' focus on hiring and retaining the most effective teachers. To attain this lofty goal, NCLB required highly qualified teachers teach all elementary and secondary students. KSDE (2008) defined a highly-qualified teacher as a person who "1) has a minimum of a bachelor's degree, 2) has a valid Kansas teaching license, and 3) has demonstrated subject-matter competency in each of the core academic subjects in which he or she teaches" (sect. 4).

According to The U.S. Department of Education (2006), highly qualified teachers are one of the most influential factors in raising student achievement. In a study conducted by Tobe (2008), the presence of a highly-qualified teacher was the only factor

that had a statistically significant effect on raising student test scores in Houston, Texas. In a time of high expectations and high stakes standardized tests, having highly qualified teachers in classrooms has never been more important.

Studies have been conducted to determine which qualities make teachers highly qualified. Rice (2008) claimed that teacher quality is the most important school-related factor that impacts student achievement. Rice also stated that there is evidence that teachers who have earned advanced degrees have a positive impact on high school mathematics achievement; however, this was only true if the advanced degrees were held in the content area. Dial (2008) studied the effect of teacher experience and teacher degree levels on student achievement in mathematics and communication arts in an urban school district in Missouri. She found that years of teaching experience, as well as the interaction between years of experience and degree level, influenced student achievement in both communication arts and mathematics.

Background

This study was conducted in an affluent, suburban school district located in northeast Kansas. The school district is referred to as School District B for this study. School District B spans over 91 square miles and consists of five high schools, nine middle schools, 20 elementary schools, one alternative high school, and one Center for Advanced Professional Studies, with a total enrollment of approximately 21,134 students during the 2011-2012 school year. The certified staff members had an average of 13.2 years of experience. Certificated staff includes classroom teachers, counselors, school psychologists, nurses, and administrators; however, only classroom teachers were examined in this study.

Illustrated in Table 1 are the enrollment trends in School District B from 2009-2010 to 2011-2012 school years. During this time, the district's enrollment and diversity steadily increased. The enrollment increased by 663 students, the percentage of non-Caucasian students increased 2.1%, and the number of students eligible for free and reduced lunch increased 1.8% from the 2009-2010 school year to the 2011-2012 school year.

Table 1

School District B Demographic Information 2009-2012

	2009-2010	2010-2011	2011-2012
Enrollment (*n*)	21,368	21,633	21,731
Gender *n* (%)			
Males	10,962 (51.3)	11,192 (51.6)	11,192 (51.5)
Females	10,406 (48.7)	10,471 (48.4)	10,539 (48.5)
Ethnicity *n* (%)			
Caucasian	17,395 (81.4)	17,406 (80.5)	17,230 (79.3)
Non-Caucasian	3,973 (18.6)	4,227 (19.5)	4,501 (20.7)
SES *n* (%)			
Free/Reduced Lunch	1,313 (6.1)	1,605 (7.4)	1,713 (7.9)
Full Pay	20,055 (93.9)	20,028 (92.6)	20,018 (92.1)

Note. SES = Socioeconomic Status. Adapted from the *Report Card*, by Kansas State Department of Education, 2010, 2011, 2012.

The focus of the study was on sixth, seventh, and eighth-grade students in the district. Table 2 includes the enrollment and demographics of students enrolled in sixth,

seventh, and eighth grades during the 2011-2012 school year. The enrollment and demographics are very similar at each grade level.

Table 2

School District B Middle School Demographic Information 2011-2012

	Sixth grade	Seventh grade	Eighth grade
Enrollment	1,772	1,679	1,729
Gender *n* (%)			
Males	904 (51.0)	874 (52.1)	886 (51.2)
Females	868 (49.0)	805 (47.9)	843 (48.8)
Ethnicity *n* (%)			
Caucasian	1,415 (79.9)	1,372 (81.7)	1,379 (79.8)
Non-Caucasian	357 (20.1)	307 (18.3)	350 (20.2)
Socioeconomic Status *n* (%)			
Free/Reduced Lunch	141 (7.9)	129 (7.7)	139 (8.1)
Full Pay	1,631 (92.1)	1,550 (92.3)	1,590 (91.9)

Note. Adapted from *Report Card*, by Kansas State Department of Education, 2010, 2011, 2012.

Between the school years 2008-2009 and 2011-2012, the number of middle school mathematics courses taught by highly qualified teachers fluctuated slightly. The data in Table 3 show the percentage of all middle school mathematics courses taught by highly qualified teachers. The percentage of highly qualified teachers is very similar over the three-year period.

Table 3

Mathematics Classes Taught by Highly Qualified Teachers 2009-2012

	2009-10	2010-11	2011-12
Middle School Mathematics	97.63%	98.79%	97.16%

Note. Adapted from *Report Card*, by Kansas State Department of Education, 2010, 2011, 2012.

Teaching positions in School District B are determined by full-time equivalent (FTE) student enrollment. Table 4 illustrates the FTE of mathematics teachers in grades 6, 7, and 8 from 2009-2010 through 2011-2012. An important note is the fact that some teachers are assigned courses other than mathematics or multiple grade level mathematics courses. For example, one teacher may teach sixth grade mathematics and seventh grade mathematics or eighth-grade mathematics and eighth-grade science. If a teacher in this study taught mathematics at multiple grade levels, they were matched to the correct student in both grades.

Table 4

Full-time Equivalent of Grades 6-8 Mathematics 2009-2012

	2009-10	2010-11	2011-12
Sixth grade mathematics teachers	16	16	18
Seventh grade mathematics teachers	16	16	18
Eighth grade mathematics teachers	16	16	18
Total mathematics teachers	48	48	54

Note. Adapted from a personal communication, School District B Coordinating Mathematics Teacher, November 20, 2011.

Every kindergarten through eighth grade student in School District B is required to participate in the Measures of Academic Progress (MAP) assessment. The MAP

assessment is a computerized adaptive assessment which is aligned with both national and Kansas state standards. It is administered in the fall and spring of each academic year and was implemented in School District B in 2005 (School Improvement Specialist, personal communication, November 20, 2011). Both the mathematics and reading portions of the MAP assessment are leveled, meaning the difficulty of the assessment will either increase or decrease, depending on how the student performs. For example, if a student answers an item correctly, the assessment presents the student with a more difficult item. Conversely, if the student answers an item incorrectly, the assessment gives the student a less rigorous item (p. 4). Each item on the assessment is assigned a difficulty value, and the assessment is then scored using this scale (based on a Rasch, or RIT, scale) (p. 5). The RIT scale measures grade level knowledge on a continuum of skills for each student in the fall and spring of an academic year. The Northwest Evaluation Association (NWEA), located in Portland, Oregon, is the organization responsible for the development and scoring of the MAP and has placed all assessment items on the RIT scale according to their difficulty. Each increasing RIT is assigned a numeric value, or RIT score, that indicates a higher level of difficulty. RIT scores of sixth, seventh, and eighth-grade students typically fall between 190 and 260 out of a possible 305 (NWEA, 2011).

Displayed in Table 5 are the mean RIT scores for sixth, seventh, and eighth-grade students in School District B for the 2011-12 school year, as compared with the mean RIT scores for the rest of the United States. As the table illustrates, the district's mean RIT scores, was consistently above the national average. The average RIT score increased from fall 2011 to spring 2012 in the district.

Table 5

Measures of Academic Progress (Mathematics) Mean RIT Scores

	Fall 2011	Spring 2012
Sixth Grade		
District Average	231.4	237.9
National Average	220.0	223.8
Seventh Grade		
District Average	237.3	244.0
National Average	226.0	228.3
Eighth Grade		
District Average	243.6	246.6
National Average	230.0	232.7

Note. Adapted from *MAP Guidelines*, by District Director of Assessment and Research, June 15, 2012.

The RIT score measures knowledge regardless of grade level, so the information is helpful to track individual student progress from academic year to academic year. NWEA (2011) defines growth as, "the change in a student's score and improvement in achievement over time" (sect. 1). Growth targets can be developed to project anticipated growth over a specific period for each student. The growth targets are determined by identifying how much growth a student typically makes across set intervals of time (NWEA, 2011).

Statement of the Problem

The passage of the No Child Left Behind Act of 2001 brought about changes to teacher qualifications and certification. School districts were required to hire teachers

who were considered "highly qualified" by state and federal standards. Many factors make an effective teacher and can be used to measure effective teaching. One way to measure the effectiveness of a teacher is to analyze student growth during the school year in which they were taught by a specific teacher. This study focuses particularly on middle school mathematics teachers to determine if there is a significant relationship between the years of teacher experience, the type of teacher certification, and the teacher degree level and student achievement.

Goal One of School District B's Strategic Plan (School District B, 2015b) stated that "We will improve the academic performance of each student," (p. 8) and Focus Two of the Strategic Plan specifically states that each kindergarten through eighth-grade student will participate in the MAP assessment to provide progress data. The MAP assessment measures student growth from fall to spring during a school year. NWEA provides resources for teachers, students, parents, and administrators to utilize to assist in each student's growth. One resource provided is a sample Goal Setting Worksheet (Appendix A) which can be used to develop attainable goals to help students meet their growth target from fall to spring. Each growth target is determined by NWEA and is based on the student's present academic level and the typical growth over a period from the normative data. Table 6 includes the percentage of students who met their MAP growth target from the 2009-10 school year to the 2011-12 school year in School District B.

Table 6

Percentage of Students Meeting MAP Mathematics Growth Target 2009-2012

	2009-2010	2010-2011	2011-2012
Sixth grade	56.2	54.2	57.7
Seventh grade	61.0	58.4	66.4
Eighth grade	55.3	56.3	46.4
Total Average	57.5	56.3	56.8

Note. Adapted from a personal communication, School District B Director of Assessment and Research, September 29, 2012.

Based on the data displayed in Table 6, the percentage range of students who met their growth target from 46.4% of eighth grade students during the 2011-2012 school year to 66.4% of seventh grade students during the 2011-12 school year. This 20% difference is evidence that there are many factors that attribute to the mathematics growth of middle school students. If student growth is significantly affected by teacher qualities such as years of teacher experience, type of teacher certification, and type of teacher degree level, it would be important for school districts to collect this information about prospective teachers during the recruitment and hiring processes for middle school mathematics teachers.

Purpose of the Study

The purpose of this study was to determine if there is a difference in student growth on the sixth, seventh, and eighth-grade mathematics MAP among types of teacher certification in School District B. The second purpose of this study was to determine if there is a difference in student growth on the sixth, seventh, and eighth-grade mathematics MAP among teacher degree levels in School District B. The final purpose

of this study was to determine if there is a difference in student growth on the sixth, seventh, and eighth-grade mathematics MAP among years of teacher experience in School District B.

Significance of the Study

Per School District B Board Policy 6220 (2015a), "The District shall employ the best prepared and the best-qualified persons available" (sect. 1). The district grants increases in teaching salaries based on the years of experience and degree level the teacher attains, but it is unknown whether this translates into higher student achievement. Because this is the basis for the selection of employees, it is best to examine whether years of teaching experience and teacher preparation have a positive effect on student achievement. This study potentially could provide valuable information to the district regarding which teachers are best qualified for certified middle school mathematics positions. The findings of this study could potentially be helpful to Human Resources and building administrators for recruitment and retention purposes. Ludwigsen (2009) recommended further research on teacher certification and its relationship with student achievement. The mixed results illustrated in chapter two demonstrate the need to conduct further studies in this area. The findings of this study would also add to the literature on this topic.

Delimitations

Lunenburg and Irby (2008) stated, "Delimitations are self-imposed boundaries set by the researcher on the purpose and scope of the study" (p. 134). These delimitations help narrow the focus of the research. There are five delimitations in this study:

1. The location of the study is a suburban school district in northeast Kansas.

2. The population was limited to middle school mathematics teachers.

3. Only data from the 2011-2012 school year was utilized in this study.

4. The mathematics portion of the MAP assessment was the only measurement of student achievement utilized in this study.

Assumptions

Roberts (2004) indicated that assumptions are the factors taken for granted in a study. This study incorporated the following four assumptions:

1. The MAP data was an accurate and reliable measure of student achievement.

2. All data compiled by the school district was accurate.

3. Middle school mathematics teachers provided accurate data related to years of experience and preparation.

4. The data entry and coding processes were accurate.

Research Questions

The following questions guided this study, which examined whether teacher certification, teacher degree level, and years of teacher experience have a positive effect on student learning according to the results of the MAP assessment in middle school mathematics.

RQ1. To what extent is there a difference in student growth on the sixth-grade mathematics MAP among types of teacher certification in School District B?

RQ2. To what extent is there a difference in student growth on the seventh-grade mathematics MAP among types of teacher certification in School District B?

RQ3. To what extent is there a difference in student growth on the eighth-grade mathematics MAP among types of teacher certification in School District B?

RQ4. To what extent is there a difference in student growth on the sixth-grade mathematics MAP between teacher degree levels in School District B?

RQ5. To what extent is there a difference in student growth on the seventh-grade mathematics MAP between teacher degree levels in School District B?

RQ6. To what extent is there a difference in student growth on the eighth-grade mathematics MAP between teacher degree levels in School District B?

RQ7. To what extent is there a difference in student growth on the sixth-grade mathematics MAP among years of teacher experience in School District B?

RQ8. To what extent is there a difference in student growth on the seventh-grade mathematics MAP among years of teacher experience in School District B?

RQ9. To what extent is there a difference in student growth on the eighth-grade mathematics MAP among years of teacher experience in School District B?

Definition of Terms

Per Lunenburg and Irby (2008), "key terms central to a study and used throughout a dissertation" should be defined. For clarity, the following key terms of this study are defined.

No Child Left Behind (NCLB). Public Law No. 107-110, also known as the No Child Left Behind Act of 2001, was enacted with the purpose of ensuring that all children reach proficiency on challenging state academic assessments by the year 2014 (Gingerich, 2003).

Measures of Academic Progress (MAP) assessment. MAP is a computer-based adaptive assessment administered in the fall and spring of each academic year to all kindergarten through eighth-grade students in School District B (NWEA, 2011).

RIT score. A RIT score is a numerical score that reflects a student's readiness level, allows teachers to know where to begin instruction and is aligned directly to state standards (NWEA, 2012).

Growth target. A growth target is a goal developed to describe anticipated growth over time based on normative data. The growth target identifies how much growth a student typically makes across set intervals of time (NWEA, 2012).

Years of teaching experience. Years of teaching experience is the number of years of teaching a teacher has in the classroom setting. No less than one-half of a school year can be counted as a full teaching year (Executive Director of Human Resources, personal communication, March 30, 2017).

Teacher certification. Teacher certification refers to the four possible certification areas for Kansas middle school mathematics teachers: (a) K-6 Generalist, (b) K-9 Generalist, (c) Mathematics 5-8, and (d) Mathematics 6-12 (KSDE, 2008).

Organization of Study

This study is presented in five chapters. Chapter one included the background of the study, statement of the problem, the purpose of the study, the significance of the study, the delimitations, the assumptions, the research questions, the definition of terms, and the organization of the study. Provided in chapter two is a basic rationale for the study by reviewing the relevant literature. In chapter three, a detailed description of the methodology used for this study is provided. Presented in chapter four are the findings of the study, which includes hypothesis testing of the nine research questions. In chapter five, a study summary, findings related to the literature, and the conclusions are included.

Chapter Two

Review of Literature

According to the Center for Public Education (2006), research indicates that the achievement gap between students with effective teachers and students with ineffective teachers widens each year. When students receive instruction from good teachers over consecutive years, significant gains in student achievement are likely. The results of the studies have shown that mathematics achievement was greater when students were enrolled with mathematics teachers who have earned a degree in mathematics than when taught by a mathematics teacher who did not earn a degree in mathematics (Goldhaber & Brewer, 1997). Evidence suggests that teacher quality is the number one determinant of student achievement, but it is very difficult to measure (Haycock, 1998).

This chapter includes a discussion of the literature about highly qualified teachers, teacher certification, teacher experience, and teacher degree level and their effect on student academic growth, specifically in middle school mathematics. This chapter is organized into four sections. The first section provides an overview of "highly-qualified" teachers, a definition created through the No Child Left Behind Act of 2001 (NCLB). Included in the second section is a review of literature about teacher certification. The focus of the third section is on years of teaching experience. The fourth and last section pertains to teacher degree levels.

Highly-Qualified Teachers

Included in this section is a review of the literature pertaining to highly-qualified teachers, as defined by NCLB, and the impact of the instruction delivered by those teachers. According to NCLB, a highly-qualified teacher is required in all core academic

subject areas. Highly qualified is determined by three essential criteria: 1) attaining a bachelor's degree or better in the subject being taught, 2) obtaining full state teacher certification, and 3) demonstrating knowledge of the subject being taught. Subsequently, the Kansas Department of Education (KSDE) (2008) defines a highly qualified teacher as "a person who 1) has a minimum of a bachelor's degree, 2) has a valid Kansas teaching license, and 3) has demonstrated subject matter competency in each of the core academic subjects in which he or she teaches" (sect. 4).

The Every Student Succeeds Act (ESSA) was implemented in 2015 to focus on the clear goal to prepare all students for success in college or careers. The ESSA stated that any teacher who meets the state certification requirements is considered highly qualified. ESSA gave each state the authority to determine all teacher certification requirements. State education departments are now able to determine the requirements needed for teachers to deliver core content instruction.

In 2006 Plunkett conducted a two-stage qualitative study with 14 administrators and 34 teachers across Wisconsin. The purpose of the study was to determine the characteristics of a highly-qualified teacher and the ways in which states and school districts can help teachers maintain that status. Plunkett surveyed administrators from her doctoral cohort and asked them to operationalize their beliefs on effective teachers and to identify three effective teachers. In a survey, the identified effective teachers were asked to provide demographic information, rank themselves given 25 statements about characteristics of highly qualified teachers, and answer three open-ended questions about highly qualified teachers. The data from each survey was analyzed and coded for themes and patterns. The results indicated that the administrators and teachers in the study

agreed that pedagogy, intrinsic qualities, content knowledge, and engaging students are necessary characteristics of highly qualified teachers.

In 2008, Gass conducted a quantitative study to determine the impact of highly qualified teachers on student achievement, based on the Grade Eight Proficiency Assessment (GEPA) in the areas of science, mathematics, and language. The study was conducted in New Jersey, and student achievement results from 503 public middle schools were used. In New Jersey, the definition of a highly-qualified teacher is someone who 1) holds at least a bachelor's degree, 2) is fully certified by the New Jersey Department of Education and 3) demonstrates competence in each core academic subject that he or she teaches. For the study, highly qualified teachers were defined as being certified in the core subject of mathematics. Eighth-grade general education students GEPA scores from the 2004-2005 school year were examined in the study. The results of the study showed a positive statistically significant relationship between highly qualified teachers and advanced proficient scores on the GEPA in all three subject areas: science, mathematics, and language.

In 2009, Finkbonner examined the relationship between student reading and mathematics achievement and highly-qualified versus non-highly-qualified teachers. The sample of teachers in this study consisted of 20 fourth and fifth grade teachers from five school districts in central Kentucky. Results from the 2008 Kentucky Core Content Test (KCCT) in reading and mathematics were used to measure the achievement of the 448 students used for this study. The results of the student indicated that fourth grade students with highly-qualified teachers performed at higher levels on the KCCT in reading than students with non-highly-qualified teachers, but no relationship was found

for mathematics. For fifth grade students, the results showed a significant positive relationship in reading and mathematics scores for students with highly-qualified teachers.

Ludwigsen (2009) studied strategies used by seventh grade mathematics teachers to determine which strategies caused greater student growth. The study was conducted in a diverse school district of more than 17,000 students in Delaware. Using data from the MAP, Ludwigsen identified 16 seventh grade mathematics teachers from the district's three middle schools and collected observational data based on lesson plans, classroom observations, and classroom culture during the spring of 2008. The results of the study determined that effective classrooms consist of well-planned lessons, a positive learning environment, and evident mathematical knowledge of the teacher. Ludwigsen (2009) recommended further research on teacher certification and content knowledge and the relationship it has on student achievement.

Silver (2009) conducted a study to determine if there was a relationship between National Board Certified teachers and student achievement. Silver analyzed three years of archived student data from the North Carolina End-of-Grade (EOG) assessment of students in grades 3-5. The study sample consisted of 162 teachers, and the independent variable was National Board Certification. Of the 162 teachers in the study, 81 were National Board Certified, and 81 were non-National Board Certified. Silver found a significant positive relationship between third grade mathematics achievement and National Board Certified teachers, but a positive relationship did not exist in higher grades.

Mascia (2010) used data results from the mathematics portion of the Ohio Achievement Test in the 2006-2007 school year to examine the effect of the program the school district implemented to increase the content knowledge of the middle school mathematics teachers through their participation in graduate coursework. Mascia also examined the effects of the stability of teacher assignment. The teacher sample included 114 sixth grade, 105 seventh grade, and 107 eighth grade mathematics teachers from a large public school district in Cleveland, Ohio. The results of the study indicated that the stability of teacher assignment had a statistically significant relationship with sixth grade student achievement, but not for seventh and eighth grade student achievement. The results of the study indicated that program participation had a significant, but negative effect on sixth grade student achievement and no significant effect on seventh and eighth grade student achievement.

In 2010, Tomasson conducted a study in which he analyzed the student achievement data from the 2006 and 2007 Georgia Criterion-Referenced Competency Test (CRCT) of 449 students from two Georgia middle schools. Using the data, Tomasson aimed to find potential predictors of student achievement for the 2008 mathematics test for eighth graders. The results of the analysis showed three predictors: the sixth grade mathematics percent correct, the seventh grade mathematics scaled score, and the seventh grade science performance level. These predictors provided the administration and teachers with an early indicator of which students would score lower on the eighth grade mathematics test. This knowledge allowed for those students to be paired with competent mathematics teachers and receive interventions to improve the students' performance on the eighth grade mathematics CRCT.

In a quantitative study conducted in an urban Virginia public school district from 2006 to 2010, Andrews (2012) sought to determine whether a relationship existed between 101 highly qualified elementary and middle school (grades 3-9) teachers and student achievement, as determined by the state's Standards of Learning (SOL) test. The results of the study led to the conclusion that there was no significant relationship between highly qualified elementary and middle school (grades 3-9) teachers and student achievement in the areas of English-reading, mathematics, or social studies. However, the results of the study showed a significant relationship between highly qualified elementary and middle school (grades 3-9) teachers and student achievement in science.

Teacher Certification

Teachers can become certified in multiple ways. This section reviews several studies that have been conducted to determine if the type of certification or licensure a teacher holds influences student achievement. The results of the studies vary based on traditional vs. alternative certification, elementary vs. secondary certification, and mathematics certification vs. no mathematics certification. Some studies reveal positive relationships between types of certification while other studies reveal no relationships. Some results reveal higher student achievement in mathematics while being taught by a teacher with an elementary certification while some results reveal higher achievement with a secondary certified teacher. The mixed results illustrated the need to conduct further studies in the area of teacher certification and student achievement.

Sparks (2004) conducted a meta-analysis of five studies based on the effect that teacher certification has on student achievement. The independent variable was teacher certification (certification in mathematics, certification in fields other than mathematics).

The dependent variable utilized in the study was National Educational Longitudinal Survey (NELS) individual student achievement. The results of the study indicated that students who were taught by certified mathematics teachers had higher gains than students who were taught by teachers who were not certified to teach mathematics.

In 2006, Veale conducted a study in a diverse West Texas school district to determine the difference in students' achievement between traditionally and alternatively certified teachers. The researcher analyzed student data from the 2006-2007 Texas Assessment of Knowledge and Skills (TAKS) to determine if differences existed in student achievement. Based on data collected from 132 secondary teachers, Veale (2007) found that a larger percentage of eighth grade students taught by alternatively certified teachers passed all sections of the TAKS, including mathematics, than the percentage of students who were taught by traditionally certified teachers.

In 2007, Miller conducted a study of elementary and secondary certified teachers in a public school district located in a western state that, at the time of the study, only had three types of licensure, elementary (K-8), secondary (7-12), and special education (K-12). The school district included in the study had six middle schools, grades 7 and 8. Miller analyzed the mathematics results from the 2006-2007 Criterion Referenced Test (CRT). The results of the study indicated that on average, students who were taught by an elementary certified teacher scored significantly higher than students who were taught by a secondary certified teacher.

In 2008, Richardson examined the relationship between teacher certification and student achievement in middle school mathematics. The study took place in Alabama and utilized 2007 Alabama Reading and Mathematics Test (ARMT) results. Twenty full-

time teachers were surveyed for background information, and student test results were aligned with the teachers for analysis. Richardson found a significant positive relationship between student performance on the ARMT and teachers who had secondary certification.

Spraque (2008) studied the relationship between academic achievement in mathematics of high school students who were taught by certified teachers in three large school districts in California. Based on the results of the California Standards Test-Mathematics (CSTM), Spraque found that there was a significant positive relationship between student achievement and certified teachers in two of the three school districts. The results of the study revealed the negative impact of hiring teachers who are not certified to teach mathematics and the importance that teacher certification has on student performance.

In 2008, Stilwell conducted a quantitative study to determine whether teacher certification status was significantly related to student achievement in private Christian schools in Oklahoma and Texas. Information from 114 elementary and secondary teachers was used in this study. Data from the spring 2005 and spring 2006 tests from the Stanford Achievement Test, Tenth Edition (SAT-10) results were used to measure student achievement. The results of the study found that no significant relationship existed between student achievement and teacher certification.

Dingman (2010) studied the relationship between student achievement in seventh and eighth-grade mathematics and traditional teacher programs versus alternative teacher programs. Included in the study were included 1,040 students and 36 teachers from school districts in Colorado and Washington. The results of the study indicated that

student performance was not affected by their teachers' type of teacher licensure program.

Staropoli (2010) suggested that eleventh grade special education students in an urban public high school in New Jersey who were taught by state certified mathematics teachers scored higher on the mathematics section of the High School Proficiency Assessment (HSPA) than eleventh grade special education students who were taught by a non-certified mathematics teacher. The study sample consisted of 76 eleventh grade special education students and five teachers, four with state mathematics certification and one without state mathematics certification. The results of the study supported the claim that the greater the content knowledge of the teacher, the greater likelihood the teacher would have the ability to improve student performance in the content area.

In 2011, Matagi-Tofiga conducted a study to determine if there was a significant relationship between teacher certification and student achievement. From the 2004-2005 school year to the 2008-2009 school year, demographic information, including the type of certification of 70 teachers from American Samoa public secondary schools, was used to determine if there was a significant relationship between teacher certification and student achievement in mathematics, as measured to by the SAT-10. The results of the study indicated there was a statistically significant relationship between student achievement scores and teacher certification.

Rieke (2011) conducted a study in which the eighth grade mathematics results of the Indiana Statewide Testing for Educational Progress-Plus from spring 2009 to spring 2010 were analyzed to determine if there was a correlation between student achievement and teachers who were certified in secondary mathematics education or teachers who

were certified in elementary education with an endorsement in middle school mathematics. The study included 9,581 students whose teachers were secondary certified and 2,059 students whose teachers were elementary certified with the endorsement in middle school mathematics. The results of the study indicated that the student achievement growth was significantly greater for students who were taught by teachers who were certified in secondary mathematics education.

Moss (2012) conducted a mixed-method study in six school districts in Mississippi. Moss analyzed the results of 7,105 sixth, seventh, and eighth grade students' mathematics scores on the Mississippi Curriculum Test Second Edition (MCT2). Moss disaggregated the student assessment results among the 92 mathematics teachers who taught the students. Of the 92 mathematics teachers, 51 were alternatively certified, and 41 were traditionally certified. Thus, 60.4% of students were taught by teachers with alternative certification, and 39.6% of students were taught by teachers with traditional certification. The research focused on the relationship between types of teacher certification and student achievement and the relationship between years of teaching experience and student achievement. Moss concluded that there was a statistically significant difference in sixth grade mathematics achievement scores and type of teacher certification. Students with mathematics teachers who were traditionally certified had higher assessment scores than students with mathematics teachers who were alternatively certified. Results of the study also indicated that there was a statistically significant difference in seventh grade mathematics achievement scores and type of teacher certification. Students with mathematics teachers who were alternatively certified had higher assessment scores than students with mathematics teachers who were traditionally

certified. However, the results did not show a statically significant relationship in eighth grade mathematics achievement scores based on the type of teacher certification.

In 2013, Duke studied the effects of teacher certification and student achievement in middle school mathematics. Duke compared Standards of Learning achievement scores of minority students in grades six, seven, and eight from 2005 to 2009 in an urban school district in Virginia. The results of the data analysis indicated significantly higher scores for students who were taught by teachers with traditional certification compared to students who were taught by teachers with alternative certification.

Blackmer (2014) conducted research to determine if there was a relationship between student achievement and seven teacher characteristics in Seventh Day Adventist elementary schools across the United States. The seven teacher characteristics were 1) teacher certification, 2) teacher degree level, 3) years in the present school, 4) years teaching in an Adventist school, 5) years taught in an area in which a teacher is certified, 6) years of elementary experience of the teacher, and 7) teacher training. The results of the study indicated that there was no significant relationship between teacher certification and grade 5 and grade 8 mathematics achievement.

Harris (2014) studied the mathematics achievement of students whose teachers were certified up to grade 6 versus teachers who were certified up to grade 8 or 9. The researcher utilized archival data from the 2011 and 2012 Tennessee Comprehensive Assessment Program (TCAP) math assessments of 72 teachers and 1,294 students, grades 4-8, in a rural Tennessee school district. Based on the results of the independent samples *t* test, no significant difference was found between the student achievement results based on teacher certification.

In 2015, Johnson focused on the correlation between bilingual education teachers' certification and fourth grade bilingual students' reading and mathematics achievement as measured by the State of Texas Assessment of Academic Readiness (STAAR). Johnson (2015) analyzed teacher certification route (traditional v. alternative) and certification field: bilingual/English as a Second Language (ESL), bilingual education supplemental-Spanish, ESL, bilingual Spanish, generalist, or self-contained. Johnson found significant correlations between student mathematics achievement and teacher certification fields.

In 2015, Fernandez examined the effect teacher certification has on student achievement in Guam Department of Education high schools using data from the SAT-10. Data collected in this study was for students in grades 9-12 who took the SAT-10 between the 2009-2010 and the 2011-2012 school years. The researcher examined certification type of 156 mathematics and reading teachers from the five high schools in the school district. The results of the study revealed no significant difference between student achievement scores and teacher certification.

Grigsby (2015) conducted a study to determine if there was a difference in student performance on state standardized tests based on teacher certification routes. The researcher compared student test scores of traditionally certified teachers versus student test scores of alternatively certified teachers. The 2011-2012 STAAR mathematics achievement data of students in grades 3-8 was utilized in this study. The results of the data analysis suggested that there was a significant difference between the student achievement results and teacher certification in grades 4-7, but no significant difference between the student achievement results and teacher certification in grades 3 and 8. The

findings revealed that the student achievement results were higher in grades 4-7 with traditionally certified teachers.

Years of Teacher Experience

One teacher characteristic that is often associated with student achievement is years of teaching experience. While many studies indicate that the more years of experience a teacher has, the higher the student achievement, there are studies that reveal that is not always the case. This section summarizes several studies that focus on years of teaching experience and the wide range of results on how that has affected student achievement.

In 2005, Ferguson conducted a causal-comparative research study in two school districts north of Houston, Texas to determine if years of teaching experience had an effect on middle school mathematics achievement. Ferguson analyzed data collected from the TAKS in the spring of 2004. Included in the study were 97 teachers and 6,391 students in grades 6-8. The results of the study indicated that there was a statistically significant relationship between years of teaching experience and student mathematics achievement.

Swan (2006) conducted research in a large urban school district in Florida. A survey of 282 middle school mathematics teachers was used to collect demographic information such as certification, years of experience, degree type, and degree level. While analyzing the student achievement levels of 24,766 middle school students, using results from the 2003-2004 and 2004-05 Florida Comprehensive Assessment Test in mathematics, the results indicated that students of teachers with more years of teaching

experience performed significantly higher than students of teachers with fewer years of teaching experience.

Reed (2007) interviewed and surveyed 46 teachers to collect data regarding historical, educational, and teacher training information. Reed analyzed test results from the third grade Colorado Student Assessment Program mathematics assessment from 2004 to 2005 and compared the student achievement with the years of teaching experience. The results of the study indicated that teachers with more years of experience had students with higher achievement in mathematics.

Dial (2008) used data from the communication arts and mathematics portions of the Missouri Assessment Program to determine if years of teaching experience influenced student achievement in grades 3-8 and 11 in a mid-size urban school district in northwest Missouri. Dial analyzed data from 2005-2006 and 2006-2007 school years. The result of the study indicated that students of the seventh and eighth-grade mathematics teachers with 11-19 years of teaching experience had the highest mean score on the mathematics portion of the Missouri Assessment Program.

In 2008, Richardson examined the relationship between years of teaching experience and student achievement in middle school mathematics. The study took place in Alabama and utilized 2007 ARMT results. Twenty full-time teachers were surveyed for background information, and student test results were aligned with the teachers for analysis. Richardson found a significant relationship between student performance on the ARMT and teachers with five or more years of experience.

Zhang (2008) studied the relationship between years of teaching and student science achievement. He examined 655 sixth, seventh, and eighth grade students and

their 12 science teachers from four middle schools in a large urban school district in Utah between fall 2005 and spring 2008. Data from the Discovery Inquiry Test (DIT) in Science was used to measure student achievement, and a teacher demographic information questionnaire was used to measure teacher variables. Years of teacher experience did not show any statistically significant influence on student achievement in science.

In 2009, Abernathy examined the relationship between teacher experience and elementary student mathematics achievement in grade 3-5. Information and data for 310 teachers and 6,093 students from the Gaston County School District in North Carolina for the 2007-2008 school year were used for this study. Results from the 2008 North Carolina End-of-Grade mathematics test were used to analyze student achievement. The results of the study showed a statistically significant positive impact of teacher experience on student mathematics achievement.

In 2009, Becoats conducted a study in an urban school district in North Carolina to measure the effect of years of teaching experience on student achievement in middle school mathematics. Thirty-nine teachers were included in the study and were grouped into two categories: 1) teachers with 1-5 years of experience, and 2) teachers with more than five years of experience. The results of the study indicated the more years of teaching experience a teacher had, the higher the mean growth was for students, but the results were not statistically significant.

O'Donnell (2010) conducted a study in a California public school district during the 2008-2009 school year to determine if the years of teaching experience had a positive effect on student achievement. O'Donnell analyzed data collected by the California

Department of Education to determine student growth. The results of the study indicated that the years of teaching experience had a statistically significant positive effect on student achievement.

As mentioned in a previous section, Matagi-Tofiga (2011) conducted a study to determine if there was a significant relationship between years of teaching experience and student achievement. The details of the study were previously mentioned. The results of the study indicated there was no statistical significance between student achievement scores and years of teaching experience.

The details of Moss' study from 2012 were explained in a previous section. Moss analyzed the results of 7,105 sixth, seventh, and eighth grade students' mathematics scores on the MCT2. One of the focuses of the Moss study was the relationship between years of teaching experience and student achievement. The results of the study showed that there was a statistically significant relationship between the years of teaching experience and student mathematics achievement. Students with mathematics teachers who taught 0-3 years, 6-10 years, and more than 10 years had higher scores on the MCT2 mathematics assessment than students with mathematics teachers who had 3-5 years of teaching experience.

In 2014, Blackmer conducted research to determine if there was a relationship between student achievement and seven teacher characteristics in Seventh Day Adventist elementary schools across the United States. One of the seven characteristics was teacher experience. The results of the study indicated that there was a significantly positive relationship between years of teaching experience and grade 5 and grade 8 mathematics

achievement. The longer the teacher taught in the current school, the higher the student achievement.

Harris (2014) studied the mathematics achievement of students whose teachers were novices, mid-career, or veterans based on years of teaching experience. The researcher utilized archival data from the 2011 and 2012 TCAP math assessments of 72 teachers and 1,294 students, grades 4-8, in a rural Tennessee school district. Based on the results of the Tukey post hoc comparisons, a statistically significant difference was found between the student achievement results based on years of teaching experience. The results of the study suggested that students of mid-career teachers and veteran teachers made greater gains than students of novice teachers.

Teacher Degree Levels

Most school districts across the United States look at teacher degree levels when screening applications and recognize degree levels on salary scales because there is a positive relationship between student achievement, in most cases. This section summarizes several studies that link advanced degree levels (master's degree or higher) with student achievement. However, the results of some studies show no relationship between degree levels and student achievement.

Rugraff (2004) conducted a study of eight school districts in a Midwestern city during the 2000-2001 school year to determine if there was a significant relationship between student ACT achievement and teacher degree level. The study used archival data collected for the Annual School Report Card. The results of the study indicated a significant relationship between the percentage of students scoring at or above the ACT national average and the percentage of teachers with master's degrees or higher.

In a previous section, the details of the study that Swan conducted in 2006 were presented. Swan surveyed 282 middle school mathematics teachers in Florida to collect demographic information such as certification, years of experience, degree type, and degree level. The results indicated that students of teachers with advanced degrees performed significantly higher than students of teachers without advanced degrees.

The details of Dial's study from 2008 were shared in a previous section. Dial used data from the communication arts and mathematics portions of the Missouri Assessment Program to determine if teacher degree level influenced student achievement in grades 3-8 and 11 in a mid-size urban school district in northwest Missouri. The result of the study indicated that secondary teachers with a master's degree or higher had a larger percentage of students performing in the "proficient" and "advanced" categories in both communication arts and mathematics portions of the Missouri Assessment Program than did students with teachers with only a bachelor's degree.

Zhang (2008) studied the relationship between teacher degree level and student science achievement. Population details were shared in a previous section. Data from the DIT in Science were used to measure student achievement, and a teacher demographic information questionnaire was used to measure teacher variables. The results of the study indicated that science teachers with a master's degree or higher in science or education significantly and positively influenced student science achievement.

Abernathy (2009) examined the relationship between teacher degree level and elementary student mathematics achievement in grades 3-5. More details about this study were shared in a previous section. The results of the study showed no significant impact on student mathematics achievement based on teacher degree level.

In 2009, Arnette conducted descriptive research on the impact highly qualified teachers had on the academic achievement of secondary students (grades 9-11) from three public school systems in Georgia based on the student passing rate on the state standardized state assessment, dropout rates, and graduation rates during the 2004-2007 academic years. The independent variable was the percent of teachers with advanced degrees, and the dependent variables were student achievement on standardized tests, student dropout rates, and student graduation rates. The results of the study indicated that the percentage of teachers with advanced degrees correlated with student achievement on standardized tests; therefore, the research hypothesis was only partially supported. In addition, the results indicated a statistically significant decrease in dropout rates and a statistically significant increase in graduation rates for students with teachers who had advanced degrees.

Morris (2010) conducted a study to determine if there is a relationship between teacher certification and the student reading and mathematics achievement of 129 students in grades 4 and 5 in New Mexico. New Mexico utilized the New Mexico 3 Tiered Licensure System to determine teacher licensure. Level 1 (Provisional Teacher) was an entry-level rank for teachers who were new to the profession or were in an alternative licensure program. Level 2 (Professional Teacher) was a more advanced rank achieved after a teacher provided three years of evidence of attaining certain skills. Level 3 (Master Teacher) was the most advanced level and could be obtained if a teacher possessed a master's degree and had demonstrated complex instructional and leadership skills. The student achievement results from the 2007 and 2008 New Mexico Standards Based Assessment were analyzed in this study. The results of the study indicated a

significant positive relationship between the teacher licensure level and gains in student mathematics achievement.

Mentioned in a previous section, Matagi-Tofiga (2011) conducted a study to determine if there was a significant relationship between teacher degree levels and student achievement. The details of the study were shared previously. The results of the study indicated there were no statistically significant relationships between student achievement scores and teacher degree level; however, there was a greater increase in mathematics achievement by students who had teachers with master's degrees or higher than students who had teachers with bachelor's degrees.

In 2012, Leak examined the relationship between teacher educational background characteristics such as degree level, coursework, and certification and student achievement in preschool, kindergarten and first grade students. The researcher randomly chose at least 20 students from 1,277 schools from across the United States to utilize for the study. The results of the research concluded that there were no added benefits of having a teacher with a master's degree or higher for kindergarten and first grade students.

Blackmer (2014) conducted research to determine if there was a relationship between student achievement and seven teacher characteristics in Seventh Day Adventist elementary schools across the United States. The teacher characteristics were listed in a previous section. The results of the study indicated that there was a significantly positive relationship between degree levels and grade 5 and grade 8 mathematics achievement. Students who had teachers with a master's degree or higher had higher mathematics achievement than students who had teachers with a bachelor's degree.

As mentioned in a previous section, Harris (2014) studied the mathematics achievement of students whose teachers held a bachelor's degree only versus teachers who held a master's degree or above. The researcher utilized archival data from the 2011 and 2012 TCAP math assessments of 72 teachers and 1,294 students, grades 4-8, in a rural Tennessee school district. Based on the results of the independent samples *t* test, a significant difference was found between the student achievement results based on teacher degree levels. The results of the study suggested that students made higher gain scores with teachers who held a master's degree or above.

Summary

Chapter two included a discussion of the literature that focused on highly qualified teachers, teacher certification, years of teacher experience, and teacher degree level and their effect on student academic growth. Each section focused on studies that linked these teacher characteristics to student achievement. In Chapter three, the topics of research design, population and sample, instrumentation, data collection procedures, data analysis and hypothesis testing, and the limitations as related to this study are presented.

Chapter Three

Methods

The purpose of this study was to determine whether a teacher's degree level, certification, and years of teaching experience had an effect on middle school mathematics achievement. The methodology employed to address the research questions is presented in the chapter. The chapter is organized into seven sections: research design, population and sample, sampling procedures, instrumentation, data collection procedures, data analysis and hypothesis testing, and limitations.

Research Design

A quantitative approach with a causal-comparative research design was utilized in this study. The causal-comparative design was appropriate because it is used to determine relationships between variables (Lunenburg & Irby, 2008). The categorical independent variables in this study included the middle school mathematics teacher's degree level, teacher certification, and years of teaching experience. The independent variables were gathered using the responses from the Letter to Teachers with Survey (see Appendix B) for each teacher in the sample. The dependent variable in this study was individual student growth from fall 2011 to spring 2012 on the MAP mathematics test.

Population and Sample

The population consisted of middle school students (N = 5,180) enrolled in School District B and middle school mathematics teachers (N = 54) employed by the school district during the 2011-2012 academic year. This school district was chosen because of the researcher's ability to gather and analyze student data and teacher information. The sample consisted of middle school students enrolled in School District

B during the 2011-2012 academic year who participated in the fall 2011 MAP and the spring 2012 MAP (N = 4,928) and middle school mathematics teachers employed by School District B during the 2011-2012 academic year who participated in the Letter to Teachers with Survey (N = 52).

Sampling Procedures

The sample for this study was a non-random, purposive sample of middle school mathematics teachers in one school district. Lunenburg and Irby (2008) described purposive sampling as selecting a sample based on the researcher's experience or knowledge of the group to be sampled. Students were selected for this sample based on the following criteria: the student had to be enrolled in one of the nine middle schools selected for the study and had to have taken the MAP assessment in the fall of 2011 and the spring of 2012. The criteria used to select teachers for this sample was the teacher had to be employed by the school district as a middle school mathematics teacher during the 2011-2012 academic year.

Instrumentation

Two instruments were used to measure the variables in this study. The Measure of Academic Progress (MAP) was used to measure the dependent variable, student mathematics growth. The Letter to Teachers with Survey was developed to gather the independent variables of teachers' years of experience, degree level, and licensure. The MAP was developed by the Northwest Evaluation Association (NWEA) and is a computerized adaptive assessment that has been utilized by school districts nationwide to determine a student's academic instructional level. The mathematics portion of the MAP assessment consists of 52 items. During the fall of 2011, all middle school students were

administered the Math Survey 6+ with the Goals version of the MAP assessment. During the spring of 2012, all sixth and seventh-grade students were again administered the Math Survey 6+ with the Goals version, but eighth-grade students were administered the End of Course Algebra I version of the MAP assessment. Although eighth graders participated in two different versions of the assessment from fall 2011 to spring 2012, growth was still measurable because regardless of the test version, all MAP assessments scores are based on the same RIT scale, or Rasch unit (NWEA, 2009). The teacher survey (see Appendix B) is a 10-item, pencil/paper survey developed specifically for this study. The survey was designed to gain background knowledge of the degree level, years of teaching experience, and certification of the teachers in the sample.

Measurement. For all research questions, student growth was measured by subtracting the fall MAP score from the spring MAP score for each student. The calculated difference equals the student growth. Years of teaching experience was measured by the teacher responses to questions on the Letter to Teachers with Survey. For questions 1-4, the teachers had to write a number as their answer. Question 1 determined the grade level the teacher taught during the 2011-2012 school year: 6, 7, or 8. Question 2 of The Letter to Teachers with Survey measured the number of years the teacher had been a teacher, excluding student teaching and substitute teaching. The number of years the teacher had taught at the middle school level (grades 6, 7, 8) was measured by question 3. Question 4 measured the number of years the teacher had taught the same position as they taught during the 2011-2012 school year. Question 5 of The Letter to Teachers with Survey was used as a filter to determine which teachers were dropped from the study because it asked the teacher if they took an extended leave of

absence during the 2011-2012 school year. If the teacher answered "yes" to question 5, they were excluded from the study. Question 6 of The Letter to Teachers with Survey measured teacher degree level and questions 7-10 measured teacher certification (K-6 Generalist, K-9 Generalist, 5-8 Mathematics, 6-12 Mathematics) for which teachers were asked to check all that apply. After this information had been collected, the numerical variables were categorized to conduct the hypothesis testing. Middle school mathematics teachers were organized into seven groups based on the number or years of teaching experience: (a) 0-5 years, (b) 6-10 years, (c) 11-15 years, (d) 15-20 years, (e) 21-25 years, (f) 26-30 years, and (g) more than 30 years. Next, the teachers were asked, "Do you have a master's degree of higher?" If the response was "yes," they were placed in the master's degree or higher group, and if the response was "no," they were placed in the bachelor's degree group.

Validity and reliability. According to Lunenburg and Irby (2008), validity is the degree to which an instrument measures what it purports to measure, and reliability is the degree to which an instrument consistently measures that in which it is designed to measure. The internal reliability of a survey refers to the relationship between the response of each item on the survey and the overall response or score for the instrument itself (Lunenburg & Irby, 2008). Because single-item measurement was used for the measurement of the demographics on this survey, the internal reliability of a scale was not an issue.

Northwest Evaluation Association (NWEA) developers created an extensive item bank of 15,000 test items to assess language usage, mathematics, reading, and science. The test item bank is regularly updated with new teacher-developed items. One of the

primary goals of creating an educational assessment is to create an assessment that can produce valid and reliable scores. Per Wang, McCall, Jiao, and Harris (2013), the concurrent validity evidence was established by comparing test scores on the MAP to test scores of the same content on other assessments such as AIMS, ISAT, ITBS, SAT9, and TAKS. Pearson correlation coefficients indicated that the relationship was moderate to strong and positively correlated with the content of these other assessments (meaning there is concurrent validity evidence). Table 7 shows the coefficient ranges for grades 6, 7, and 8. The correlation coefficient ranges were moderate to strong relationships.

Table 7

Concurrent Validity of Mathematics MAP Assessment

Grade	Correlation Coefficient Range
Sixth grade	0.87 - 0.89
Seventh grade	0.78 - 0.90
Eighth grade	0.79 - 0.88

Note. Adapted from *Construct Validity and Measurement Invariance of Computerized Adaptive Testing: Application to Measures of Academic Progress (MAP) Using Confirmatory Factor Analysis*, by S. Wang, M. McCall, H. Jiao, and G. Harris, 2013, Journal of Educational and Developmental Psychology, *3* (1), p. 98. Retrieved from https://www.nwea.org/content/uploads/2014/07/Construct-Validity-and-Measurement-Variance....pdf

Lunenburg & Irby (2008) stated, "Test-retest reliability is the degree to which scores on the same instrument are consistent over time" (p. 182). NWEA uses the test-retest approach to obtain evidence of the reliability of the MAP assessment. The test-retest reliability coefficient for the MAP (from fall to spring in 2002) in reading was .91 for all grades; for mathematics, it was .93 for grades 6 and 8, and .94 for grade 7; and for

language usage, it was .92 for all grades. Per Wang et al. (2013), the internal consistency coefficients (from fall to spring terms in 1999) of the MAP for reading was .94 for all three grade levels for both terms; for mathematics there was a range between .94 and .96 across grades and terms; and for MAP language usage, the coefficient was .94 for all grades and terms, except it was .93 for grade 8 in the spring term. These are all strong reliability coefficients.

Data Collection Procedures

A request was made to the Baker University Institutional Review Board (IRB) (see Appendix C). In February 2013, the IRB was approved (see Appendix D). A request for archived MAP data was sent to School District B's Director of Assessment and Research (see Appendix E). The approval was granted to conduct research in School District B on February 19, 2013 (see Appendix F). The Teacher Survey (see Appendix B) was distributed via district email. An email was sent to each participant with a brief explanation of the study, directions to reply with responses to the ten items, and a copy of the IRB approval letter. Teachers were assigned a non-identifiable label and were categorized based on the information gathered from the teacher survey. Students were also assigned non-identifiable labels; the Director of Assessment and Research provided the student data. The data were exported from a Microsoft Excel worksheet into IBM® SPSS® Statistics Faculty Pack 23 for Windows for data analysis and hypothesis testing.

Data Analysis and Hypothesis Testing

Nine one-factor analyses of variance (ANOVAs) were conducted using student growth scores as the dependent variable and years of teaching experience, teacher degree level, and teacher certification as the independent variables. A post hoc analysis was

conducted when an ANOVA produced a significant finding. The hypothesis testing addressed nine research questions. Below are restatements of each research question and a description of the hypothesis testing procedure.

RQ1. To what extent is there a difference in student growth on the sixth-grade mathematics MAP among types of teacher certification in School District B?

H1. There is a difference in student growth on the sixth-grade mathematics MAP among types of teacher certification in School District B.

A one-factor analysis of variance (ANOVA) was conducted to test the difference in student growth on the sixth-grade mathematics MAP among types of teacher certification in School District B. The level of significance was set at 0.05.

RQ2. To what extent is there a difference in student growth on the seventh-grade mathematics MAP among types of teacher certification in School District B?

H2. There is a difference in student growth on the seventh-grade mathematics MAP among types of teacher certification in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the seventh-grade mathematics MAP among types of teacher certification in School District B. The level of significance was set at 0.05.

RQ3. To what extent is there a difference in student growth on the eighth-grade mathematics MAP among types of teacher certification in School District B?

H3. There is a difference in student growth on the eighth-grade mathematics MAP among types of teacher certification in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the eighth-grade mathematics MAP among types of teacher certification in School District B. The level of significance was set at 0.05.

RQ4. To what extent is there a difference in student growth on the sixth-grade mathematics MAP between teacher degree levels in School District B?

H4. There is a difference in student growth on the sixth-grade mathematics MAP between teacher degree levels in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the sixth-grade mathematics MAP among teacher degree levels in School District B. The level of significance was set at 0.05

RQ5. To what extent is there a difference in student growth on the seventh-grade mathematics MAP between teacher degree levels in School District B?

H5. There is a difference in student growth on the seventh-grade mathematics MAP between teacher degree levels in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the seventh-grade mathematics MAP among teacher degree levels in School District B. The level of significance was set at 0.05

RQ6. To what extent is there a difference in student growth on the eighth-grade mathematics MAP between teacher degree levels in School District B

H6. There is a difference in student growth on the eighth-grade mathematics MAP between teacher degree levels in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the eighth-grade mathematics MAP among teacher degree levels in School District B. The level of significance was set at 0.05

RQ7. To what extent is there a difference in student growth on the sixth-grade mathematics MAP among years of teacher experience in School District B?

H7. There is a difference in student growth on the sixth-grade mathematics MAP among years of teacher experience in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the sixth-grade mathematics MAP among years of teacher experience in School District B. The level of significance was set at 0.05.

RQ8. To what extent is there a difference in student growth on the seventh-grade mathematics MAP among years of teacher experience in School District B

H8. There is a difference in student growth on the seventh-grade mathematics MAP among years of teacher experience in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the seventh-grade mathematics MAP among years of teacher experience in School District B. The level of significance was set at 0.05.

RQ9. To what extent is there a difference in student growth on the eighth-grade mathematics MAP among years of teacher experience in School District B?

H9. There is a difference in student growth on the eighth-grade mathematics MAP among years of teacher experience in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the eighth-grade mathematics MAP among years of teacher experience in School District B. The level of significance was set at 0.05.

Limitations

The limitations of a study are "factors that may have an effect on the interpretation of the findings or the generalizability of the results" (Lunenburg & Irby, 2008, p. 133). The researcher does not control limitations. Limitations of this study included the following:

1. A multitude of factors can affect student mathematical growth. Student growth on the MAP test was potentially influenced by many factors other than the years of teaching experience and preparation of the mathematics teachers.

2. Conditions surrounding the administration of the MAP test may vary among teachers. The instruction and the test-taking environment may have been inconsistent among teachers included in the study.

Summary

The purpose of this study was to determine whether teacher's degree level, teacher certification, and years of teaching experience had an effect on middle school mathematics achievement. The methodology employed to test the research hypothesis was presented in this chapter. The chapter was organized into seven sections: research design, population and sample, sampling procedures, instrumentation, data collection procedures, data analysis and hypothesis testing, and limitations. The results of the data analysis for this study are presented in chapter four.

Chapter Four

Results

The purpose of this study was to examine the relationship between academic growth in mathematics of middle school students in grades 6-8 in School District B utilizing MAP results from fall 2011 and spring 2012 and teacher certification, teacher degree level, and teacher experience. The previous three chapters presented the background, literature review, research questions and hypotheses, and methodology of the study. This chapter will present the research questions, hypotheses, and the results of hypothesis testing.

Hypothesis Testing

A one-factor analysis of variance (ANOVA) was conducted to test the differences students' average growth in mathematics based on teacher certification, teacher degree level, and teacher experience for each of the nine research questions. If the results of the analysis indicated a statically significant difference between at least two of the means, a follow-up post hoc was conducted to determine which pairs of means were different. The Tukey's Honestly Significant Difference (HSD) post hoc was conducted at $\alpha = .05$. Each research question is stated, followed by the corresponding hypothesis, and the results of the hypothesis testing are presented.

RQ1. To what extent is there a difference in student growth on the sixth-grade mathematics MAP among types of teacher certification in School District B?

H1. There is a difference in student growth on the sixth-grade mathematics MAP among types of teacher certification in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the sixth-grade mathematics MAP among types of teacher certification in School District B. The level of significance was set at 0.05. The results of the analysis indicated there was a statistically significant difference between at least two of the means, $F = 2.333$, $df = 5, 1573$, $p = 0.400$. See Table 8 for the means and standard deviations for this analysis. A follow-up post hoc was conducted to determine which pairs of means were different. The Tukey's Honestly Significant Difference (HSD) post hoc was conducted at $\alpha = .05$. Two of the differences between the means were statistically significant, and one difference was marginally significant. The mean growth of sixth grade students whose teachers were certified K-6 ($M = 7.34$) was higher than the mean growth of sixth grade students whose teachers were certified K-6 and 5-8 Mathematics ($M = 4.78$). The mean growth of sixth grade students whose teachers were certified K-9 ($M = 6.76$) was higher than the mean growth of sixth grade students whose teachers were certified K-6 and 5-8 Mathematics ($M = 4.78$). The mean growth of sixth grade sixth grade students whose teachers were certified 5-8 Mathematics ($M = 6.74$) was marginally higher than the mean growth of sixth grade students whose teachers were certified K-6 and 5-8 Mathematics ($M = 4.78$). Although the differences were not statistically significant, the hypothesis that there is a difference in student growth on the sixth-grade mathematics MAP among types of teacher certification in School District B was supported.

Table 8

Descriptive Statistics for H1

Certification	*M*	*SD*	*N*
K-6	7.34	6.48	166
K-9	6.76	5.85	503
5-8 Mathematics	6.74	6.49	250
6-12 Mathematics	6.38	6.50	116
K-9 and 5-8 Mathematics	6.41	6.58	443
K-6 and 5-8 Mathematics	4.78	6.09	101

RQ2. To what extent is there a difference in student growth on the seventh-grade mathematics MAP among types of teacher certification in School District B?

H2. There is a difference in student growth on the seventh-grade mathematics MAP among types of teacher certification in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the seventh-grade mathematics MAP among types of teacher certification in School District B. The level of significance was set at 0.05. The results of the analysis indicated there was a statistically significant difference between at least two of the means, $F = 6.571$, $df = 7, 1589$, $p = 0.000$. See Table 9 for the means and standard deviations for this analysis. A follow-up post hoc was conducted to determine which pairs of means were different. The Tukey's Honestly Significant Difference (HSD) post hoc was conducted at $\alpha = .05$. Five of the differences between the means were statistically significant, and two differences were marginally significant. The mean growth of seventh grade students whose teachers were certified K-9 ($M = 8.67$) was higher than the mean growth of

seventh grade students whose teachers were certified 5-8 Mathematics (M = 5.06). The mean growth of seventh grade students whose teachers were certified K-9 (M = 8.67) was higher than the mean growth of seventh grade students whose teachers were certified K-9 and 5-8 Mathematics (M = 6.44). The mean growth of seventh grade students whose teachers were certified K-9 (M = 8.67) was higher than the mean growth of seventh grade students whose teachers were certified K-6 and 5-8 Mathematics (M = 6.51). The mean growth of seventh grade students whose teachers were certified K-9 (M = 8.67) was higher than the mean growth of seventh grade students whose teachers were certified K-6 and K-9 (M = 6.08). The mean growth of seventh grade students whose teachers were certified 5-8 Mathematics (M = 5.06) was lower than the mean growth of seventh grade students whose teachers were certified 5-8 Mathematics and 6-12 Mathematics (M = 8.21). The mean growth of seventh grade students whose teachers were certified K-9 (M = 8.67) was marginally higher than the mean growth of seventh grade students whose teachers were certified K-6, K-9, and 5-8 Mathematics (M = 6.60). The mean growth of seventh grade students whose teachers were certified K-9 and 5-8 Mathematics (M = 6.44) was marginally lower than the mean growth of seventh grade students whose teachers were certified 5-8 Mathematics and 6-12 Mathematics (M = 8.21). Although the difference was not statistically significant, the hypothesis that there is a difference in student growth on the seventh-grade mathematics MAP among types of teacher certification in School District B was supported.

Table 9

Descriptive Statistics for H2

Certification	*N*	*M*	*SD*
K-9	478	8.67	6.83
5-8 Mathematics	67	5.06	6.60
6-12 Mathematics	103	7.47	6.06
K-9 and 5-8 Mathematics	488	6.44	6.46
K-6 and 5-8 Mathematics	128	6.51	6.31
5-8 Mathematics and 6-12 Mathematics	143	8.21	6.94
K-6 and K-9	97	6.08	6.18
K-6, K-9, and 5-8 Mathematics	93	6.60	6.50

RQ3. To what extent is there a difference in student growth on the eighth-grade mathematics MAP among types of teacher certification in School District B?

H3. There is a difference in student growth on the eighth-grade mathematics MAP among types of teacher certification in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the eighth-grade mathematics MAP among types of teacher certification in School District B. The level of significance was set at 0.05. The results of the analysis indicated there was not a statistically significant difference between at least two of the means, $F = 0.840$, $df = 5, 1527$, $p = 0.521$. See Table 10 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The hypothesis that there is a difference in student growth on the eighth-grade mathematics MAP among types of teacher certification in School District B was not supported.

Table 10

Descriptive Statistics for H3

Certification	*N*	*M*	*SD*
K-9	251	2.39	6.78
5-8 Mathematics	57	3.93	5.82
6-12 Mathematics	293	2.83	6.55
K-9 and 5-8 Mathematics	346	2.96	6.23
K-6 and 5-8 Mathematics	492	3.15	6.06
5-8 Mathematics and 6-12 Mathematics	94	2.63	6.15

RQ4. To what extent is there a difference in student growth on the sixth-grade mathematics MAP between teacher degree levels in School District B?

H4. There is a difference in student growth on the sixth-grade mathematics MAP between teacher degree levels in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the sixth-grade mathematics MAP between teacher degree levels in School District B. The level of significance was set at 0.05. The results of the analysis indicated there was not statistically significant difference between the means, $F = 0.073$, $df = 1, 1577$, $p = 0.787$. The mean for sixth grade students whose teachers did not have a master's degree ($M = 6.50$, $SD = 6.40$) was not different from the mean for sixth grade students whose teachers had a master's degree or higher ($M = 6.59$, $SD = 6.27$). The hypothesis that there is a difference in student growth on the sixth-grade mathematics MAP between teacher degree levels in School District B was not supported.

RQ5. To what extent is there a difference in student growth on the seventh-grade mathematics MAP between teacher degree levels in School District B?

H5. There is a difference in student growth on the seventh-grade mathematics MAP between teacher degree levels in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the seventh-grade mathematics MAP between teacher degree levels in School District B. The level of significance was set at 0.05. The results of the analysis indicated there was a statistically significant difference between the means, $F = 5.226$, $df = 1, 1595$, $p = 0.022$. The mean for seventh grade students whose teachers did not have a master's degree ($M = 6.21$, $SD = 7.16$) was lower than the mean for seventh grade students whose teachers had a master's degree or higher ($M = 7.41$, $SD = 6.57$). The hypothesis that there is a difference in student growth on the seventh-grade mathematics MAP between teacher degree levels in School District B was supported.

RQ6. To what extent is there a difference in student growth on the eighth-grade mathematics MAP between teacher degree levels in School District B.

H6. There is a difference in student growth on the eighth-grade mathematics MAP between teacher degree levels in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the eighth-grade mathematics MAP between teacher degree levels in School District B. The level of significance was set at 0.05. The results of the analysis indicated there was a marginally significant difference between the means, $F = 2.828$, $df = 1, 1531$, $p = 0.093$. The mean for eighth grade students whose teachers did not have a master's degree ($M = 3.43$, $SD = 6.11$) was higher than the mean for eighth grade students whose teachers had a

master's degree or higher (M = 2.78, SD = 6.36). Although the difference was not statistically significant, the hypothesis that there is a difference in student growth on the eighth-grade mathematics MAP between teacher degree levels in School District B was supported.

RQ7. To what extent is there a difference in student growth on the sixth-grade mathematics MAP among years of teacher experience in School District B?

H7. There is a difference in student growth on the sixth-grade mathematics MAP among years of teacher experience in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the sixth-grade mathematics MAP among years of teacher experience in School District B. The level of significance was set at 0.05. The results of the analysis indicated there was a statistically significant difference between at least two of the means, F = 3.560, df = 5, 1573, p = 0.003. See Table 11 for the means and standard deviations for this analysis. A follow-up post hoc was conducted to determine which pairs of means were different. The Tukey's Honestly Significant Difference (HSD) post hoc was conducted at $\alpha = .05$. Five of the differences between the means were statistically significant. The mean growth of sixth grade students whose teachers had 0-5 years of experience (M = 5.24) was lower than the mean growth of sixth grade students whose teachers had 6-10 years of experience (M = 7.16). The mean growth of sixth grade students whose teachers had 0-5 years of experience (M = 5.24) was lower than the mean growth of sixth grade students whose teachers had 11-15 years of experience (M = 5.90). The mean growth of sixth grade students whose teachers had 0-5 years of experience (M = 5.24) was lower than the mean growth of sixth grade students whose teachers had 16-20 years of

experience (*M* = 6.60). The mean growth of sixth grade students whose teachers had 0-5 years of experience (*M* = 5.24) was lower than the mean growth of sixth grade students whose teachers had 26-30 years of experience (*M* = 6.76). The mean growth of sixth grade students whose teachers had 6-10 years of experience (*M* = 7.16) was higher than the mean growth of sixth grade students whose teachers had more than 30 years of experience (*M* = 5.94). The hypothesis that there is a difference in student growth on the sixth-grade mathematics MAP among years of teacher experience in School District B was supported.

Table 11

Descriptive Statistics for H7

Certification	*M*	*SD*	*N*
0 to 5 Years	5.24	5.96	238
6 to 10 Years	7.16	6.37	534
11 to 15 Years	7.14	5.90	92
16 to 20 Years	6.60	6.28	405
26 to 30 Years	6.76	6.84	151
More than 30 Years	5.94	6.15	159

RQ8. To what extent is there a difference in student growth on the seventh-grade mathematics MAP among years of teacher experience in School District B.

H8. There is a difference in student growth on the seventh-grade mathematics MAP among years of teacher experience in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the seventh-grade mathematics MAP among years of teacher experience in School

District B. The level of significance was set at 0.05. The results of the analysis indicated there was a statistically significant difference between at least two of the means, F = 15.450, df = 5, 1591, p = 0.000. See Table 12 for the means and standard deviations for this analysis. A follow-up post hoc was conducted to determine which pairs of means were different. The Tukey's Honestly Significant Difference (HSD) post hoc was conducted at $\alpha = .05$. Five of the differences between the means were statistically significant. The mean growth of seventh grade students whose teachers had 0-5 years of experience (M = 7.20) was lower than the mean growth of seventh grade students whose teachers had more than 30 years of experience (M = 10.62). The mean growth of seventh grade students whose teachers had 6-10 years of experience (M = 6.49) was lower than the mean growth of seventh grade students whose teachers had more than 30 years of experience (M = 10.62). The mean growth of seventh grade students whose teachers had 11-15 years of experience (M = 6.90) was lower than the mean growth of seventh grade students whose teachers had more than 30 years of experience (M = 10.62). The mean growth of seventh grade students whose teachers had 16-20 years of experience (M = 6.73) was lower than the mean growth of seventh grade students whose teachers had more than 30 years of experience (M = 10.62). The mean growth of seventh grade students whose teachers had 26-30 years of experience (M = 6.41) was lower than the mean growth of seventh grade students whose teachers had more than 30 years of experience (M = 10.62). The hypothesis that there is a difference in student growth on the seventh-grade mathematics MAP among years of teacher experience in School District B was supported.

Table 12

Descriptive Statistics for H8

Certification	*M*	*SD*	*N*
0 to 5 Years	7.20	6.98	210
6 to 10 Years	6.49	6.55	485
11 to 15 Years	6.90	5.56	185
16 to 20 Years	6.73	6.12	203
26 to 30 Years	6.41	6.88	274
More than 30 Years	10.62	6.54	240

RQ9. To what extent is there a difference in student growth on the eighth-grade mathematics MAP among years of teacher experience in School District B?

H9. There is a difference in student growth on the eighth-grade mathematics MAP among years of teacher experience in School District B.

A one-factor ANOVA was conducted to test the difference in student growth on the eighth-grade mathematics MAP among years of teacher experience in School District B. The level of significance was set at 0.05. The results of the analysis indicated there was not a statistically significant difference between at least two of the means, $F = 0.966$, $df = 5, 1527$, $p = 0.438$. See Table 13 for the means and standard deviations for this analysis. No post hoc was warranted. The hypothesis that there is a difference in student growth on the eighth-grade mathematics MAP among years of teacher experience in School District B was not supported.

Table 13

Descriptive Statistics for H9

Certification	*M*	*SD*	*N*
0 to 5 Years	3.35	5.70	158
6 to 10 Years	3.21	6.21	508
11 to 15 Years	2.93	6.28	437
16 to 20 Years	2.27	7.03	123
21 to 25 Years	2.39	6.67	213
26 to 30 Years	2.63	6.15	94
0 to 5 Years	3.35	5.70	158

Summary

This chapter began with the presentation of the descriptive statistics related to this study. The results of the data analysis that addressed the nine research questions were then presented in the chapter. Chapter five includes a study summary, findings related to the literature, and the conclusions.

Chapter Five

Interpretation and Recommendations

The purpose of this study was to determine if there is a relationship between middle school student mathematics achievement and teacher certification, degree types, and years of experience. This chapter provides a summary of the main points provided in chapters one through four. Included are a study summary, the findings related to the literature, and the conclusions.

Study Summary

This study took place in School District B, an affluent suburban school district located in northeast Kansas. The sample consisted of the 4,928 middle school students enrolled in School District B during the 2011-12 academic year and participated in the fall 2011 MAP and the spring 2012 MAP and the 52 middle school mathematics teachers employed by the school district who participated in the teacher data survey. The mathematics growth of the students and how the growth was related to the teacher variables of certification, degree levels and years of experience was examined.

Overview of the problem. School administrators are responsible for hiring teachers who are highly qualified. Many factors could make a teacher effective, and many ways exist to measure effective teaching. One way to measure the effectiveness of a teacher is to analyze student growth during the school year in which they were taught by a specific teacher. During the 2011-2012 school year in School District B, 46.4% of eighth grade students and 66.4% of seventh grade students met their MAP growth target. The 20% difference between growth for seventh and eighth grade students is a reason to believe research needed to be conducted to determine which factors attribute to the

mathematics growth of middle school students. It is important for school district administrators to collect information such as years of teaching experience, teacher certification, and teacher degree levels during the recruitment and hiring process for middle school mathematics teachers to be able to make an informed decision to determine which candidate is the best for the position.

Purpose statement and research questions. The purpose of this study was to determine if there is a relationship between sixth, seventh, and eighth grade student growth on the mathematics MAP, and types of teacher certification, teacher degree levels, and years of teacher experience in School District B. Nine research questions addressed the purpose of the study. Study results could inform district and building administrators of teacher qualities that affected middle school mathematics achievement.

Review of the methodology. The categorical independent variables in this study included the middle school mathematics teacher's certification, degree levels, and years of teaching experience. The independent variables were measured using the responses to the Letter to Teachers with Survey for each teacher in the sample. The dependent variable in this study was individual sixth, seventh, and eighth grade student growth from fall 2011 to spring 2012 on the MAP mathematics test. One-factor ANOVAs were conducted to test for differences in student growth based on teacher certification, teacher degree level, and teacher experience.

Major findings. Results from this study indicated that a statistically significant difference in student growth existed for six of the nine hypotheses tested. For RQ1, two statistically significant differences and one marginally significant differences were revealed. The mean growth of sixth graders taught by teachers who were certified as K-6

was higher than the mean growth of sixth graders taught by teachers who were K-6 and 5-8 mathematics certified. The mean growth of sixth graders taught by teachers who were certified as K-9 was higher than the mean growth of sixth graders taught by teachers who were K-6 and 5-8 mathematics certified. The mean growth of sixth graders taught by teachers who were 5-8 mathematics certified was marginally higher than sixth graders taught by teachers who were K-6 and 5-8 mathematics certified. The results of this study revealed that sixth grade students with teachers who were K-6 or K-9 certificated had higher growth in mathematics than students with teachers who were certified in mathematics.

For RQ2, five statistically significant differences and two marginally significant differences were revealed. The mean growth of seventh graders taught by teachers who were certified as K-9 was higher than the mean growth of seventh graders taught by teachers who were 5-8 certified. The mean growth of seventh graders taught by teachers who were certified as K-9 was higher than the mean growth of seventh graders taught by teachers who were K-9 and 5-8 certified. The mean growth of seventh graders taught by teachers who were K-9 certified was higher than seventh graders taught by teachers who were K-6 and 5-8 certified. The mean growth of seventh graders taught by teachers who were K-9 certified was higher than seventh graders taught by teachers who were K-6 and K-9 certified. The mean growth of seventh graders taught by teachers who were 5-8 certified was lower than seventh graders taught by teachers who were 5-8 and 6-12 certified. The mean growth of seventh graders taught by teachers who were K-9 certified was marginally higher than seventh graders taught by teachers who were K-6, K-9, and 5-8 certified. The mean growth of seventh graders taught by teachers who were K-9 and5-8

certified was marginally lower than seventh graders taught by teachers who were 5-8 and 6-12 certified. The results of this study revealed that seventh grade students with teachers who were K-9 certified had higher mathematics growth than students with teachers who had other certifications.

The results of the data analysis associated with RQ3 revealed no statistically significant difference between at least two of the means in student growth of eighth graders and teacher certification. The results of the data analysis associated with RQ4 revealed no statistically significant difference between the means in sixth grade student growth and teacher degree levels. The results of the data analysis associated with RQ5 revealed a statistically significant difference between the means in seventh grade student growth. The mean growth of seventh grade students with teachers who had a bachelor's degree was lower than the mean growth of seventh graders with teachers who had a master's degree or higher. The results of this study revealed that seventh grade students with teachers who held a master's degree or higher had higher mathematics growth than students with teachers who held only a bachelor's degree.

For RQ6, a statistically significant difference between the means in eighth grade student growth was found. The mean growth of eighth grade students with teachers who had a bachelor's degree was higher than the mean growth of eighth graders with teachers who had a master's degree or higher. The results of the data analysis associated with RQ7 revealed five statistically significant differences between at least two of the growth means for sixth grade students and teacher years of experience. The mean growth of sixth graders taught by teachers who had 0-5 years of experience was lower than the mean growth of sixth graders taught by teachers who had 6-10 years of experience. The

mean growth of sixth graders taught by teachers who had 0-5 years of experience was lower than the mean growth of sixth graders taught by teachers who had 11-15 years of experience. The mean growth of sixth graders taught by teachers who had 0-5 years of experience was lower than the mean growth of sixth graders taught by teachers who had 16-20 years of experience. The mean growth of sixth graders taught by teachers who had 0-5 years of experience was lower than the mean growth of sixth graders taught by teachers who had 26-30 years of experience. The mean growth of sixth graders taught by teachers who had 0-5 years of experience was lower than the mean growth of sixth graders taught by teachers who had more than 30 years of experience. The mean growth of sixth graders taught by teachers who had 6-10 years of experience was higher than the mean growth of sixth graders who were taught by teachers with more than 30 years of experience. The results of this study revealed that sixth grade students with teachers who had 0-5 years of experience had lower mathematics growth than students with teachers who had more than five years of experience.

The results of the data analysis associated with RQ8 revealed five statistically significant differences between at least two of the growth means for seventh grade students and teacher years of experience. The mean growth of seventh graders taught by teachers who had 0-5 years of experience was lower than the mean growth of seventh graders taught by teachers who had more than 30 years of experience. The mean growth of seventh graders taught by teachers who had 6-10 years of experience was lower than the mean growth of seventh graders taught by teachers who had more than 30 years of experience. The mean growth of seventh graders taught by teachers who had 11-15 years of experience was lower than the mean growth of seventh graders taught by teachers who

had more than 30 years of experience. The mean growth of seventh graders taught by teachers who had 16-20 years of experience was lower than the mean growth of seventh graders taught by teachers who had more than 30 years of experience. The mean growth of seventh graders taught by teachers who had 26-30 years of experience was lower than the mean growth of seventh graders taught by teachers who had more than 30 years of experience. The results of this study revealed that seventh grade students who had teachers with more than 30 years of experience had higher mathematics growth than students who had teachers with 30 years of experience or less. The results of the data analysis associated with RQ9 revealed no statistically significant difference between at least two of the means in student growth of eighth graders and years of teacher experience.

Findings Related to the Literature

This section is organized in the same order as the research questions. The first topic discussed is the literature related to the relationship between student achievement and teacher certification. The link between the findings of the current study and the findings in previous studies related to the relationship between student achievement and types of teacher degree levels is presented. Finally, in this section, a discussion of the literature related to the relationship between student achievement and years of teacher experience is included.

In the current study, the mean growth of students with teachers who were certified K-6 and K-9 was higher than the mean growth of students with teachers who were certified 5-8 mathematics. This finding was consistent with the results of Miller's (2007) study, which indicated students who were taught by an elementary certified teacher

scored significantly higher on the 2006-2007 CRT than students who were taught by a secondary certified teacher.

The results regarding teacher certification in the current study contradict the findings in several studies that were discussed in chapter two. Sparks (2004) indicated that students who were taught by certified mathematics teachers had higher gains than students who were taught by teachers who were not certified to teach mathematics. Richardson (2008) found a significant positive relationship between student performance on the 2007 ARMT and secondary certification of teachers. Students who were taught by secondary certified teachers had higher ARMT scores than teachers who not secondary certified. However, the results of Sprague's (2008) study revealed a negative impact on the CSTM for students who were taught by teachers who were not certified to teach mathematics and Stilwell (2008) and Fernandez (2015) found no significant relationship between teacher certification and student achievement. The results of Rieke's (2011) study indicated that student achievement growth was significantly greater for students who were taught by teachers who were certified in secondary mathematics education.

In the current study, no statistically significant relationship was found between teacher degree levels and sixth grade mathematics achievement, but a statistically significant relationship was found between teacher degree levels and mathematics achievement for seventh and eighth graders. These mixed results are similar to the results found in the related literature from chapter two. The results of Rugraff's (2004) study indicated a significant positive relationship between student achievement and teachers with master's degrees or higher. Similarly, Swan (2006) found that students of teachers with advanced degrees performed significantly higher than students of teachers

without advanced degrees. The results of Dial's (2008) study also revealed that students of teachers with a master's degree or higher had higher mathematics achievement than did students with teachers with only a bachelor's degree. Zhang (2008) and Morris (2010) found a significant positive relationship between teacher degree levels and gains in student achievement. Finally, Harris (2014) suggested that students made higher gain scores with teachers who held a master's degree or above.

Unlike the studies discussed above, there were findings from previous studies that revealed no statistically significant relationship between student achievement and teacher degree levels. Abernathy (2009) concluded that teacher degree level had no significant impact on elementary mathematics achievement. The results of Matagi-Tofiga's (2011) study indicated there were no statistically significant relationships between student achievement scores and teacher degree level. Lean (2012) concluded that there were no added benefits of having a teacher who held a master's degree or higher. These results are similar to the results of the current study for sixth grade mathematics achievement.

Finally, results from the current study indicated a statistically significant relationship between years of teacher experience and sixth grade and seventh grade mathematics achievement, but no statistically significant positive relationship between years of teacher experience and mathematics achievement for eighth grade. The findings from previous studies were similar to the results of the current study. Ferguson (2005) found a statistically significant relationship between years of teaching experience and student mathematics achievement. Swan (2006) indicated that students of teachers with more years of teaching experience performed significantly higher than students of teachers with fewer years of teaching experience. In 2007, Reed indicated that teachers

with more years of experience had students with higher achievement in mathematics. Dial (2008) found a statistically significant positive relationship between the years of teaching experience and student achievement. Also, other researchers (Richardson, 2008; Abernathy, 2009; O'Donnell, 2010; Blackmer, 2014; Harris, 2014) found that the more years of teacher experience, the higher the student achievement. However, the results of other studies (Zhang, 2008; Becoats, 2009; Matagi-Tofiga, 2011) are consistent with the eighth grade findings of the current study which indicated no statistical significance between the years of teacher experience and student achievement.

Conclusions

The following section provides detailed conclusions made from the current study which focused on the relationship between student achievement and types of teacher certification, teacher degree level and years of teacher experience. The alignment of the current study with other studies was mixed. The next section includes recommendations for future research that could help resolve the discrepancies. Implications for action, recommendations for future research and concluding remarks are provided in this section.

Implications for action. The findings of the current study have many implications for schools, especially School District B. According to School District B's Board Policy 6220 (2015a), "The District shall employ the best prepared and the best-qualified persons available" (sect. 1). This study provides valuable information to the district regarding which persons might be best qualified for middle school mathematics certified positions. Because this is the basis for the selection of employees, it is best to understand the relationship between the type of teacher certification, degree level, and the years of teaching experience. The findings of this study are helpful to the human

resources department and building administrators for recruitment and retention purposes. The district grants increases in teaching salaries based on the years of experience and degree levels the teacher attains; therefore, it is financially responsible for the district to be very clear on which teacher characteristics have a positive correlation with student achievement. According to the findings of this study, the teacher characteristics that result in higher sixth grade mathematics achievement are K-6 or K-9 certification, a bachelor's or master's degree, and at least five years of teaching experience. The teacher qualifications that result in higher seventh grade mathematics achievement are K-9 certification, master's degree, and more than 30 years of experience. The teacher qualification that resulted in higher eighth grade mathematics achievement was bachelor's degree. There is no relationship between types of certification or years of experience for eighth grade. Based on these results, the school district should recruit, hire, and retain middle school mathematics teachers who have an elementary certification as well as teachers who have a mathematics certification. The school district should be aware that teachers who have a master's degree or higher are not always "more qualified" than teachers with a bachelor's degree. The teacher salary scale should be revisited to align with the characteristics that affect student achievement. Currently, the years of teaching experience and degree level determine the compensation for teachers in School District B. The results of this study revealed that those characteristics do not always have a positive impact on student learning, particularly with teachers who have 0-5 years of experience. School District B should recruit and hire teachers with more than 5 years of experience.

Recommendations for future research. The purpose of this study was to determine if a relationship existed between middle school mathematics achievement and teacher characteristics such as teacher certification, teacher degree levels and years of teaching experience. This study could be replicated and extended to include additional school districts to determine if these results are consistent with other suburban populations, as well as in urban or rural populations. The study could also be expanded to other grade levels and multiple years of MAP data. For example, School District B administers the MAP assessment to grades K-8. The study could be replicated at the elementary level to determine whether years of experience and degree level affect student achievement at the elementary level. This study could also be extended to other content areas, such as English Language Arts. Also, future research could include other variables such as class size, student gender, race, and ethnicity to determine if the differences in student achievement are affected by these variables.

Concluding remarks. In this study, the relationship of teacher certification, types of teacher degree levels, and years of teaching experience with student mathematics achievement in grades 6-8 on the MAP assessment in a suburban school district in Kansas was examined. Analyses revealed statistically significant relationships in six of the nine research questions. The results of this study indicated that teacher certification had an effect on student achievement in sixth and seventh grade, but not in eighth grade. Because the findings were of a mixed nature, it is important to continue to research which teacher qualifications have a positive relationship with student achievement. Students deserve high-quality teachers in each classroom, each year. School administrators are

responsible for hiring the most qualified individuals for each position, and the results from studies such as this can help lead them in the decision-making process.

References

Abernathy, D. F. (2009). *Affluence and influence: A study of inequities in the age of excellence* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3355826)

Andrews, S. L. (2012). *Impact of teacher qualification on student achievement at the elementary and middle school levels* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3494940)

Arnette, K. R. (2009). *Highly qualified teachers and the impact on academic achievement: A descriptive research study* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3372233)

Becoats, J. B. (2009). *Determining the correlation of effective middle school math teachers and math student achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3387584)

Blackmer, L. D. (2014). *The relationship between selected teacher characteristics and student achievement in Seventh-Day Adventist elementary schools in the United States* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3633934)

Burke, D. (2010). *Highly qualified teachers: An analysis of post-NCLB trends* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 1476419)

Center for Public Education. (2006). *Teacher quality and student achievement: Q&a*. Retrieved from http://www.centerforpubliceducation.org/Main-Menu/Staffingstudents/Teacher-quality-and-student-achievement-At-a-glance/Teacher-quality-and-student-achievement-QA.html

Dial, J. C. (2008). *The effect of teacher experience and teacher degree levels on student achievement in mathematics and communication arts* (Doctoral dissertation, Baker University). Retrieved from http://www.bakeru.edu/images/pdf/SOE/EdD_Theses/Dial_Jaime.pdf

Dingman, J. B. (2010). *A quantitative correlational study of teacher preparation program on student achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3431867)

Duke, R. S. (2013). *The impact of teacher licensure programs on minority student achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3569935)

Ferguson, C. R. (2005). *Differences in teacher qualifications and the relationship to middle school student achievement in mathematics* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3168640)

Fernandez, K. C. (2015). *Teacher certification and its relationship to student achievement in Guam public high schools* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3702748)

Finkbonner, G. (2009). *A comparison of student achievement between highly qualified and non-highly qualified teachers in Kentucky* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3447702)

Gass, A. H. (2008). *Do highly qualified teachers improve student learning?* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3313314)

Gingerich D. (2003). No child left behind. *Currents [Research for Better Schools], VI*(2), 1, 12-14. Retrieved from http://www.math.uiuc.edu/~castelln/M103/nochildleftbehind.pdf

Goldhaber, D. D., & Brewer, D. J. (1997). Why don't schools and teachers seem to matter? Assessing the impact of unobservables on educational productivity. *The Journal of Human Resources, 32*(3), 505-523. doi: 10.2307/146181

Grigsby, P. A. (2015). *Educational pathways of teachers and the effects on students' performance on high-stakes testing in Texas* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 10129802)

Harris, T. (2014). *The effects of teacher characteristics on fourth- through eighth-grade students' mathematics and reading gain scores in a rural Tennessee setting* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3582787)

Haycock, K. (1998). Good teaching matters: How well-qualified teachers can close the gap. *Thinking K-16,* 1-2. Retrieved from http://edtrust.org/wp-content/uploads/2013/10/k16_summer98.pdf

Johnson, B. (2015). *A study of the correlation between Texas teacher preparations and English language learners' reading and math achievement* [Abstract]. Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3706090)

Kansas State Department of Education. (2008). *Highly qualified teacher overview 2008-2009*. Retrieved from http://www.ksde.org/Portals/0/TLA/Licensure/Licensure%20Documents/HQOverview1.pdf?ver=2013-10-22-124429-623\

Kansas State Department of Education. (2010a). *Kansas adequately yearly progress (AYP) Revised guidance.* Retrieved from http://files.eric.ed.gov/fulltext/ED483789.pdf

Kansas State Department of Education. (2010b). *Report Card 2009-2010.* Retrieved from http://ksreportcard.ksde.org/summary/FY2010/[redacted].pdf

Kansas State Department of Education. (2011). *Report Card 2010-2011*. Retrieved from http://ksreportcard.ksde.org/summary/FY2011/[redacted].pdf

Kansas State Department of Education. (2012). *Report Card 2011-2012.* Retrieved from http://ksreportcard.ksde.org/summary/FY2012/[redacted].pdf

Leak, J. A. (2012). *Effects of teacher educational background and experience on student achievement in the early grades* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3512699)

Ludwigsen, E. S. (2009). *Teacher effectiveness and the effect on student achievement in middle school mathematics* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3361928)

Lunenburg, F. C., & Irby, B. J. (2008). *Writing a successful thesis or dissertation: Tips and strategies for students in the social and behavioral sciences*. Thousand Oaks, CA: Corwin Press.

Mascia, S. M. (2010). *Teacher mathematics learning and middle school student achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3492688)

Matagi-Tofiga, R. (2011). *The relationship of teacher certification to student achievement in American Samoa public schools* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3473535)

Miller, T. L. (2008). *Straddling the fence: The relationship of elementary versus secondary certification on middle school teachers' beliefs, practices, and student achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3339131)

Morris, R. L. (2010). *The relationship between teacher-licensure level and gains in the student academic achievement in New Mexico public schools* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3429033)

Moss, P. L. (2012) *Teacher certification and student achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3514701)

Northwest Evaluation Association. (2011). *Measure of Academic Progress: A comprehensive guide to the MAP K-12 computer adaptive interim assessment.* Retrieved from https://www.nwea.org/content/uploads/2014/01/MAP-Comprehensive-Brochure-Jan14.pdf

O'Donnell, P. S. (2010) *Is 'highly qualified' really highly qualified? An examination of teacher quality measures and their impact on student achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 1475216)

Plunkett, C. E. (2006). *What are the characteristics of a highly qualified teacher and how do we help maintain that status* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3236915)

Reed, W. C. (2007). *Teachers' education and training factors and their influence on formative assessment processes* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3282550)

Rice, J. K. (2008). From highly qualified to high quality: An imperative for policy and research to recast the teacher mold. *Education Finance and Policy, 3*(2), 151-164. Retrieved from http://www.mitpressjournals.org/doi/pdf/10.1162/edfp.2008.3.2.151

Richardson, A. R. (2008). *An examination of teacher qualifications and student achievement in mathematics* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3333147)

Rieke, K. A. (2011). *Subject content knowledge: Middle school teacher certification pathway and student achievement in mathematics* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3491564)

Riordan, J. (2009). *Do teacher qualifications matter? A longitudinal study investigating the cumulative effect of NCLB teacher qualifications on the achievement of elementary school children* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3395715)

Roberts, C. M. (2004). *The dissertation journey: A practical and comprehensive guide to planning, writing, and defending your dissertation*. Thousand Oaks, CA: Sage Publications.

Rugraff, D. R. (2004). *The relationship of teacher salaries, teacher experience, and teacher education on student outcomes* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3134966)

School District B. (2015a). *Policy 6220*. Retrieved from https://district.[redacted].org/DistrictInformation/Policies/6220policy.pdf#search=6220

School District B. (2015b). *Strategic Plan*. Retrieved from https://district.[redacted].org/DistrictInformation/FormsAndDocsStrategicPlan/Vision-2020-Strategic-Plan.pdf#search=strategic%20plan

Silver, K. (2010). *The National Board effect: Does the certification process influence student achievement?* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3280759)

Sparks, K. (2004). *The effect of teacher certification on student achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3172168)

Sprague, R. E. (2008). *A correlational study of California high school mathematics teacher qualifications and student performance* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3330385)

Staropoli, M. A. (2010). *Does teacher certification in mathematics improve high school special education students' performance on the high school proficiency assessment?: A preliminary investigation* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3427779)

Stilwell, T. R. (2008). *A study of the relationship between teacher qualifications and student achievement gains in accredited private Christian schools* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3313874)

Swan, B. A. (2006). *Middle school mathematics teacher certification, degree level, and experience, and the effects on teacher attrition and student mathematics achievement in a large urban district* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3233679)

Thomasson, C. (2010). *An investigation into predictors of middle school mathematics achievement as measured by the Georgia criterion-referenced competency tests* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3444432)

Tobe, P. F. (2008). *An investigation of the differential impact of teacher characteristics and attitudes on student mathematics achievement using a value-added approach* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No.3309561)

U.S. Department of Education. (2002). *No child left behind: A desktop reference.* Retrieved from https://www2.ed.gov/admins/lead/account/nclbreference/reference.pdf

U.S. Department of Education. (2006). *Highly qualified teachers for every child.* Retrieved from https://www2.ed.gov/nclb/methods/teachers/stateplanfacts.pdf

Veale, M. (2006). *Certification programs and their relationship to teacher preparedness and student academic achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3291010)

Zhang, D. (2008). *The effect of teacher education level, teaching experience, and teaching behaviors on student science achievement* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3330757)

Appendices

Appendix A: Student Goal Setting Worksheet

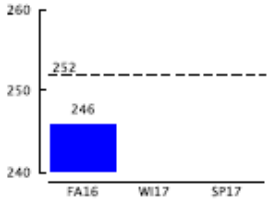
NWEA

Student Goal Setting Worksheet

Student ID:
District: School District USD
School: Middle School
Term Rostered:

Norms Reference Data: 2015
Growth Comparison Period: Fall to Spring
Weeks of Instruction: Start - 4 (Fall)
End - 32 (Spring)

Mathematics (MAP: Math 6+ KS 2010)

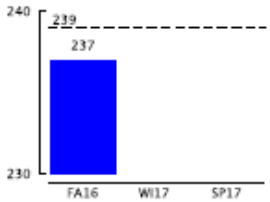


Projected RIT 252
My Goal
RIT Growth *

	FA16	WI17	SP17
Overall RIT Score	246		
Goal Performance			
Operations and Algebraic Thinking	229-241		
The Real and Complex Number Systems	246-258		
Geometry	244-256		
Statistics and Probability	246-258		

Student Action Plan: _____

Reading (MAP: Reading 6+ KS 2010)



Projected RIT 239
My Goal
RIT Growth *

	FA16	WI17	SP17
Overall RIT Score	237		
Goal Performance			
Literature	227-239		
Informational Text	235-247		
Vocabulary Acquisition and Use	230-242		
Lexile® Range	1167-1317L		

Student Action Plan: _____

Student Signature: _____ Instructor Signature: _____

Parent Signature: _____ Date: _____

Explanatory Notes

RIT ranges may indicate an area of relative strength or area of possible concern determined by comparing the student's Goal Performance score with the student's Overall RIT Score for the test event.

* Projected RIT is only reported when there is growth norm data and a test event in the initial term. RIT Growth is only reported when there are test events in both the initial and final terms.

Appendix B: Letter to Teachers with Survey

Teachers,

My name is Annette Sauceda and I am the assistant principal at [redacted] Middle School. I am working toward my doctorate through Baker University and need to collect data for my dissertation. I have been granted permission to collect teacher data from [redacted] **Middle School Math Teachers during the 2011-2012 school year** from Baker University (see attachment) and from [redacted], [redacted] Director of Assessment and Research. I have emailed your principals and assistant principals to inform them that I am sending you this email. Please know that all teacher data will be kept **confidential**. Please respond to this email and answer the 10 questions below. Keep in mind that these questions pertain to **last school year**. Thank you so much for your time. I truly appreciate your help!

1) Which grade level did you teach during the 2011-12 school year?
2) Excluding the current school year, how many years have you been a teacher, excluding student teaching or substitute teaching?
3) Excluding the current school year, how many years have you taught middle school mathematics?
4) How many years did you teach the position you taught during the 2011-12 school year?
5) During the 2011-12 school year, did you take an extended leave of absence?
6) Do you have a master's degree or higher?
7) Are you licensed K-6 Generalist?
8) Are you licensed K-9 Generalist?
9) Are you licensed 5-8 Mathematics?
10) Are you licensed 6-12 Mathematics?

Annette K Sauceda, M.Ed.
Assistant Principal
[redacted] Middle School
[redacted] School District
[redacted]
asauceda@[redacted].org
www.[redacted].org

Appendix C: Baker University IRB Form

BAKER UNIVERSITY

SCHOOL OF EDUCATION
GRADUATE DEPARTMENT

Date: January 2013
IRB PROTOCOL NUMBER _____
(IRB USE ONLY)

IRB REQUEST
Proposal for Research
Submitted to the Baker University Institutional Review Board

I. Research Investigator(s)

Department(s) **School of Education Graduate Department**

Name	Signature	
1. Dr. Susan Rogers		Major Advisor
2. Katie Hole		Research Analyst
3. Dr. Charmaine Henry		University Committee Member
4. Dr. Russ Kokoruda		External Committee Member

Principal Investigator: Annette K. Sauceda
Phone: 913.231.1179
Email: asauceda@[redacted]12.org
Mailing address: 1007 W. Howard Pl.
Louisburg, KS 66053

Faculty sponsor: Dr. Susan Rogers
Phone: 913.344.1226
Email: srogers@bakeru.edu

Expected Category of Review: ____Exempt __X__Expedited ____Full

II: Protocol Title

The Effect of Teacher Degree Level, Teacher Licensure, and Years of Teacher Experience on Student Achievement in Middle School Mathematics

Summary

In a sentence or two, please describe the background and purpose of the research.

The purpose of this study is to examine whether years of teaching experience, teacher degree level, and teacher licensure effect student achievement on the mathematics portion of the Measures of Academic Progress (MAP) assessment based on student growth from fall 2011 and spring 2012.

Briefly describe each condition or manipulation to be included within the study.

The independent variables of the study are teacher years of experience, teacher licensure, and degree level.

What measures or observations will be taken in the study? If any questionnaire or other instruments are used, provide a brief description and attach a copy.

The dependent variable, student mathematics growth, is measured by the student Measures of Academic Progress (MAP) scores from fall 2011 to spring 2012 and comparing the student growth to the growth target determined by NWEA. Teachers will be asked to complete a survey (see attachment) to determine the number of years in education, number of years teaching mathematics, degree level, and teacher licensure.

Will the subjects encounter the risk of psychological, social, physical, or legal risk? If so, please describe the nature of the risk and any measures designed to mitigate that risk.

Subjects will not encounter any psychological, social, physical, or legal harm as a result of this study.

Will any stress to subjects be involved? If so, please describe.

Subjects will not be subjected to any form of stress in this study.

Will the subjects be deceived or misled in any way? If so, include an outline or script of the debriefing.

Subjects will not be deceived or misled in any way. All student data collected is historical. All teacher data will be collected by a survey.

Will there be a request for information that subjects might consider to be personal or sensitive? If so, please include a description.

No information that subjects might consider to be personal or sensitive will be requested.

Will the subjects be presented with materials that might be considered to be offensive, threatening, or degrading? If so, please describe.

No materials will be presented to the subjects for the purpose of this study.

Approximately how much time will be demanded of each subject?

Approximately ten minutes will be demanded of the middle school mathematics teachers participating in the study to complete a survey.

Who will be the subjects in this study? How will they be solicited or contacted? Provide an outline or script of the information which will be provided to subjects prior to their volunteering to participate. Include a copy of any written solicitation as well as an outline of any oral solicitation.

The subjects in the study are [redacted] middle school students (grades 6-8) during the 2011-2012 school year who participated the fall 2011 MAP and the spring 2012 MAP. Also, the [redacted] middle school mathematics teachers during the 2011-2012 school year. Teachers will be contacted by the researcher in person during a district middle school mathematics professional development. The researcher will provide the title and purpose of the study to the middle school mathematics teachers. Also, the researcher will provide a copy of the approval letter from the Director of Assessment and Research which grants the researcher permission to gather teacher demographical information in form of a survey. The researcher will make it clear that all student data and teacher information will be kept confidential and used only for the purpose of the study. Teachers and students will be randomly assigned numbers to be used as identifiers only.

What steps will be taken to ensure that each subject's participation is voluntary? What, if any, inducements will be offered to the subjects for their participation?

Prior to participating, teachers will be presented with a letter of approval from the Director of Assessment and Research granting the researcher permission to gather the demographical information asked in the teacher survey. All information gathered from the teachers is also available from the Human Resources department and can be accessed if teachers choose to not participate in the survey.

How will you ensure that the subjects give their consent prior to participating? Will a written consent form be used? If so, include the form. If not, explain why not.

Prior to participating, teachers will be presented with a letter of approval from the Director of Assessment and Research granting the researcher permission to gather the demographical information asked in the teacher survey. All information gathered from the teachers is also available from the Human Resources department and can be accessed if teachers choose to not participate in the survey. Written consent is not necessary.

Will any aspect of the data be made a part of any permanent record that can be identified with the subject? If so, please explain the necessity.

No data will be made part of any permanent record.

Will the fact that a subject did or did not participate in a specific experiment or study be made part of any permanent record available to a supervisor, teacher or employer? If so, explain.

No data will be made part of any permanent record.

What steps will be taken to ensure the confidentiality of the data?

Before delivery, the Director of Assessment and Research will randomly assign a number to each set of student data to be used as an identifier only. The Director of Assessment and Research will also randomly assign a number to each teacher to be used as an identifier only. As a result, all subjects will remain anonymous. Data will remain confidential, used only by the researcher for the purposes previously described.

If there are any risks involved in the study, are there any offsetting benefits that might accrue to either the subjects or society?

There are no risks involved in this study.

Will any data from files or archival data be used? If so, please describe.

All student data used in this study will be archival data from the 2011-2012 school year. The data set will include:

- Randomly assigned student number
- Fall 2011 MAP math score
- Spring 2012 MAP math score
- Student math growth
- Growth target

All teacher data used in this study will be collected through a teacher survey. The data set will include

- Randomly assigned teacher number
- Years of teaching experience
- Teacher degree level
- Teacher licensure

Teacher Survey

School:
Grade Level:
Name:

1) Which grade level did you teach during the 2011-12 school year?
2) Excluding the current school year, how many years have you been a teacher, excluding student teaching or substitute teaching?
3) Excluding the current school year, how many years have you taught middle school mathematics?
4) How many years did you teach the position you taught during the 2011-12 school year?
5) During the 2011-12 school year, did you take an extended leave of absence?
6) Do you have a master's degree or higher?
7) Are you licensed K-6 Generalist?
8) Are you licensed K-9 Generalist?
9) Are you licensed 5-8 Mathematics?
10) Are you licensed 6-12 Mathematics?

Appendix D: IRB Approval Letter

February 11, 2013

Annette K. Sauceda
[redacted]

Dear Ms. Sauceda:

The Baker University IRB has reviewed your research project application (E-0158-0131-0211-G) and approved this project under Expedited Review. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

The Baker University IRB requires that your consent form must include the date of approval and expiration date (one year from today). Please be aware of the following:

1. At designated intervals (usually annually) until the project is completed, a Project Status Report must be returned to the IRB.
2. Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
3. Notify the OIR about any new investigators not named in original application.
4. Any injury to a subject because of the research procedure must be reported to the IRB Chair or representative immediately.
5. When signed consent documents are required, the primary investigator must retain the signed consent documents for at least three years past completion of the research activity. If you use a signed consent form, provide a copy of the consent form to subjects at the time of consent.
6. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.

Please inform Office of Institutional Research (OIR) or myself when this project is terminated. As noted above, you must also provide OIR with an annual status report and receive approval for maintaining your status. If your project receives funding which requests an annual update approval, you must request this from the IRB one month prior to the annual update. Thanks for your cooperation. If you have any questions, please contact me.

Sincerely,

Carolyn Doolittle, EdD
Chair, Baker University IRB

Appendix E: Request to Conduct Research in School District B

Request to Conduct Research in the [redacted] Schools

1. Primary Investigator
• Annette K. Sauceda
[redacted]
asauceda@[redacted]

2. Purpose of purposed research
• The purpose of this study is to determine to what extent is there a difference in student growth on the mathematics Measures of Academic Progress (MAP) based on years of teaching experience, teacher degree level, and types of teacher certification from fall 2011 to spring 2012 in a suburban school district in northeast Kansas.
• Baker University Advisor: Dr. Susan Rogers, 913-344-1226, srogers@bakeru.edu

3. Name of [redacted] staff members consulted
• [redacted], Director of Assessment and Research
• [redacted], Mathematics District Coordinating Teacher

4. Name of schools to be involved
• Mathematics teachers assigned to [redacted] during the 2011-2012 school year

5. Description of the research
Research Design
A quantitative approach with a causal-comparative research design will be utilized. The causal-comparative design is appropriate for this study because it is used to determine cause-and-effect relationships between variables (Lunenburg & Irby, 2008). The categorical independent variables in this study include the middle school mathematics teacher's degree level, teacher certification, and years of teaching experience. The independent variables will be measured using the teacher survey (see attached) for each teacher in the sample. The dependent variables in this study include individual student growth score from fall 2011 to spring 2012 on the MAP mathematics test.
Sampling Procedures
The research sample of this study will be represented through a nonrandom, convenience sample of middle school mathematics teachers during the 2011-2012 academic year. Students will be selected for this sample based on the following criteria: the student has to be enrolled in one of the nine middle schools selected for the study, and has to have taken the MAP assessment in the fall of 2011 and the spring of 2012.
6. Data to be collected and how
• Teacher survey (attached) will be completed by the district middle school math teachers who taught during the 2011-2012 school year. Teachers will be assigned

a non-identifiable label and will be categorized based on the information gathered by the teacher survey.
• Archived mathematics MAP data from fall 2011 and spring 2012 will be collected. Students will be assigned non-identifiable labels and aligned with teachers. The data will be exported into a Microsoft Excel spreadsheet and given to the researcher by the Director of Assessment and Research.

7. Amount of time each subject will spend on data collection
• 2011-2012 district math teachers will need approximately 10 minutes to complete the teacher survey.

8. Where and when the data collection will take place
• District math teachers will be given the opportunity to complete the teacher survey during a professional development session on February 26, 2013.

9. IRB approval letter (attached)
Teacher Survey
Name School
Grade Level
1) Which grade level did you teach during the 2011-12 school year?
2) Excluding the current school year, how many years have you been a teacher, excluding student teaching or substitute teaching?
3) Excluding the current school year, how many years have you taught middle school mathematics?
4) How many years did you teach the position you taught during the 2011-12 school year?
5) During the 2011-12 school year, did you take an extended leave of absence?
6) Do you have a master's degree or higher?
7) Are you licensed K-6 Generalist?
8) Are you licensed K-9 Generalist?
9) Are you licensed 5-8 Mathematics?
10) Are you licensed 6-12 Mathematics?

Appendix F: Approval to Conduct Research in School District B

Parks, Elizabeth | Sauceda, Annette
RE: Request to Conduct Research
You replied to this message on 3/2/2013 2:30 PM.

Good news, Annette! Your request has been approved. When you are ready you and I will need to get together to make sure I am pulling exactly the data you will need and in a format you can use. Just let me know.

Elizabeth

Begin forwarded message:

From: "Sauceda, Annette" <ASauceda@[redacted]k12.org>
Date: February 14, 2013, 5:12:50 PM CST
To: "Parks, Elizabeth" <EParks@[redacted]k12.org>
Subject: Request to Conduct Research

Elizabeth,

Attached is my request to conduct research in [redacted]. Please let me know if I need to provide more information about the dissertation.

Thanks!

Annette K Sauceda, M.Ed.
Assistant Principal
[redacted] Middle School
[redacted] School District
913.[redacted].5800
asauceda@[redacted]k12.org
www.[redacted].org

"Making a Difference"