

**The Relationship between Teacher Factors and Student Achievement in Middle School**

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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

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Date Defended: August 30, 2016

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## **Abstract**

Teacher factors that improve student achievement in middle school can be difficult to pinpoint. Districts need to be able to identify any teacher factor that improves student achievement. The purpose of this non-experimental quantitative study was to determine to what extent there is a difference in middle school student achievement based on teacher factors. Specifically, the study was designed to determine the extent that there is a difference in middle school student achievement among teachers who have different levels of education (bachelor's, master's, or doctorate) and whether that difference is affected by teachers' gender and years of teaching experience. Additionally, the study was designed to determine the extent that there is a difference in middle school student achievement among teachers who have different types of advanced degrees (content area or other) and whether that difference is affected by gender and years of teaching experience.

The target population for this research study was all middle school mathematics and English language arts teachers in District A who administer either the Kansas Mathematics Assessment or the Kansas Reading Assessment to students in grades 6, 7, and 8. The sample for this study consisted of 44 fully certified mathematics teachers and 45 fully certified English language arts teachers of middle school students, who administered the Kansas Mathematics Assessment or the Kansas Reading Assessment in District A, during the 2010-2011, 2011-2012, and 2012-2013 school years.

The results of the study indicated that the average Kansas Mathematics Assessment score for the students of teachers with bachelor's degrees was higher than the average Kansas Mathematics Assessment score for the students of teachers with graduate

degrees. The results also indicated that the average Kansas Reading Assessment score for the students of teachers with an advanced degree in English was higher than the Kansas Reading Assessment score for the students of teachers with an advanced degree in something other than English. Lastly, the results of additional analyses indicated that the mean Kansas Reading Assessment score was higher for the students of English language arts teachers with an advanced degree in something other than English and with one to ten years of experience, than the mean scores for students of English language arts teachers with an advanced degree in something other than English and with more than ten years of experience.

## **Dedication**

This dissertation is dedicated to the following:

To educators who have made a tremendous impact on my life and influenced my decision to become an educator: Jennifer Punswick, you are the reason I became a teacher. Dr. Lawrence Scharmann, you fought for me and what was right. Without your belief, I would not be where I am today. Penny Macumber, you showed me what a great educator looks like. You all have made a significant difference in my life as role models and mentors. Thank you for teaching me that I could have or be anything I wanted if I worked hard enough for it.

I would like to thank everyone in Cohort 12 and specifically Diamond, Erica, & Rich—my cohort within the cohort—for holding me accountable and being a sounding board. Chad and Todd, thanks for giving me invaluable advice, reassurance, and something for which to strive.

My parents, whose love and encouragement I cannot put into words. I am grateful that you always nurtured my ambitions and allowed me to pursue my dreams. I do not have enough years left to appropriately thank you for your wisdom, encouragement, and especially, love.

My sister, in whose own dissertation are the words, “to my older brother Brett, I win (Hartin, 2015)!” I concede that will always be true. The race was fun, but as of now, I hold more degrees.

Most importantly, I would like to thank Lindsey, my beautiful wife. You have been incredibly patient throughout this process and I am beyond fortunate to have such a strong supportive woman in my life. Thank you for taking care of our family through the

hard work, long hours, and commitment this program and dissertation required. Without your unwavering support and encouragement I would not have completed this quest to better our family and kids everywhere. I look forward to spending more time with you, Brynley, and Teagan.

## **Acknowledgements**

I would like to take this opportunity to acknowledge all of my Baker professors for the valuable real-world knowledge you have given me throughout the doctoral program. I would also like to acknowledge my doctoral committee for helping me along the dissertation journey. I am beyond grateful to my data advisor Dr. Peg Waterman. I am in awe of your knowledge of data preparation and presentation. Thank you to Dr. Mike Wolgast for being a strong motivational leader and inspirational boss. I am thankful to have learned many ins and outs of building administration from you. Thank you to Dr. Russ Kokoruda for not only serving on my doctoral committee, but for putting the right people on the right bus, and in the right seats, when I was in high school. Without your influence both as my principal and professor, I would not be doing what I am today. To my advisor, Dr. Verneda Edwards, thank you for being a mentor and guide throughout the doctoral and dissertation processes. You kept me grounded while pushing me to do better. Thank you for your support and encouragement. Go Wildcats!

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## Chapter One

### Introduction

Two years after the United States (U.S.) declared its independence, the need for an educated populace began to take root. In his *Bill for the More General Diffusion of Knowledge*, Thomas Jefferson (1778), wrote:

It is believed that the most effectual means of preventing [tyranny] would be, to illuminate, as far as practicable, the minds of the people at large, and more especially to give them knowledge of those facts, which history exhibiteth, that...they may be enabled to know...it is better that such should be sought for and educated at the common expence of all. (Jefferson, 1778)

This belief led the federal government to begin to set aside resources for education as early as 1787 (Grant, 1993). Less than 100 years after becoming a country, the U.S. began seriously concentrating on education with the establishment of the Department of Education in 1867 (Grant, 1993). The U.S. had a desire to:

Collect...statistics and facts [that] show the condition and progress of education... and management of schools...and methods of teaching...[that]...aid the people of the United States in the establishment and maintenance of efficient school systems, and otherwise promote the cause of education throughout the country. (p. 1)

During most of the 20<sup>th</sup> century, the U.S. was proud of opportunities that schools provided to students for academic growth. According to Snyder (1993), enrollment rates for 5 to 19-year-olds rose from 51% in 1900 to 93% in 1991. Fundamental literacy rates (unable to read or write in any language), as opposed to functional literacy rates (a

person's educational level sufficient to function in a modern society), among students 14 to 18 years of age rose from 80% in 1870 to 99.4% in 1979. The rise in both enrollment and literacy is attributed to mandatory laws for school attendance that had been put into place (Snyder, 1993). Although these educational statistics were impressive, the U.S. continued to lag behind other nations in student achievement on a worldwide standard assessment. Every three years an assessment issued by the Organization for Economic Cooperation and Development (OECD), called the Programme for International Student Assessment (PISA), is taken by 15-year-old students from around the world. The PISA, "assesses the extent to which 15-year-old students have acquired key knowledge and skills that are essential for full participation in modern societies" (OECD, 2014, p. 3). Based on the 2012 results, the U.S. ranked 36<sup>th</sup> out of 64 countries.

Many factors attribute to the U.S. 2012 PISA scores, but the foundational factor are teachers. Teachers are the most significant resource in schools and improving student achievement depends on having high quality teachers (OECD, 2005). Hattie (2009) concluded after reviewing over 50,000 educational research studies, "not all teachers are effective, not all teachers are experts, and not all teachers have powerful effects on students" (p. 34). However, his major finding was that many teachers are dedicated and passionate professionals that make a difference. To improve student achievement our educational system needs high-quality teachers able to produce an improvement in student learning. However, defining a high-quality teacher by focusing on teacher factors has delivered mixed results. Factors of quality teachers could include years of teaching experience, or possession of an advanced degree. The type of graduate degree a teacher

receives might also impact student achievement. Teacher gender could also play a role affecting student achievement.

## **Background**

Public education in the U.S. is a decentralized educational system, based on the federal constitution. The constitution delegates power over education to state and local authorities. U.S. public education is comprised of early childhood, primary or elementary school, middle school, secondary or high school, and finally postsecondary school (US Department of Education (USDOE), 2008). Given the obligation of producing an educated populace, school districts have the responsibility to hire effective teachers that will ensure student achievement. Eric Hanushek, an educational researcher since the 1970s, has shown that it is undeniable that there are differences in the quality of teachers and their ability to elicit gains in student achievement, noting that good teachers can push students to a gain of one and a half grade-level equivalents per year (Hanushek, 1971). Furthermore, it is a widely accepted belief that teacher quality is the most important educational input predicting student achievement:

The quality of teachers in our schools is paramount: no other measured aspect of schools is nearly as important in determining student achievement. The initiatives we have emphasized in policy discussion—class-size reduction, curriculum revamping, reorganization of school schedule, investment in technology—all fall far short of the impact that good teachers can have in the classroom. (Hanushek, 2011, p. 41)

However, determining the factors that contribute to teacher quality is a complex task that has been studied by researchers (Carlisle, Kelcey, Rowan & Phelps, 2011b; Clotfelter,

Ladd, & Vigdor, 2007, 2010; Darling-Hammond, 2000; Goldhaber, 2002, 2003; Goldhaber & Brewer, 1996; Goldhaber & Walch, 2014; Hanushek, 1971, 2002; Hattie, 2009) for the last half century and continues to be studied and debated.

The current study examined to what extent different middle school teacher factors impact student achievement on the Kansas Mathematics Assessment and Kansas Reading Assessment. The teacher factors identified were: level of teacher education (bachelor's, master's, or doctorate), type of advanced degree (content area or other), gender (male or female), and years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years).

District A, a large suburban school district in Kansas, was used in the study. According to District A (2015), the district had 29,567 students in 52 schools: 35 elementary schools, 9 middle schools, grades 6 through 8, 4 high schools, and 4 alternative schools. District A had 2,414 certified staff with an average of 15 years classroom teaching experience. Across the nine middle schools, depending on student enrollment, there are 73 mathematics teachers and 68 English language arts (ELA) teachers. Eighty percent of the middle school teaching staff were white females with higher numbers in ELA compared to mathematics. Those numbers align with the typical U.S. teacher in that most are white, Anglo-Saxon, middle-class, females (Wideen, Mayer-Smith, & Moon, 1998).

During the 2011-2012 school year, using data from the Kansas Mathematics Assessment, the average percentage of middle school students who scored proficient or above was 93%. During the same school year, using data from the Kansas Reading

Assessment, the average percentage of middle school students who scored proficient or above was 95% (District A, 2014).

### **Statement of the Problem**

Some teachers are more effective than others. To ensure learning for all students it is important to identify those teacher factors that most impact student achievement. Researchers have identified teacher factors that influence student achievement (Goldhaber, 2002, 2003; Goldhaber & Brewer, 1996; Goldhaber & Walch, 2014; Hanushek, 1971, 2002; Hattie, 2009). However, much of the research examining teacher factors, as they influence student achievement, has been conducted at the elementary or high school levels (Akbari & Allvar, 2010; Akyuz & Berberoglu, 2010; Badgett, Decman, & Carman, 2013; Cavanagh, 2009; Clotfelter et al., 2007, 2010; Huang & Moon, 2009; Jacob, 2012). Elementary and high schools have their unique challenges, but little research has been conducted focusing specifically on middle school student achievement as it is impacted by middle school teacher factors. In middle school, students have moved from being in a classroom where one teacher teaches multiple subjects, to multiple classrooms, each staffed by a different content-area specialist. The problem is isolating which factors best predict, or identifies, teachers that increase student achievement in middle school.

The USDOE expects students to leave their formal public education experience college and career ready. One way states and districts attempt to determine student readiness beyond K-12 schooling is through achievement measured by standardized testing. Admittedly, there are multidimensional factors that contribute to a student's achievement including the influences of the student's family, often correlated with

socioeconomic status, peers, and even innate abilities acting as adversaries to cumulative school inputs (Hanushek, 1971). Regardless, responsibility for student achievement primarily falls to the teacher in the classroom (Hattie, 2009).

Ever since the implementation of the No Child Left Behind Act (NCLB) of 2001, there has been an expectation that students achieve at a high level. High-quality teachers contribute to student academic success and higher assessment scores. Since “educational attainment is more important...than ever before...as more jobs require more education” (“Increasing College,” 2014, p. 2), standardized assessments can provide an objective, consistent measure of academic growth that helps teachers determine what has been learned (Northwest Education Association, 2014). Students have experienced, and will continue to experience, a variety of formal assessments over time, from the implementation of NCLB and states’ requirements to create a standardized test that is comparable to the National Assessment of Educational Progress (NAEP), to the Common Core State Standards (CCSS) and the use of assessments like Smarter Balanced and Partnership for Assessment of Readiness for College and Careers (PARCC). Assessments like these, or the ACT Aspire (previously ACT Explore), can be used to link middle school student achievement to identifiable middle school teacher factors.

### **Purpose Statement**

The purpose of this study was to determine to what extent there is a difference in middle school student achievement based on teacher factors. The study was designed to determine the extent that there is a difference in middle school student achievement among teachers who have different levels of education (bachelor’s, master’s, or doctorate) and whether that difference is affected by gender and years of teaching



experience. Additionally, the study was designed to determine the extent there is a difference in middle school student achievement among teachers who have different types of advanced degrees (content area or other) and whether that difference is affected by gender and years of teaching experience.

### **Significance of the Study**

Findings from this study could contribute valuable insight into the teacher factors that positively influence student achievement in mathematics and ELA at the middle school level. The results of this study could also be significant to middle school teachers who are considering obtaining an advanced degree, as well as the type of advanced degree, that might improve their ability to positively impact student learning. Finally, results of this study could be used to support the hiring process of school districts when considering teacher factors and student improvement at the middle school level.

### **Delimitations**

All research is limited in one or more ways by the researcher. “Delimitations are self-imposed boundaries set by the researcher on the purpose and scope of the study” (Lunenburg & Irby, 2008, p. 134). The following delimitations were used to narrow the focus in this study:

1. Only middle school (grades 6-8) ELA and mathematics teachers in a large Midwest suburban school district were included.
2. Archived data were collected from the Kansas Mathematics Assessment and Kansas Reading Assessment during the 2010-2011, 2011-2012, and 2012-2013 school years.

3. Years of teaching experience did not take into consideration at what grade level or subject matter the teacher taught before the study.

### **Assumptions**

According to Lunenburg and Irby (2008), “Assumptions are postulates, premises, and propositions that are accepted as operational for purposes of the research” (p. 135).

The following assumptions were made in this study:

1. All information collected by the district regarding teacher factors was accurate.
2. Graduate degrees were considered equal, regardless of the institution at which they were earned.
3. All data collected by the district regarding student assessment scores were accurate.
4. All data collected by the district were coded to the right teacher.

### **Research Questions**

Research questions are used to formulate and focus an investigation and should be created to evaluate the relationships among the variables (Creswell, 2009). The research questions investigated were:

**RQ1.** To what extent is there a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, among teachers who have different levels of education (bachelor’s, master’s, or doctorate)?

**RQ2.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment,

among teachers who have different levels of education (bachelor's, master's, or doctorate), affected by gender?

**RQ3.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years)?

**RQ4.** To what extent is there a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, between teachers who have an advanced degree in their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English?

**RQ5.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, between teachers who have an advanced degree in their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English, affected by gender?

**RQ6.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, between teachers who have an advanced degree in their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English, affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years)?

## **Definition of Terms**

Key terms are words that can have different meanings and appear throughout the research study. According to Roberts (2010), “This section of the dissertation provides the definition for the terms used that do not have a commonly known meaning or that have the possibility of being misunderstood” (p. 139). The following terms were used throughout this research study.

**Advanced Degree.** Advanced degree refers to a university degree (master’s or doctorate) higher than a bachelor’s (Advanced degree, n.d.).

**Content Area.** Content area refers to a defined domain of knowledge and skill in an academic program. The most common content areas in U.S. public schools are English (or ELA), mathematics, science, and social studies. (Hidden curriculum, 2014).

**Middle School.** Middle School refers to a school for children that usually includes grades six to eight (Middle school, n.d.).

**Other.** Other refers to a graduate degree that is not English or mathematics.

**Student Achievement.** Student achievement refers to student-scale scores on the Kansas Mathematics Assessment and Kansas Reading Assessment. Student scale scores compared to state-determined cut-scores determine whether the student is categorized as ‘academic warning,’ ‘approaches standards,’ ‘meets standards,’ ‘exceeds standards,’ or ‘exemplary’ (Poggio, Yang, Irwin, Glasnapp, & Poggio, 2007).

## **Overview of the Methodology**

This was a non-experimental quantitative study that employed archival data for 2010-2011, 2011-2012, and 2012-2013 school years. Middle school ELA and mathematics teachers were specifically identified for the purpose of this study. As part of

this quantitative study, data was collected to examine certain teacher factors including gender, years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years), possession of an advanced degree (master's or doctorate), and type of advanced degree (content area or other). Archival data was imported into IBM® SPSS® Statistics Faculty Pack 23 for Windows for analysis. Statistical tests used in the hypothesis testing for this study included two one-factor analyses of variance (ANOVAs), a two-factor ANOVA, and a two-sample *t* test.

### **Organization of the Study**

This study is organized into five chapters. The first chapter includes the background of the study, statement of the problem, the purpose of the study, the significance of the study, delimitations, assumptions, definition of terms, an overview of the methodology, and an organization of the study. Chapter two is the review of literature, which includes a brief overview of requirements to become a teacher and teacher factors that have an impact on student academic success. Chapter three describes the methodology used to conduct the study and provides a description of the research design, population and sample, sampling procedure, measurement, data collection procedures, data analysis and hypothesis testing, and the limitations of the study. Chapter four presents descriptive statistics and the results of hypothesis testing. Chapter five includes the interpretation of the findings and provides future recommendations and suggestions for the field and future areas of study.

## Chapter Two

### Review of the Literature

The purpose of this study was to determine to what extent there is a difference in middle school student achievement as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment among teachers with different factors. The current study examined teacher educational level (bachelor's, master's, or doctorate); type of advanced degree (content area or other); gender (male or female); and years of teaching experience (1 to 5 years, 6 to 10 years, 11 to 15 years, and 16+ years).

#### Teachers Matter

In 1965 the USDOE, in conjunction with the Civil Rights Act of 1964, requested a report on the availability of equal educational opportunities in U.S. public schools (Coleman, 1966). Despite what the report, *Equality in Educational Opportunity* (1966), or more commonly recognized as *The Coleman Report*, led some to believe, the last 50 years of educational research indicated that schools and teachers can have an immense impact on student learning, both positively and negatively. Whitaker and Whitaker (2002), researchers who have published over 30 books, claimed that teaching is the most important profession there is and that there is no other work more valuable or essential to the world. However, Whitaker (2004) claimed, “the difference between more effective teachers and their less effective colleagues is not what they know. It is what they do” (p. xiii). Whitaker did not argue a teacher's subject matter knowledge, or possession of an advanced degree, is unimportant, but he does believe there is more to teaching than those readily identifiable factors like educational level or type of advanced degree. Whitaker (2004) went on to note “learning can happen in isolation; teaching happens between

people. Effective teaching calls for “people skills,” and the best teachers practice those skills every day” (p. xiv). According to Whitaker, if the best teaching strategies were not learned in university classrooms, or during professional development, then at least they can be mastered over time as long as teachers are practicing the strategies throughout their career.

Marzano (2007), agreed with Whitaker and concluded that, “the one factor that [is] the single most influential component of an effective school is the individual teachers within that school” (p. 1). Marzano’s extensive research identified three components of teaching that combine to create the most effective pedagogy: use of effective instructional strategies, use of effective management strategies, and use of effective classroom curriculum-design strategies. Those three strategies are learned and can be acquired either in university classrooms or through experience and learning opportunities provided by school districts.

Danielson (2007), created a *Framework for Teaching* that, according to the Teacher/Principal Evaluation Project (TPEP), “is a comprehensive and coherent framework that identifies those aspects of a teacher’s responsibilities that have been documented through empirical studies and theoretical research as promoting improved student learning” (TPEP, 2015). Danielson’s framework includes four domains on which teachers should be evaluated for effectiveness: planning and preparation, classroom environment, instruction, and professional responsibilities (Danielson, 2007). It is not coincidental that the first component of the Danielson’s planning and preparation domain is demonstrating knowledge of content and pedagogy. Teachers must undoubtedly know their content and how to teach it. Knowing how to best teach the required content may

come with experience, but the foundation begins with either a teacher's preparation program in college, or professional development either through the district or through the process of obtaining an advanced degree.

In addition to the substantial body of evidence from researchers and practitioners (Danielson, 2007; Hattie, 2009; Marzano, 2007; Whitaker, 2004), considered experts in the field of education, a large amount of empirical evidence that demonstrates the importance of teachers also exists. A report by the OECD (2005), provided international analysis of trends and developments in the teacher workforce, evidence on key factors of effective teachers, and innovative and successful teacher policies. Twenty-five countries participated in the analytical review which was comprised of not only country background reports and commissioned papers, but also literature reviews and data analyses. The broad finding was that teachers were the most important school variable influencing student achievement:

Most of the research has examined the relationship between measures of student performance, most commonly standardized test scores, and readily measurable teacher characteristics such as qualification, teaching experience, and indicators of academic ability or subject-matter knowledge. Such research generally indicates that there is a positive relationship between these measured teacher characteristics and student performance. (OECD, 2005, p. 2)

Additional evidence of the importance of teachers to student achievement can be found in the research of John Hattie. After 15 years of synthesizing over 50,000 studies and more than 800 meta-analyses on influences on student achievement comprising over 80 million students, Hattie (2009) identified 138 factors that affect student achievement. Hattie used



Cohen's  $d$  to represent the effect size. Cohen's  $d$  is defined as the difference between two means divided by a standard deviation of the pooled groups or of the control group alone (Gorard, 2013). Hattie found that the average effect size of all the interventions he studied was  $d = 0.4$ . Therefore, he decided to judge the success of influences relative to this  $d = 0.4$  'hinge point.' Effect sizes below the hinge point of  $d = 0.4$  are considered low and effect sizes above  $d = 0.6$  are considered large and characteristic of excellent teachers.

Of Hattie's 138 factors, 63 had a positive effect size above the  $d = 0.4$  hinge point, meaning they contribute to improving student achievement. Regarding specific teacher factors having an effect on student achievement, Hattie (2009) found ten teacher-related factors that contribute to student success. The positive teacher factors ranged from teachers' expectations of students to teacher-student relationships. Interestingly, the teacher factor that had the lowest effect size was teacher subject matter knowledge, which was less than the already low effect size for teacher training and teacher gender. The factor that Hattie found to have the strongest influence on student achievement was self-reported grades, or student expectations: setting one's own goals, or self-reporting. The concept of self-reported grades involves a teacher finding out what the student's expectations are and pushing the learner to exceed these expectations (Hattie, 2012). Influential teacher factors, those within the teacher's control, were microteaching, teacher clarity, and student-teacher relationship (Cohen, Porath, & Bai, 2010; Hattie, 2009). However, "the most critical aspects contributed by the teacher are the quality of the teacher, and the nature of the teacher—student relationships" (Hattie, 2009, p. 126).

## **Teacher Certification/Requirements**

To become a teacher in the U.S., most states require a candidate hold a bachelor's degree and complete a teacher education program. "All 50 states, the District of Columbia and Puerto Rico require their teachers be licensed to teach in public schools" (*Get Your Teaching Credential*, n.d., para. 1). However, licensure rules are set by each state's board of education. In addition to a bachelor's degree and completion of a teacher education program, most states require candidates successfully pass a standardized test in the content area they desire to teach.

Others [states] require teachers to receive certification for each individual subject they teach or even certification for the specific grade they plan on teaching.

Teachers can be licensed in early childhood education (preschool through third grade), elementary education (first grade through sixth or eighth), middle school (roughly grades five through eight), secondary education (usually a specific subject area from seventh through twelfth grade) or a specific field, such as reading, writing, English as a second language, or special education. (*Get Your Teaching Credential*, n.d. para. 3)

Most states require at least the possession of a bachelor's degree and a criminal background check to teach in public schools; individual states have different requirements before a candidate can be considered for employment.

The literature on the impact of teacher certification on student achievement is mixed. It largely depends on what is taught and at what grade level. Teachers with full certification and a major in the field they were teaching were a powerful predictor of student achievement (Darling-Hammond, 2000). Jepsen and Rivkin (2009) suggested

teachers lacking full certification tended to be less effective in the classroom.

Furthermore, using 2002-2005 student performance data and teacher certification statistics from Missouri's Comprehensive School Improvement Plan (CSIP), Marszalek, LaNasas, & Adler (2010) found a negative impact on student achievement when a teacher was not fully certified or had an alternate certification. "Even with important extraneous variables controlled—such as student-teacher ratio, economic status, teacher experience and education, attendance rate, and building type—the quality of teachers' pedagogical training matters" (Marszalek et al., 2010 p. 22). However, the researchers speculate that those results might be impacted by the type of school: middle school comprising grades six through eight, or junior high school comprising grades seven through nine.

Certification seemed to matter more for some subjects and at different grade levels (Huang & Moon, 2009). Subject-specific certification in mathematics and English generated higher student achievement (Boyd, Grossman, Lankford, Loeb & Wyckoff, 2008; Cavanagh, 2009; Clotfelter et al., 2010; Darling-Hammond, Holtzman, Galin, & Heilig, 2005; Harris & Sass, 2008, 2009; Kukla-Acevedo, 2009; Rice, 2003). Qureshi and Niazi (2012) stated, "a trained teacher is certainly more effective than untrained teachers" (p. 31) regardless of the type of certification.

However, researchers (Carlisle et al., 2011b; Creemers & Kyriakides, 2015; Hanushek, 2002; Huang & Moon, 2009; Jepsen & Rivkin, 2002) compared teachers with degrees and certification in education to those with degrees in a disciplinary field and found no relationship between degree type or certification and teacher performance. In a review of about 150 studies on teacher certification by the Abell Foundation, Walsh

(2001) concluded there was no evidence that showed certified teachers were more effective than uncertified teachers.

Teacher certification requirements are promoted as ensuring that there is a floor on quality, yet the requirements can have the exact opposite effect by “keeping out high-quality teachers who do not want to take the specific required courses, such requirements act more like a ceiling on quality” (Hanushek, 2002, p. 4). More recently, several researchers (Cavanagh, 2009; Jacob, 2012; Leana, 2011) concluded that teacher certification had no discernible impact on teacher quality or student achievement. Jacob (2012) reviewed 48 different studies and concluded that future research needs to use value-added measurement tools to “draw on multiple years of student achievement outcomes to isolate the contribution of individual schools and teachers to student growth” (p. 10).

With research providing mixed results of the importance of teacher certification, more and more states are modifying requirements. Thus, many states offer alternative licensure for teachers who do not have the background, or desire, for traditional licensure. According to “Alternative Licensure” (n.d.), alternative licensure programs require possession of bachelor’s degree, but not in education. Programs such as Teach for America allow teacher candidates to work immediately in a classroom under the supervision of a licensed teacher while simultaneously taking education classes. Alternative licensure programs exist to fill shortages of teachers in certain subjects and in difficult-to-fill positions (*Alternative Licensure*, n.d.), although Clotfelter et al. (2007) found negative effects on achievement for teachers with other types of alternative, provisional, or emergency certification. Their data came from end-of-course tests at the

high school level in North Carolina. Their analysis was restricted to four cohorts of 137,597 10<sup>th</sup> graders from 1999 to 2003, in one of five subjects: algebra, biology, economic legal and political systems, English I, and geometry. The researchers found that having a teacher without full certification reduced student achievement by 0.06 standard deviations compared to a teacher with a regular license.

### **Impact of Advanced Degrees on Student Achievement**

Teachers are encouraged to be life-long learners; many obtain degrees beyond the necessary bachelor degree. According to the USDOE in 2013, 39.9% of public school teachers held a bachelor's degree and 47.7 % held a master's degree. During 2011-2012, there were 178,000 master's degrees conferred in the field of education, which was second only to business degrees (National Center for Education Statistics (NCES), 2015). Although educators are encouraged to continue to learn and work towards earning an advanced degree throughout their career, with pay raises being based on the successful completion of graduate level courses, the research findings linking advanced degrees to student success are widely mixed, with even less evidence of correlation for teachers at the middle level. The number of advanced degrees in education has risen since 1971, but it has not necessarily improved student achievement (Dial, 2008).

Goldhaber and Walch (2014) merged data from College Board with the Integrated Postsecondary Education Data System and noted more teachers are gaining formal teacher preparation from graduate rather than undergraduate programs. Instead of obtaining an undergraduate degree in education, more teachers possess a degree in a field outside of education, but then receive an advanced degree in education. Furthermore, “of teachers who report having one year or less of teaching experience, approximately 26%

entered teaching with a master's degree in 2007-08 compared to 17% in 1987-88" (Goldhaber & Walch, 2014, p. 420). McCarthy and Young (2001) claimed that "graduate teacher education programs are critical components in the continuous development of teacher skills and knowledge" (p. 16). However, possessing an advanced degree might have more impact indirectly on student achievement in the form of teaching style, rather than directly influencing student test scores. Furthermore, when teachers obtained their master's degrees, directly following the completion of their undergraduate degree or later in their career, was also found to have varying effects. Darling-Hammond (2000), using data from a 50-state survey of policies, state case study analyses, the 1993-1994 Schools and Staffing Surveys (SASS), and the National Assessment of Educational Progress (NAEP), found teachers to be more confident if they were part of a five-year program (including a bachelor's in the subject and a master's in education) with a year-long student teaching placement compared to a four-year program.

Several studies (Guarino, Dieterle, Bargagliotti, & Mason, 2013; Harris & Sass, 2008; Subeidi, Rese, & Powell, 2015) showed a significant positive relationship between teachers' advanced degrees and student achievement at all grade levels. Harris and Sass (2008) used an educational production function that "relates student achievement to vectors of time-varying student/family inputs, classroom-level inputs, school inputs, and time-invariant student/family characteristics" (p. 9). The data used for the equation was student-level achievement tests for both mathematics and reading in grades 3-10 for the years 1999-2000 through 2004-2005. The scores linked specific teacher data including college transcripts, entrance exam scores, courses taken, and degree received. The researchers found that obtaining an advanced degree during one's teaching career is

positively correlated with the teacher's ability to improve student achievement, but only in the case of middle school mathematics. Guarino et al. (2013) found that training and knowledge gained through earning an advanced degree had a positive effect on student achievement, raising mathematics and reading test scores by more than one-third of a standard deviation, but the data only related to early-elementary students. Guarino et.al used data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), of 22,000 children enrolled in approximately 1,000 kindergarten programs. Expanding the research at the high school level, Subeidi et al. (2015) employed a two-level hierarchical linear model (HLM) in which student and teacher variables were incorporated in the level-1 (students) and level-2 (teachers) models. The researchers used an HLM to "identify any significant predictors associated with multiple levels and to determine the proportions of variance as well as effect sizes, based on these variances, at higher levels" (p. 34). Their study included 1,004 students in grades 9 through 12 taught by 53 teachers during the 2013-2014 school year. They found a significant effect for teachers' possessing an advanced degree improving a student's grade point average (GPA). They recommended district authorities recruit and retain teachers with advanced academic degrees (master's or Ph.D.) in high schools to improve student achievement and attendance (Subeidi et al., 2015).

Other researchers found small positive effects linking a teacher possessing an advanced degree and student achievement. Clotfelter et al. (2010) employed a standard education production function—the relationship between school and student inputs and a measure of school output—modified to refer to achievement test scores in mathematics taken by each student. The data included all North Carolina students who were in the 10<sup>th</sup>

grade during 1999-2000, 2000-2001, 2001-2002, and 2002-2003 school years. The researchers found small positive effects of having an advanced degree compared to having a teacher without an advanced degree. “Investigation at a more disaggregated level generates a small positive coefficient of 0.004 for a master’s degree (which is statistically significant at the 10% level)” (Clotfelter et al., 2010, p. 667). Furthermore, Badgett et al. (2013) examining data from 1,026 K-12 districts across Texas during the 2008-2009 school year, used a non-experimental correlational research design to test the hypothesis that “the greater percentages of teachers with graduate degrees in a district would contribute to higher levels of student achievement in mathematics” (p. 5). They conducted multiple Pearson Product Moment Correlations, and their results found only a limited positive impact on student math achievement when the teacher possessed a master’s degree.

Researchers (Clotfelter et al., 2007; Harris & Sass, 2008; Ohlson, 2009; Rivkin, Hanushek & Kain 2005) found that possession of an advanced degree might negatively impact student achievement depending on what level or subject the teacher taught. The negative trend does not appear limited to one grade level or subject matter. Furthermore, researchers (Clotfelter et al., 2007; Prince, Koppich, Westat, Bhatt, & Whitham, 2007), found that teachers earning an advanced degree more than five years after entering the profession were less effective than teachers without master’s degrees. “For middle school reading teachers and both math and reading high school teachers there is actually significant negative association between attainment of an advanced degree and measured productivity” (Harris & Sass, 2008, p. 27). Clotfelter et al. (2010) found, “an unexpected



and surprisingly large 0.09 negative effect of having a teacher with a Ph. D.” (p. 667), though admittedly the result is based on a small number of teachers.

For research related to the impact of a teacher possessing an advanced degree on student achievement, the results are mixed, especially taking into consideration student grade level, with most studies (Buddin & Zamaro, 2009; Cavanagh, 2009; Goldhaber & Walch, 2014; Hanushek et al., 1998; Huang & Moon, 2009; Leigh, 2010; Ohlson, 2009) showing no effects on student achievement. Furthermore, of the studies relating an advanced degree to student achievement, most addressed elementary or high school teachers and not middle school teachers. “Students’ test scores are not significantly higher on average with teachers who have masters degrees” (Rockoff, 2003, p. 19). Two studies (Clotfelter et al., 2007; Prince et al., 2007), produced similar results. Both found that teachers with master’s degrees earned before they entered the profession, or in the first five years, were no better or worse in raising student achievement than teachers with master’s degrees earned after teaching for at least five years. Many researchers (Buddin & Zamarro, 2009; Cavanagh, 2009; Goldhaber & Walch, 2014; Hanushek, Kain, & Rivkin, 1998; Huang & Moon, 2009; Leigh, 2010; Ohlson, 2009;) came to the same conclusion that there were no positive or negative effects of having an advanced degree on student achievement as measured by any means. Pennucci (2012) conducted a meta-analysis of 26 studies that examined the relationship between having a master’s degree and student test scores and found there is no consistent relationship (average effect size of -0.001) between teachers with advanced degrees and student achievement. Jacob’s (2012) study yielded the same results:

Ideally, a master's degree in education or similar qualification signals advanced knowledge about how children learn and grow and the appropriate pedagogical implications to maximize student learning...[but there is] no relationship, either positive or negative, between attainment of a master's degree and teacher quality, as measured by student achievement outcomes. (p. 9)

An important aspect to account for is the type of master's degree that can be obtained by teachers, including degrees in unique content areas and directly related to the teaching field, compared to fields like administration and others that have little to do with teaching (Darling-Hammond, 2000).

**Advanced Degree in Field of Study.** As with the possession of an advanced degree, the concentration of that degree has been found to have varying effects on student achievement depending on the grade and subject taught. Goldhaber (2003), Rice (2003), and Whitley (2010), found that possession of an advanced degree in the content area in which a person taught had a positive effect on student achievement. Whitley (2010) reviewed survey data from the Canadian National Longitudinal Survey of Children and Youth. Participants included 2,367 students identified as learning disabled (LD) in grades one through six. Whitley's analysis incorporated seven variables including student sex, student LD status, teacher level of special education training, teacher years of experience, teacher efficacy, teacher expectations, and student level of achievement. Although Whitley's findings show a relationship between a teacher possessing an advanced degree and student achievement, caution should be noted when attempting to equate those to subjects outside of special education. Pennucci (2012) researched seven 'rigorous' studies that examined the impact of teachers' master's content on student

achievement. Pennucci included studies that demonstrated methodological rigor and relevance as well as quasi-experimental or observational evaluations, but only when, “special care [had] been taken to isolate the causal effect of a K-12 policy or program on academic outcomes” (Pennucci, 2012, p. 2). Pennucci (2012) computed an effect size to measure the degree to which an evaluated policy or program changed an outcome and found that content area degrees, such as mathematics, have a positive impact on student achievement, but the effect size was only 0.023.

The desire to obtain a degree in a specific content area such as mathematics might be attributed to the teacher’s appreciation for the content. Cohen et al. (2010) noted teachers who loved the subject inspired others to love it. The researchers found that teachers who personalized the subject showed students it was a living part of the society from which it evolved. It is reasonable to believe that teachers who love their subject matter could inspire others to love it. After all, “Strong content knowledge is one of the attributes of teacher success” (Goldhaber & Walch, 2014, p. 42). One way to gain strong content knowledge is to obtain a degree in a specific area.

Goldhaber and Brewer (1996) found that teachers who were certified in mathematics and have an advanced degree in mathematics were associated with high student mathematics scores. They concluded that it is subject-specific training, or possession of a degree in a specific content area, that leads to greater student success rather than teacher ability. Consistent with Goldhaber and Brewer (1996), Goldhaber (2002) stated:

Teachers’ knowledge of their subject matter, as measured by degrees, courses, and certification in that area, is associated with high performance. Studies with

more detailed measures of teachers' education levels and coursework in subject areas found that, at least in math and science, academic preparation does positively influence student achievement. Having an advanced degree in subjects outside math and science, however, does not appear to affect student achievement. (p. 53)

Kukla-Acevedo (2008) also found statistically significant positive results for holding a master's degree in mathematics and student achievement. Kukla-Acevedo used data from 5<sup>th</sup> grade student scores on the Kentucky Core Content Test (KCCT) for the 2000-2001, 2001-2002, and 2002-2003 school years. The study included 3,812 students, 46 schools, and 120 teachers. "All else equal, a teacher who took 11 hours of math content will have higher student math scores than a teacher who took 10 hours of math content and will have incrementally higher student math scores over the years" (p. 18).

Positive results linked to a teacher possessing an advanced degree in a subject area were also found for student achievement in lower elementary school. Using data that included 4,021 first grade mathematics students of 1,126 teachers across 435 schools, and 3,897 reading students of 1,078 teachers across 431 schools, Phillips (2010) concluded that subject-specific graduate degrees were strong predictors of student achievement for at-risk first graders. Additionally, while controlling for outside variables, Carlisle et al. (2011) studied the classrooms of 44 teachers who taught third grade. They concluded that teachers, possessing an advanced degree in reading or literacy, produced higher gains in student achievement on the ITBS reading comprehension.

Although some researchers concluded there were positive relationships between teachers who possessed an advanced degree in a content area and student achievement, not all studies found the same results. Darling-Hammond (2000) examined teachers' scores on subject matter tests and the National Teacher Examinations (NTE). Her research did not find consistent relationships between those measures of subject matter knowledge and teacher performance related to student achievement. Darling-Hammond agrees that teachers' content preparation, based on course work in a specific subject, is positively related to student achievement, "but that the relationship is curvilinear, with diminishing returns to student achievement of teachers' subject matter courses above a threshold level" (p. 4). After teachers take an undefined amount of subject matter courses, there is no greater effect on student achievement due to the demands of what is being taught. For example, a 6<sup>th</sup> grade mathematics teacher does not need to pass a college level Differential Equations course to be able to teach 6<sup>th</sup> grade mathematics.

Hanushek and Rivkin (2007), after analyzing test score data in grades 3-7 for three cohorts of students in Texas, as well as analyzing findings from previous literature conclude, "Graduate degrees are not a good predictor of teacher effectiveness" (p. 81). Simply gaining knowledge via traditional master's degree programs does not guarantee transferability of knowledge into the classroom (Lease & Garrison, 2008).

Evans (2011) examined 42 new teachers' student results on a mathematics content test consisting of 25 free-response items ranging from algebra to calculus. Evans found discrepancies between middle school teachers and high school teachers' subject matter knowledge. Evans (2011) concluded, "High school teachers had higher mathematics content knowledge than middle school teachers [yet there were] no significant differences

found in gain scores between middle and high school teachers” (p. 30). Higher content knowledge at the high school level could be expected since the material being taught becomes progressively more difficult.

### **Teacher Gender**

Literature regarding teacher gender and its effect on student achievement is mixed and often contradictory. Female and male teachers treat and perceive boys and girls differently, but it is unclear how the treatment impacts student achievement on standardized tests (Bietenbeck, 2011; Krieg, 2005). It might be expected that teacher gender would influence student outcomes if the gender of the student was the same, which is unlikely for half of the student population since women make up 75% of the teacher workforce (Goldhaber & Walch, 2014).

Using matched teacher/student data from the Washington Assessment of Student Learning (WASL), distributed across 49,415 4<sup>th</sup> grade students representing 2,519 teachers, Krieg (2005) explored the impact of teacher and student gender differences on standardized test scores. The researcher found that teachers interact differently with students of the same gender than with students of the opposite gender. Krieg (2005), found that there was a small, but statistically significant benefit of having a teacher with the same gender as the student when looking at the end of year test scores for fourth-grade mathematics students, yet it is only statistically significant at the .10 level.

However, using data from upper secondary school within-student estimates of achievement gain over three years and their teachers, Holmlund and Sund (2008) found “no strong support...that a same-sex teacher improves student outcomes” (p. 51).

Furthermore, Roorda, Koomen, Split, and Oort (2011) examined effects of teacher gender

by studying the effect of teacher-student relationships (TSR) on students' achievement. Their meta-analysis consisted of 92 papers, describing 99 studies, including a total of 129,423 students, and at least 2,825 teachers from preschool to high school. They conducted four analyses of associations between positive and negative aspects of TSR and engagement as well as positive and negative aspects of the TSR and achievement. The researchers concluded that teachers treat students differently based on the teachers' gender, which had implications for student engagement, but not with student achievement.

Although there is little conclusive evidence that having the same gender teacher and student affects achievement on standardized tests, there are real differences in the interactions between female and male teachers and their students. Krieg (2005) found male teachers are more authoritative and have a more aggressive disciplinary approach to boys, whereas female teachers are more supportive and expressive and tend to ignore boys' disruptive behavior. He also found that male teachers provide a more positive learning environment for boys, but female teachers provide a more positive learning environment overall. Though these differences are not directly related to achievement scores, they might have an indirect impact on achievement in how teachers get students to learn.

Teacher gender has been linked to teacher efficacy. According to Tschannen-Moran and Hoy (2001), teacher efficacy is defined as a teacher's "judgment of his or her capabilities to bring about desired outcomes of student engagement and learning even among those students who may be difficult or unmotivated" (p. 783). Rubie-Davies, Flint, and McDonald, (2012) conducted research on 68 teachers, 11 males and 57

females, with varying years of teaching experience, from schools in a variety of socio-economic areas, and from rural and urban locations in New Zealand. Of the 68 teachers, 52 were from primary school (students 5 to 10 years old), and 16 were from intermediate school (students 11 to 12 years old). The researchers found that teacher gender did relate to different subscales of teacher efficacy: instructional strategies, student engagement, and classroom management. Female teachers had higher teaching efficacy and were more mastery oriented whereas male teachers were more performance oriented (Rubie-Davies et al., 2012). However, these findings relate only tangentially to student achievement and not directly to assessment scores.

Winters, Haight, Swaim, and Pickering (2013) linked student achievement directly to teacher gender at the elementary, middle, and high school levels, and found a positive relationship between student achievement and female teachers, but only at the middle and high school levels. Using mathematics and reading data from the Florida Comprehensive Assessment Test (FCAT) for more than 1.7 million students grades three through ten and 13,000 teachers in more than 3,000 schools from the 2000 through 2005 school years, they found a “significant relationship between being assigned to a female teacher and student achievement in middle and high school” (p. 75). Their unique dataset allowed them to match teachers to students with 99% accuracy. Their study evaluated how female students achieve relative to male students assigned to the same teacher. Though the researchers found a statistically significant relationship between being assigned to a female teacher and student achievement in middle school and high school, “the magnitude of the effect is so small that it is of little policy significance” (Winters et al., 2013, p. 75).



In contrast, one study found that male teachers had a better effect on student achievement than female teachers. Reviewing data from the Trends in Mathematics and Science Study (TIMSS) of 13-year-old students, across ten different countries totaling 38,109 mathematics students, Akyuz and Berberoglu (2010) found that, in some countries, teacher gender does have an effect on student mathematics achievement. They found male teachers were more successful than female teachers. Those findings might be a reflection of cultural differences (Akyuz & Berberoglu, 2010). The US, however, was not a country where male teachers were found to be more successful than female teachers. Akyuz and Berberoglu's findings were in contrast to the findings from Luschei and Chudgar's (2011) study of fourth-grade students' mathematics achievement. Luschei and Chudgar analyzed student data across 25 countries that participated in the TIMSS testing in 2003. They found a negative statistically significant correlation between male teachers and student achievement, but only in 15% of the 25 countries in the study.

Occasionally, researchers have found that male teachers have a negative impact on student achievement, as was the case in Krieg's 2005 research. Krieg's findings revealed that students of male teachers scored worse on the WASL than students of female teachers. Clotfelter et al. (2007) echoed results for mathematics achievement "with male teachers generating less positive results than female teachers" (p. 26). Clotfelter et al. (2010) found:

The combination of a male teacher with a female student generates a large negative effect of -0.105. In contrast, female teachers appear to be equally effective in teaching male students as they are in teaching female students.

Further, male teachers teaching male students are equally effective as female

teachers teaching female students. Thus, the large overall negative coefficient for male teachers is driven entirely by the negative interactions between male teachers and female students. (p. 673)

Petty, Harbaugh, and Wang (2013) conducted research and reported similar results using data from the North Carolina Department of Public Instruction. The study included 28,258 ninth through twelfth-grade students who took Algebra II in 2006, and 530 teachers, from 108 schools. “Students taught by male teachers performed significantly worse than students taught by female teachers,  $t(526) = -3.80, p < .001$ . On average, students taught by male teachers scored 2.16 points lower than students taught by female teachers” (p. 341).

Not all research has presented negative findings for male teachers. A study conducted by Coenen and Klaveren (2011) revealed mixed results of both negative and positive effects of male teachers on students’ achievement. Using a dataset of 65 schools including 2,090 students in grades 5, 6, and 7, from a three-year field experiment, the researchers concluded that test score data revealed that girls perform better in mathematics when taught by a male teacher, but boys do not perform better with a female mathematics teacher (Coenen & Klaveren, 2011). Although research has been conducted linking teacher gender to student achievement, there are not many studies done specifically at the middle school level. Of the studies reviewed the results were mixed.

### **Years of Teaching Experience**

The effect of a teacher’s years of experience on student achievement continues to be debated. Pennucci (2012) conducted a meta-analysis of 38 studies examining teacher experience effects on students’ achievement. Pennucci computed 146 separate effect

sizes at different times in teachers' careers and indicated that in the first few years a teachers' ability to increase student achievement improves dramatically and then levels off. Pennucci's findings have remained consistent with other research. For much of the past decade, the beliefs of the effects of a teacher's years of experience on student achievement had been considered settled. "Policymakers and researchers tend to believe that teachers improve rapidly during their initial years in the classroom, but that the returns to experience flatten out after the first few years of teaching" (Papay & Kraft, 2015, p. 2).

One study reinforcing the positive effects of the first few years of teaching found "the positive impact of teacher experience is limited to the earlier part of a teacher's career" (Luschei & Chudgar, 2011, p. 520). Furthermore, a substantial amount of research (Betts, Zau, & Rice, 2003; Boyd et al., 2008; Clotfelter et al., 2010; Darling-Hammond, 2000; Kane & Staiger, 2008; Pennucci, 2012; Rivkin et al., 2005; Wiswall, 2011), concluded that after only one or two years, a teacher's effectiveness may surpass veteran teachers.

Not only does teacher experience have varying impact on student achievement, but teacher experience is linked to more than just test scores. The more experienced teachers provide the school with stability and serve as mentors to new teachers, whereas new teachers bring new ideas and enthusiasm (Great Schools Staff, 2015). Most schools have a combination of veteran and new teachers. There are differences in teacher experience as first classified by Huberman (1989). According to Huberman, the first stage of a teacher's career (years 1-3) is survival and discovery when a teacher is excited about his/her first teaching assignment. In the second stage of a teacher's career (years 4-

6), the stabilization stage, the teacher become more professional and assumes more responsibility. In the third stage of a teacher's career (years 7-18), the experimentation and activation stage, the teacher has a decent knowledge base about best practices and begins experimenting with new teaching strategies. However, this stage is also when a teacher might experience burnout and a desire to leave the profession. In the fourth stage of their careers (years 19-30), the serenity/relational distance and conservatism stage, teachers respond mechanically and lack energy and enthusiasm. In the final stage of a career (years 31-40), according to Huberman (1998), the disengagement stage, teachers experience either serenity or bitterness (as cited in Ubben, Hughes, & Norris 2011). Huberman's research showed that "teachers will have different needs at various times during their careers" (as cited in Ubben et al., 2011, p. 170) and those needs might influence student achievement.

Teachers with more teaching experience have better classroom management (Rubie-Davis, Flint, & McDonald 2012). Teachers with experience with different populations are more confident in their teaching ability (Flores, Desjean-Perrotta, & Steinmetz, 2004). Harris and Sass (2008) note that experience enhances teacher productivity or a teacher's contribution to student achievement. Using data from the 2006-2007 school year from 23 urban public elementary schools in Florida, Ohlson (2009) found that dropout rates decrease and student achievement increases when teachers remained in the profession (Ohlson, 2009). With experience, teachers can adjust their teaching strategies to increase student engagement and student achievement. With experience, teachers can also adjust their teaching strategies to decrease behavioral issues including reducing student absence due to suspension. The correlation between average

years of teaching experience and reduction in student suspension was significant at the .05 level (Ohlson, 2009). Teacher experience has also been linked to student GPA and a reduction in truancy (Subeidi et al., 2015).

However, there are concerns to consider when linking teacher experience and student achievement. Rockoff (2003) stated, “using variation in student performance across teachers to measure gains from experience is likely to give misleading results” (p. 18). Carey (2004) gave specific reasons results might be skewed, “seniority-based transfer provisions, single salary schedule, and within-district financial arrangements combine to create a system where experienced teachers get paid the most money to work with students they most want to teach” (p. 19). Additionally, Hanushek and Rivkin (2007) argued, “higher student achievement ‘causes’ teacher experience in the sense that schools with easier-to-educate students attract experienced teachers” (p. 79). Their findings are consistent across other studies (Ingersoll, 2002; Phillips, 2010) that found that at-risk students are likely to be assigned to the least experienced teachers.

Kalogrides, Loeb, and Beteille (2012) conducted research using the Miami-Dade County Public School district for the school years of 2003-2004 through 2010-2011. The data analysis came from three files provided by the district: test scores on the Florida Comprehensive Assessment Test (FCAT) for students in grades 4-11, course-level data that link students to teachers, and staff files with information on all district employees. The authors found that teaching experience was associated with the types of students to which teachers are assigned, “less experienced teachers receive more challenging classes in all types of schools, the relationship between experience and the prior achievement of

students is stronger in schools with more senior teachers” (Kalogrides, Loeb, & Beteille, 2012, p. 119).

Although caution must be heeded when linking student achievement to teacher’s length of teaching experience due to several factors skewing research results, researchers were again beginning to place significance on the length of a teacher’s teaching experience. Papay & Kraft (2015), using a dataset that included more than 200,000 fourth through eighth-grade students and 3,500 teachers from the 2000-2001 to the 2008-2009 school years from a large, urban school district in the southern U.S., explored the relationship between teacher experience and student achievement. They found that although the largest gains in improving student achievement were indeed in the first five years of teaching, a teacher’s ability to improve student achievement persisted through their 30<sup>th</sup> year of teaching. On average, student test scores rose 40% between a teacher’s 10<sup>th</sup> and 30<sup>th</sup> year of teaching. Although the improvements in student achievement were greatest in mathematics, they also held true for reading. Furthermore, researchers Ladd and Sorenson (2015) reported similar findings. They analyzed records from about 1.2 million middle school students in North Carolina from 2007 to 2011. The records included absences, disciplinary offenses, and test scores. Using a value-added method, the researchers determined that, on average, teachers continued to improve their effectiveness in boosting academic outcomes for at least 12 years. Consistent with prior research, the returns of experience were largest during the first few years, leveling off after 12 years, but their results showed that for both mathematics and ELA teachers with 21-27 years of experience, the teachers were still more effective than they were when they only had 5 years of experience.

Although studies have shown positive correlations between a teacher's years of teaching experience, student achievement, and factors that may influence student achievement, a number of studies (Bietenbeck, 2011; Buddin & Zamarro, 2009; Cooper & Cohn, 1997; Ehrenberg & Brewer, 1994; El-Hajji, 2010; Ferguson & Ladd, 1996; Hanushek, 1971; Rubie-Davis et al., 2012; Stronge, Ward, & Grant, 2011) did not find any correlation between a teacher's teaching experience and student achievement. "Total years of teaching experience was not a significant predictor [of student achievement] but a more specific measure, *years of teaching experience at a particular grade level* (emphasis added), was significantly associated with increased student reading achievement" (Huang & Moon, 2009, p. 209). Leana (2011) examined one-year changes in student achievement scores in mathematics among over 1,000 fourth and fifth grade teachers between 2005 and 2007 in the New York City public schools system and claimed "students show stronger growth in math achievement when their teacher has spent more time teaching at the same grade level" (Leana, 2011, p. 34). However, Huang & Moon's (2009) and Leana's (2011) findings related to experience at a particular grade level and did not take into account that "there is a threshold in the years of experience in order to be an effective mathematics teacher in the classroom" (Akyuz & Berberoglu, 2010, p. 89).

Years of experience itself cannot guarantee an increase in student achievement nor predict teacher quality. The recentness of a teacher's educational experience has a significant effect on student achievement regardless of years of experience (Hanushek, 1971). A teacher could have obtained a degree in education but chose not to go directly into the teaching field. Examining 22 teacher-preparation programs in Louisiana,

Honawar (2007) found evidence of a wide variation in skill for not just new teachers, but veteran teachers as well. “It is possible to prepare new teachers who are as effective as, or sometimes more effective than, their experienced colleagues” (p. 1). Furthermore, Archer (2004) concluded, “Recent graduates...produced more learning gains in their students in mathematics than did veteran teachers overall” (p. 2). One impact of effectiveness might be “new teachers have significantly higher SAT scores than their counterparts in the mid-1990s...graduates entering the teaching profession in the 2008-2009 school year had average SAT scores that slightly exceeded average scores of their peers entering other occupations” (Goldhaber & Walch, 2014, p. 40). Another impact might be the type of educational preparation program new teachers complete. Research analyzing five-year teacher education programs that include a Master’s in Education and a year-long student teacher experience showed graduates to be more confident than peers and as effective as senior teachers (Darling-Hammond, 2000).

The research is clearly split. Experience and student achievement are linked more closely when the experience is in a specific position and subject. However, there is no guarantee that a more experienced teacher will be better than a new teacher, which is even more evident depending on the type of students being taught.

### **Summary**

Research has shown varying teacher factors can have a positive effect on student achievement, but there are as many studies that show no effects, or even adverse effects. This chapter provided a review of literature pertinent to this study. Specifically, the literature review addressed measurable teacher factors including teachers’ level of education, teachers’ type of advanced degree, gender, and years of teaching experience.



A description of the methodology employed in the study, including the research design, population and sample, and sampling procedures is provided in chapter three. The instrumentation and measurement are also described. Additionally, data collection procedures and data analysis are discussed.

## **Chapter Three**

### **Methods**

The purpose of this study was to determine to what extent there was a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, for teachers with different levels of education (bachelor's, master's, or doctorate) and different types of advanced degrees (content area or other). This study also examined differences based on the above teacher factors as they were affected by teachers' gender and years of teaching experience.

Chapter three includes the research design of the study and the process used to address the research questions posed in chapter one. This chapter includes descriptions of the population and sample as well as sampling procedures. Chapter three details the instruments used to measure student achievement on the Kansas Mathematics Assessment and Kansas Reading Assessment. The chapter also details the validity and reliability of the measurement and the data collection procedures, and concludes with the hypothesis testing and limitations.

#### **Research Design**

A non-experimental quantitative research design was used to determine the extent to which middle school teacher factors influenced student achievement. The independent variables were a teacher's level of education (bachelor's, master's, or doctorate), an advanced degree (content area or other), gender (male or female), and years of teaching experience (1-5 year, 6-10 years, 11-15 years, and 16+ years). The dependent variables used in this study were the Kansas Mathematics Assessment and Kansas Reading Assessment middle school scores from 2010-2011, 2011-2012, and 2012-2013.

## **Population and Sample**

The target population for this research study was all middle school mathematics and ELA teachers in District A who administer either the Kansas Mathematics Assessment or the Kansas Reading Assessment to students in grades 6, 7, and 8. The sample for this study consisted of 44 fully certified mathematics teachers and 45 fully certified ELA teachers of middle school students, who administered the Kansas Mathematics Assessment or the Kansas Reading Assessment in District A.

## **Sampling Procedures**

Nonrandom purposive sampling was used for the study. Specific criteria were used to select teachers for the sample. Two established criterion for inclusion in the study were grade level of students taught and content area taught. Only middle school teachers of mathematics and ELA were included in the study. Another established criterion for inclusion in the study was administering, consecutively, the Kansas Mathematics Assessment or Kansas Reading Assessment during the 2010-2011, 2011-2012, and 2012-2013 school years.

## **Instrumentation**

The instruments used for this study were the Kansas Mathematics Assessment and Kansas Reading Assessment created by The University of Kansas Center for Educational Testing and Evaluation (CETE) for the Kansas State Department of Education (KSDE). The Kansas Mathematics Assessment and Kansas Reading Assessment are administered to middle school students during the spring semester of each year. The assessments were computer based, unless a student required a paper and pencil test, and used as part of the state's accountability system to ensure equal educational opportunities for all students

across the state (KSDE, 2011). Most students at the middle school level take both the Kansas Mathematics Assessment and the Kansas Reading Assessment in grades 6, 7, and 8. According to the 2011-2012 Kansas Assessment Examiner's Manual (KSDE, 2011), the assessments are designed to accomplish the following:

- (a) measure specific indicators within the Kansas Curricular Standards, (b) provide information for calculating Annual Measurable Objectives (AMOs) for Title I schools and to provide information for quality performance accreditation (QPA), (c) report individual student scores along with the student's performance level, and (d) provide subscale and total scores that can be used in conjunction with local assessment scores to assist in improving a building or district's reading, mathematics, science, history/government, and writing programs. (KSDE, 2011, p. 1)

Although the Kansas Assessments were untimed, they were designed to be administered over multiple test sessions, with each session lasting a typical class period of approximately 45-60 minutes (KSDE, 2011). Scores on the Kansas Mathematics Assessment and Kansas Reading Assessment range from 0-100 and are based on five performance levels: academic warning, approaches standard, meets standard, exceeds standard or exemplary, which vary by grade level and subject (KSDE, 2011). Table 1 shows the Kansas Mathematics and Reading Assessment cut scores for each range. Results provide an indication of whether students are making progress toward mastery of state content standards showing the level of proficiency a student demonstrates. Although Kansas schools do not use test results alone to make decisions regarding grade-level promotion or retention, low scores are one factor that might suggest the need for

additional assistance. The assessments were administered to students in three sessions and were not timed. Items on the assessments were in a multiple-choice format and students choose from four response options. Students took the test electronically unless individuals required a paper and pencil accommodation. Students then received a score on a 0-100 scale. The scale was divided into five performance categories, and students were placed into one of the five categories.

Table 1

*Kansas Mathematics and Reading Assessment Cut Scores Percent Correct*

Subject	Grade	Academic Warning	Approaches Standard	Meets Standard	Exceeds Standard	Exemplary
Mathematics	6	0-52	53-62	63-78	79-89	90-100
	7	0-43	44-55	56-70	71-83	84-100
	8	0-44	45-57	58-72	73-85	86-100
Reading	6	0-51	52-63	64-78	79-87	88-100
	7	0-49	50-62	63-76	77-86	87-100
	8	0-49	50-63	64-78	77-88	89-100

Note. Adapted from “Kansas Assessment Examiner’s Manual” by KSDE, 2011, p. 64.

Furthermore, “Adequate Yearly Progress (AYP) was a requirement of federal law No Child Left Behind. It was a process of judging whether public schools and districts were on track for achieving 100% proficiency by the 2013-2014 school year” (KSDE, 2011, p. 69). The projected AYP targets for the 2011-2012, 2012-2013, and 2013-2014 school years are in Table 2.

Table 2

*AYP Annual Targets in K-8 Schools*

Year	Mathematics	Reading
2011-2012	91.1%	91.9%
2012-2013	95.6%	95.9%
2013-2014	100.0%	100.0%

Note. Adapted from “Kansas Assessment Examiner’s Manual” by KSDE, 2011, p. 69.

“The proportion of students classified in each of the categories becomes a primary source of information in determining AYP for schools, districts, and states” (Poggio et al., 2007, p. 4). AYP has since been changed to Annual Measurable Objectives (AMO) which is “a goal that a state sets each year to define a minimum percentage of students who must meet or exceed standards on its academic assessments...All students must be proficient in reading/language arts and mathematics by 2013-14” (ED Data Express, n.d.).

**Kansas Mathematics Assessment.** According to the Kansas Assessment Examiner’s Manual (KSDE, 2011), the Kansas Mathematics Assessment should have been administered in three sessions. There were 70-85 items per test depending on the grade level. Students were allowed as much time as necessary to complete each test part in one setting. Test parts should have been given in order beginning with Part I. It was recommended that no more than two test parts be completed on any one day, and that testing be done on consecutive days. Calculators were allowed on Parts I and II, and with the exception of grade 8, students were not permitted to use a calculator on any portion of Part 3 (KSDE, 2011).

The Kansas Mathematics Assessment had 12 to 16 mathematics indicators organized into the categories: algebra, data, geometry, and number computation. The

section on algebra assessed patterns, variables, linear relationships, and functions. The section on data assessed probability and statistics. The section on geometry assessed figures, measurements, and transformations. The section on number and computation assessed number sense, estimation, and computation. Students' scores were reported to the state (KSDE, 2011).

**Kansas Reading Assessment.** According to the Kansas Assessment Examiner's Manual (KSDE, 2011), the Kansas Reading Assessment should have been administered in three sessions. There were 57-84 items per test depending on the grade level. Students were allowed as much time as necessary to complete each test part in one setting. Test parts should have been given in order beginning with Part I. It was recommended that no more than two test parts be completed on any one day, and that testing be done on consecutive days (KSDE, 2011).

The Kansas Reading Assessment utilized 11 to 16 indicators that were divided into two categories: reading and literature. In the reading category, students were to answer questions related to different types of texts: expository, technical, narrative, and persuasive. The literature category assessed skills related to comprehension of literary concepts as well as the significance of literature as a whole. Students' scores were reported to the state (KSDE, 2011).

**Measurement.** The Kansas Mathematics Assessment and Kansas Reading Assessment were used in this study. The assessments were given to students in three sessions and were not timed. Items on the assessments were in a multiple-choice format and students choose from four response options. Students took the test electronically unless individuals required a paper and pencil accommodation. Students then received a

score on a 0-100 scale. The scale was divided into five performance categories: academic warning, approaches standards, meets standards, exceeds standards, and exemplary. Students were placed into one of the five categories. Each grade level had different cutoff scores for the five categories.

**Validity and reliability.** According to Lunenburg and Irby (2008), “Validity is the degree to which an instrument measures what it purports to measure...most standardized achievement tests have good content validity... [and is] determined by expert judgment” (p. 181). The criterion-related validity of the Kansas Mathematics Assessment and Kansas Reading Assessment was explored using three analyses to document “the relationship of Kansas Assessment scores to relevant variables external to the test” (Poggio et al., 2007, p. 76). For study of predictive validity between formative and general assessments, student data was matched with formative and summative assessment results to investigate the relationship between assessment scores. The second validity study of the relationship of test scores across years given mode of assessment, examined the relationship between test scores when assessments were administered electronically or using a paper and pencil test. The correlations coefficients were consistent within and between modes of testing, ranging from .71 to .80. The relationships among the scores from the different testing modes (computer and paper and pencil) were moderate to strong, indicating that student achievement was tested, rather than the mode of testing (Poggio et al., 2007). The difference in how a student was tested, computerized vs. paper and pencil, did not affect the assessment score. The third validity study explored the relationship between teacher ratings and student test performance. For the 2005-2006 school year, teachers administering the Kansas



Mathematics Assessment and Kansas Reading Assessment were asked to place students in the following categories: unsatisfactory, basic, proficient, advanced, and exemplary (Poggio et al., 2007). The category names have since changed to academic warning, approaches standard, meets standard, exceeds standard, and exemplary. The median correlation coefficient for the relationship between teacher ratings and test scores in grades 6-8 was .62, indicating a moderately strong positive relationship. “The results of these analyses provide evidence to support the validity of the...Kansas Assessment scores” (Poggio et al., 2007, p. 81). The validity of the Kansas Mathematics Assessment and Kansas Reading Assessment, based on the relationship between teacher ratings and students performance, was strong and evidentiary.

Score reliability for the Kansas Mathematics Assessment and Kansas Reading Assessment was calculated using Cronbach alpha coefficients. For the Kansas Mathematics Assessment, the coefficient values ranged from .91 to .95 across all grade level forms. For the Kansas Reading Assessment, the coefficient values ranged from .88 to .94 across all grade level forms (Poggio et al., 2007). Additionally,

reliability analyses for performance category classification were conducted for the base form of each grade level in both content areas utilizing test scores from the base form with the four-parameter compound binomial true score model. Results showed that classification reliabilities were acceptable. (Poggio et al., 2007, p. 62)

Both the Kansas Mathematics Assessment and the Kansas Reading Assessment were considered valid and reliable for assessing student knowledge in mathematics and ELA.

## **Data Collection Procedures**

The researcher sought permission to obtain assessment data through an emailed request to the Director of School Improvement and Assessment of District A. The researcher completed the Internal Research Application Request (Appendix A) and emailed it to the Director of School Improvement and Assessment and Executive Director of Human Resources on November 19, 2013. On January 9, 2014, the Director of School Improvement and Assessment informed the researcher that the research proposal was approved and granted permission to use archival assessment data as long as there was no reference to the district's name, and that human resources and the assessment office would begin working on gathering all of the data (Appendix B).

On Feb. 19, of 2014, the Director of School Improvement and Assessment emailed the researcher quantitative data from the school database. The information was for 89 middle school teachers. To protect the teacher's identity, the district's data analyst assigned each teacher a number between 1301 and 1389. Data also linked each teacher to highest level of degree (bachelor's, master's, or doctorate), type of advanced degree (content area or other), gender (male or female), years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years), subject taught (ELA or mathematics), and Kansas Mathematics Assessment or Kansas Reading Assessment score means for 2010-2011, 2011-2012, and 2012-2013. Data was kept on a password-protected computer in a password-protected Microsoft Excel Spreadsheet.

Before beginning statistical analysis for this study, the researcher submitted a request to conduct the study to the Baker University Institutional Review Board (IRB) on March 9<sup>th</sup>, 2016 (Appendix C). On March 20<sup>th</sup>, 2016, Baker University approved the

research request (Appendix D). The data was then imported into IBM® SPSS® Statistics Faculty Pack 23 for Windows for analysis.

### **Data Analysis and Hypothesis Testing**

The research questions used for this study addressed the effect of teacher factors on student achievement as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment. The analyses utilized in this studies were two-factor ANOVAs and a two-sample  $t$  test. The following contains the six research questions and twelve corresponding hypothesis as well as a description of the analysis used to test individual hypotheses. Additionally, information regarding the variables and level of significance for each analysis is provided when applicable.

**RQ1.** To what extent is there a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate)?

**H1.** There is a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate).

**H2.** There is a difference in middle school student achievement, as measured by the Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate).

Two one-factor analyses of variance (ANOVAs) were used to test H1 and H2. The categorical factor used to group the dependent variable of student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, was

teacher's level of education (bachelor's, master's, or doctorate). The level of significance was set at .05. A Tukey HSD post hoc was conducted as a follow-up for each ANOVA.

**RQ2.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), affected by gender?

**H3.** The difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), is affected by teachers' gender.

**H4.** The difference in middle school student achievement, as measured by the Kansas Reading Assessment, among teachers with different levels of education (bachelor's, master's, or doctorate), is affected by teachers' gender.

A two-factor analysis of variance (ANOVA) was conducted to test H3. An additional two-factor ANOVA was conducted to test H4. The two categorical variables used to group the dependent variable, student achievement, were teachers' level of education (bachelor's, master's, or doctorate) and teachers' gender (male or female). The two-factor ANOVA can be used to test three hypotheses including a main effect for teacher's level of education (bachelor's, master's, or doctorate), a main effect for teacher's gender (male or female), and a two-way interaction effect (teacher's level of education and teacher's gender). The interaction effect for teacher's level of education (bachelor's, master's, or doctorate) by teacher's gender (male or female) was used to test H3. The interaction effect for teacher's level of education (bachelor's, master's, or doctorate) by teacher's gender (male or female) was used to test H4. The level of

significance was set at .05. A Tukey HSD post hoc was conducted as a follow-up for each ANOVA.

**RQ3.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years)?

**H5.** The difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), is affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years).

**H6.** The difference in middle school student achievement, as measured by the Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), is affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years).

A two-factor analysis of variance (ANOVA) was conducted to test H5. A second two-factor ANOVA was conducted to test H6. The two categorical variables used to group the dependent variable, student achievement, were teacher's level of education (bachelor's, master's, or doctorate) and teacher's years of teaching experience. The two-factor ANOVA can be used to test three hypotheses including a main effect for teacher's level of education (bachelors, masters, or doctorate), a main effect for teacher's years of teaching experience, and a two-way interaction effect (teacher's level of education and teacher's years of teaching experience). The interaction effect for teacher's level of

education (bachelor's, master's, or doctorate) by teacher's years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years) was used to test H5. The interaction effect for teacher's level of education (bachelor's, master's, or doctorate) by teacher's years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years) was used to test H6. The level of significance was set at .05. A Tukey HSD post hoc was conducted as a follow-up for each ANOVA.

**RQ4.** To what extent is there a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, between teachers who have an advanced degree in their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English?

**H7.** There is a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, between teachers who have an advanced degree in mathematics and those with an advanced degree in an area other than mathematics.

**H8.** There is a difference in middle school student achievement, as measured by the Kansas Reading Assessment, between teachers who have an advanced degree in English and those with an advanced degree in an area other than English.

A two-sample *t* test was used to test H7 and an additional two-sample *t* test was used to test H8. The categorical factor used to group the dependent variable, student achievement, was teacher's type of advanced degree (content area or other). The level of significance was set at .05.

**RQ5.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment,

between teachers who have an advanced degree in their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English, affected by gender?

*H9.* The difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, between teachers with an advanced degree in mathematics and those with an advanced degree in an area other than mathematics, is affected by teachers' gender.

*H10.* The difference in middle school student achievement, as measured by the Kansas Reading Assessment, between teachers with an advanced degree in English and those with an advanced degree in an area other than English, is affected by teachers' gender.

An ANOVA was conducted to test H9. A second two-factor ANOVA was conducted to test H10. The two categorical variables used to group the dependent variable, student achievement, were teachers' type of advanced degree (content area or other) and teacher's gender (male or female). The two-factor ANOVA can be used to test three hypotheses including a main effect for teachers' type of advanced degree (content area or other), a main effect for teacher's gender (male or female), and a two-way interaction effect (teacher's type of advanced degree and teacher's gender). The interaction effect for teacher's type of advanced degree (content area or other) by teacher's gender (male or female) was analyzed using an ANOVA for H9. The interaction effect for teacher's type of advanced degree (content area or other) by teacher's gender (male or female) was analyzed using an ANOVA for H10. The level of

significance was set at .05. A Tukey HSD post hoc was conducted as a follow-up for each ANOVA.

**RQ6.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, between teachers who have an advanced degree in their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English, affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years)?

**H11.** The difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, between teachers with an advanced degree in mathematics and an advanced degree in an area other than mathematics, is affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years).

**H12.** The difference in middle school student achievement, as measured by the Kansas Reading Assessment, between teachers with an advanced degree in English and teachers with an advanced degree in an area other than English, is affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years).

A two-factor analysis of variance (ANOVA) was conducted to test H11. A second two-factor ANOVA was conducted to test H12. The two categorical variables used to group the dependent variable, student achievement, were teachers' type of advanced degree (content area or other) and teacher's years of teaching experience. The two-factor ANOVA can be used to test three hypotheses including a main effect for teachers' type of advanced degree (content area or other), a main effect for teacher's years of teaching experience, and a two-way interaction effect (teacher's type of



advanced degree and teacher's years of experience). The interaction effect for teacher's type of advanced degree (content area or other) by teacher's years of experience, was analyzed using an ANOVA to test H11. The interaction effect for teacher's type of advanced degree (content area or other) and by teacher's years of experience, was analyzed using an ANOVA to test H12. The level of significance was set at .05. A Tukey HSD post hoc was conducted as a follow-up for each ANOVA.

### **Limitations**

Lunenburg and Irby (2008) defined the limitations of the study as factors that are out of the control of the researcher. A limitation of this study was that the Kansas Mathematics Assessment and Kansas Reading Assessment data was obtained from the school years 2010-2011, 2011-2012, & 2012-2013. More recent data could not be obtained due to changes to the assessments and districts not reporting scores. Furthermore, variables outside the control of the researcher such as student attendance, motivation, physical and emotional health, and attitude could have affected student outcomes. Additionally, teacher variables that could have been relevant, but were outside the realm of this study, include teacher motivation, instructional strategies, and classroom management, etc. Lastly, this study did not account for any teachers' leave of absence.

### **Summary**

This chapter revisited the purpose of the study and offered a detailed explanation of the process used to address the research questions. A nonrandom purposive sample was collected from District A. Careful examination of the instrument, including implications for validity and reliability, were also presented. A thorough explanation of

the data collection procedures and methods of data analysis were discussed in the chapter. Chapter four presents the results of the data analysis and hypothesis testing.

## **Chapter Four**

### **Results**

This study was designed to determine the difference in student achievement scores, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, based on teacher factors. The first purpose was to determine to what extent there was a difference in middle school student achievement among teachers who have different levels of education (bachelor's, master's, or doctorate). The second and third purposes were to determine to what extent the difference in middle school student achievement among teachers who have different levels of education (bachelor's, master's, or doctorate) were affected by teacher gender and years of teaching experience. Additionally, the study was designed to determine the extent that there was a difference in middle school student achievement between teachers who have an advanced degree in their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English. Finally, the study was designed to determine the extent that the difference in middle school student achievement between teachers who have an advanced degree in their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English was affected by gender and years of teaching experience.

### **Descriptive Statistics**

The sample for this study included 89 middle school mathematics and ELA teachers who taught in District A. Eighty-one percent of the teachers were female and nineteen percent were male. The majority of teachers, 88%, held an advanced degree as compared to 12% who possessed a bachelor's degree. Of the teachers who possessed an

advanced degree, eight obtained the degree in their content area. Of the teachers in this study, 12 had taught 5 or fewer years, 29 had taught between 6 and 10 years, 13 had taught between 11 and 15 years, and 35 taught more than 15 years.

### **Hypothesis Testing**

Data from District A was downloaded and imported into IBM® SPSS® Statistics Faculty Pack 23 for Windows. The analysis focused on six research questions. Each research question is delineated below with two corresponding hypotheses and the method and results of the statistical analysis.

**RQ1.** To what extent is there a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate)?

**H1.** There is a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate).

**H2.** There is a difference in middle school student achievement, as measured by the Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate).

Prior to conducting the hypothesis test for RQ1, the three categories for level of education (bachelor's, master's, or doctorate) were collapsed to two (bachelor's or graduate). A two-sample *t* test was used to test H1 and an additional two-sample *t* test was used to test H2. The categorical factor used to group the dependent variable of student achievement, as measured by the Kansas Mathematics Assessment and Kansas

Reading Assessment, was teacher's level of education (bachelor's or graduate). The level of significance was set at .05.

The results of the two-sample  $t$  test for the Kansas Mathematics Assessment hypothesis indicated there was a marginally significant difference between the two values,  $t = 1.81$ ,  $df = 42$ ,  $p = .08$ . The sample mean for the students of teachers with a bachelor's degree ( $M = 87.10$ ,  $SD = 3.47$ ) was higher than the sample mean for the students of teachers with a graduate degree ( $M = 83.88$ ,  $SD = 3.77$ ). The average Kansas Mathematics Assessment score for the students of teachers with bachelor's degrees tended to be higher than the average Kansas Mathematics Assessment score for the students of teachers with graduate degrees.

The results of the two-sample  $t$  test for the Kansas Reading Assessment hypothesis indicated there was not a statistically significant difference between the two values,  $t = -.725$ ,  $df = 43$ ,  $p = .473$ . The sample mean for the students of teachers with a bachelor's degree ( $M = 83.81$ ,  $SD = 1.41$ ) was not different from the sample mean for the students of teachers with a graduate degree ( $M = 84.90$ ,  $SD = 3.63$ ). The average Kansas Reading Assessment score for the students of teachers with bachelor's degrees were similar to the average Kansas Reading Assessment score for the students of teachers with graduate degrees.

**RQ2.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), affected by gender?

**H3.** The difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), is affected by teacher's gender.

**H4.** The difference in middle school student achievement, as measured by the Kansas Reading Assessment, among teachers with different levels of education (bachelor's, master's, or doctorate), is affected by teacher's gender.

Due to sample size issues, the analyses could not be conducted for H3 and H4. As presented in Table 3 below, there were no male teachers for either mathematics or ELA who held bachelor degrees. Modified analyses were conducted to partially address these hypotheses and are presented later in this chapter.

Table 3

*Descriptive Statistics Showing Teacher's Gender and Degree*

Class Taught	Gender	Degree	
		Bachelor's	Graduate
Mathematics	M	0	9
	F	5	30
ELA	M	0	8
	F	6	31

**RQ3.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years)?

**H5.** The difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), is affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years).

**H6.** The difference in middle school student achievement, as measured by the Kansas Reading Assessment, among teachers who have different levels of education (bachelor's, master's, or doctorate), is affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years).

Due to sample size issues, the analyses could not be conducted for H5 and H6. As presented in Table 4 below, there were too few teachers with bachelor degrees in at least two of the categories for years of experience. Modified analyses were conducted to partially address these hypotheses and are presented later in this chapter.

Table 4

*Descriptive Statistics Showing Teachers Years of Experience and Degree*

Class Taught	Years of Experience	Degree	
		Bachelor's	Graduate
Mathematics	1-5	4	4
	6-10	1	11
	11-15	0	5
	16+	0	19
ELA	1-5	3	1
	6-10	3	14
	11-15	0	8
	16+	0	16

**RQ4.** To what extent is there a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, between teachers who have an advanced degree in their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English?

**H7.** There is a difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, between teachers who have an advanced degree in mathematics and those with an advanced degree in an area other than mathematics.

**H8.** There is a difference in middle school student achievement, as measured by the Kansas Reading Assessment, between teachers who have an advanced degree in English and those with an advanced degree in an area other than English.

A two-sample  $t$  test was used to test H7 and an additional two-sample  $t$  test was used to test H8. The categorical factor used to group the dependent variable, student achievement, was teacher's type of advanced degree, content area or other.

The results of the two-sample  $t$  test for the Kansas Mathematics Assessment hypothesis indicated no statistically significant difference between the two values,  $t = -1.275$ ,  $df = 37$ ,  $p = .210$ . The sample mean for the students of teachers with a degree in something other than content area ( $M = 83.65$ ,  $SD = 3.78$ ) was not different than the sample mean for the students of teachers with an advanced degree in a content area ( $M = 86.52$ ,  $SD = 3.02$ ). The average Kansas Mathematics Assessment score for the students of teachers with advanced degrees in something other than content area tended to be very similar to the average Kansas Mathematics Assessment score for the students of teachers with an advanced degree in their content area.



The results of the two-sample  $t$  test for the Kansas Reading Assessment hypothesis indicated a statistically significant difference between the two values,  $t = -3.20$ ,  $df = 36$ ,  $p = .00$ . The sample mean for the students of teachers with a degree in something other than their content area ( $M = 84.29$ ,  $SD = 3.33$ ) was lower than the sample mean for the students of teachers with an advanced degree in their content area ( $M = 89.32$ ,  $SD = 2.84$ ). The average Kansas Reading Assessment score for the students of teachers with an advanced degree in something other than their content area was lower than the average Kansas Reading Assessment score for the students of teachers with an advanced degree in their content.

**RQ5.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, between teachers who have an advanced degree in their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English, affected by gender?

**H9.** The difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, between teachers with an advanced degree in mathematics and those with an advanced degree in an area other than mathematics, is affected by teacher's gender.

**H10.** The difference in middle school student achievement, as measured by the Kansas Reading Assessment, between teachers with an advanced degree in English and those with an advanced degree in an area other than English, is affected by teacher's gender.

Due to sample size issues, the analyses could not be conducted for H9 and H10. As presented in Table 5 below, there were no male teachers for mathematics, and only one for ELA, who had an advanced degree in their content area. Modified analyses were conducted to partially address these hypotheses and are presented later in this chapter.

Table 5

*Descriptive Statistics Showing Teacher's Gender and type of Advanced Degree*

Class Taught	Gender	Advanced Degree	
		Content Area	Other
Mathematics	M	0	9
	F	3	27
ELA	M	1	7
	F	4	26

**RQ6.** To what extent is the difference in middle school student achievement, as measured by the Kansas Mathematics Assessment and Kansas Reading Assessment, between teachers who have an advanced degree their content area (mathematics or English) and teachers who have an advanced degree in an area other than mathematics or English, affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years)?

**H11.** The difference in middle school student achievement, as measured by the Kansas Mathematics Assessment, between teachers with an advanced degree in mathematics and an advanced degree in an area other than mathematics, is affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years).

**H12.** The difference in middle school student achievement, as measured by the Kansas Reading Assessment, between teachers with an advanced degree in English and

teachers with an advanced degree in an area other than English, is affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years).

Due to sample size issues, the analyses could not be conducted for H11 and H12. As presented in Table 6 below, there were too few teachers for either mathematics or ELA with an advanced degree in their content area. Modified analyses were conducted to partially address these hypotheses and are presented later in this chapter.

Table 6

*Descriptive Statistics Showing Teacher's Years of Experience and Type of Advanced Degree*

Class Taught	Years of Experience	Advanced Degree	
		Content Area	Other
Mathematics	1-5	0	4
	6-10	2	9
	11-15	0	5
	16+	1	18
ELA	1-5	0	1
	6-10	3	10
	11-15	1	7
	16+	1	15

### **Additional Analyses**

As was noted in the hypothesis testing section, there were sample size issues which compromised the analysis for research questions two, three, five, and six. There were not enough teachers possessing a bachelor's degree, nor enough teachers with an advanced degree in their content area, to conduct the planned statistical analyses. Sample size issues were present for males with bachelor degrees. Samples size issues were also

present in all of the years of experience categories for teachers with an advanced degree in their content area. Modified analyses were conducted to partially address the relevant research questions and the results of the analyses are reported below.

The modified analysis that was conducted to address RQ2 utilized only middle school assessment scores for students of teachers with graduate degrees (master's or doctorate). Two two-sample  $t$  tests were conducted to test for differences in Kansas Mathematics Assessment scores and Kansas Reading Assessment scores for the students of male and female teachers. The results of the two-sample  $t$  test for the Kansas Mathematics Assessment hypothesis indicated there was not a statistically significant difference between the two values,  $t = 1.339$ ,  $df = 37$ ,  $p = .189$ . The sample mean for the students of male teachers ( $M = 85.34$ ,  $SD = 4.17$ ) was not different than the sample mean for the students of female teachers ( $M = 83.44$ ,  $SD = 3.61$ ). The average Kansas Mathematics Assessment score for the students of male teachers with graduate degrees were similar to the average Kansas Mathematics Assessment score for the students of female teachers with graduate degrees.

The results of the two-sample  $t$  test for the Kansas Reading Assessment hypothesis indicated there was not a statistically significant difference between the two values,  $t = .377$ ,  $df = 36$ ,  $p = .71$ . The sample mean for the students of male teachers ( $M = 85.39$ ,  $SD = 3.06$ ) was not different than the sample mean for the students of female teachers ( $M = 84.84$ ,  $SD = 3.85$ ). The average Kansas Reading Assessment score for the students of male teachers with graduate degrees tended to be very similar to the average Kansas Reading Assessment score for the students of female teachers with graduate degrees.

The modified analysis that was conducted to address RQ3 utilized only middle school assessment scores for the students of teachers with graduate degrees (master's or doctorate) and compared Kansas Mathematics Assessment scores and Kansas Reading Assessment scores among teachers of varying years of experience. Additional sample size issues required that the first two categories of years of experience be collapsed into one category (1-10 years) before the Kansas Reading Assessment was analyzed. The results of the analysis of the Kansas Mathematics Assessment indicated there was not a statistically significant difference between at least two of the means,  $F = .276$ ,  $df = 3, 35$ ,  $p = .84$ . The results of the analysis of the Kansas Reading Assessment indicated there was not a statistically significant difference between at least two of the means,  $F = 2.52$ ,  $df = 2, 35$ ,  $p = .10$ . No follow-up post hocs were warranted. See Table 7 for the means and standard deviations for these analyses. Years of experience did not affect Kansas Mathematics Assessment scores or Kansas Reading Assessment scores for students of teachers with graduate degrees.

Table 7

*Descriptive Statistics for the Results of the Additional Analysis for RQ3*

Class Taught	Years of Experience	<i>M</i>	<i>SD</i>	<i>N</i>
Mathematics	1-5	83.41	1.87	4
	6-10	84.71	5.27	11
	11-15	84.10	2.35	5
	16+	83.43	3.48	19
ELA	1-10	86.63	3.63	14
	11-15	83.80	3.77	8
	16+	84.06	3.30	16

The modified analysis that was conducted to address RQ5 utilized only middle school assessment scores for the students of teachers with an advanced degrees in something other than their content area. Two two-sample  $t$  tests were conducted to test for differences in Kansas Mathematics Assessment scores and Kansas Reading Assessment scores between the students of male and female teachers. The results of the two-sample  $t$  test for the Kansas Mathematics Assessment hypothesis indicated there was not a statistically significant difference between the two values,  $t = 1.57$ ,  $df = 34$ ,  $p = .13$ . The sample mean for the students of male teachers ( $M = 85.34$ ,  $SD = 4.17$ ) was not significantly different than the sample mean for the students of female teachers ( $M = 83.09$ ,  $SD = 3.55$ ). The average Kansas Mathematics Assessment score for the students of male teachers with graduate degrees tended to be similar to the average Kansas Mathematics Assessment score for the students of female teachers with graduate degrees.

The results of the two-sample  $t$  test for the Kansas Reading Assessment hypothesis indicated there was not a statistically significant difference between the two values,  $t = .33$ ,  $df = 31$ ,  $p = .75$ . The sample mean for the students of male teachers ( $M = 84.66$ ,  $SD = 2.44$ ) was not significantly different than the sample mean for the students of female teachers ( $M = 84.19$ ,  $SD = 3.57$ ). The average Kansas Reading Assessment score for the students of male teachers with graduate degrees were similar to the average Kansas Reading Assessment score for the students of female teachers with graduate degrees.

The modified analysis that was conducted to address RQ6 utilized only middle school assessment scores for the students of teachers with an advanced degrees in something other than their content and compared Kansas Mathematics Assessment scores

and Kansas Reading Assessment scores among teachers of varying years of experience. Additional sample size issues required that the first two categories of years of experience be collapsed into one category (1-10 years) before the Kansas Reading Assessment was analyzed. The results of the analysis of the Kansas Mathematics Assessment indicated there was not a statistically significant difference between at least two of the means,  $F = .14$ ,  $df = 3, 32$ ,  $p = .93$ . No follow up post hoc was warranted. The results of the analysis of the Kansas Reading Assessment indicated there was a statistically significant difference between at least two of the means,  $F = 3.54$ ,  $df = 2, 30$ ,  $p = .04$ . A follow up post hoc, the Fisher's LSD, was conducted to compare the means from the three categories. The results of the analysis indicated that the mean for the students of teachers with 1 to 10 years of experience ( $M = 86.27$ ) was statistically higher than the mean for the students of teachers with 11 to 15 years of experience ( $M = 82.77$ ). The results of the analysis also indicated that the mean for the students of teachers with 1 to 10 years of experience ( $M = 86.27$ ) was statistically higher than the mean for the students of teachers with 16+ years of experience ( $M = 83.55$ ). See Table 8 for the means and standard deviations for this analysis. Years of experience affected Kansas Reading Assessment scores for the students of teachers with an advanced degree in something other than content.

Table 8

*Descriptive Statistics for the Results of the Additional Analysis for RQ6*

Class Taught	Years of Experience	<i>M</i>	<i>SD</i>	<i>N</i>
Mathematics	1-5	83.41	1.87	4
	6-10	84.24	5.58	9
	11-15	84.10	2.35	5
	16+	83.29	3.53	18
ELA	1-10	86.27	3.84	11
	11-15	82.77	2.57	7
	16+	83.55	2.68	15

**Summary**

Chapter four included the descriptive statistics, results of the hypothesis testing, and results of the data analysis, when available, related to teacher factors that affect student achievement on the Kansas Mathematics Assessment and the Kansas Reading Assessment. Results related to RQ1 indicated that there was a marginally statistically significant difference between student scores on the Kansas Mathematics Assessment among teachers with a bachelor's degree, which was higher than the sample mean of student scores for teachers with a graduate degree. Due to sample size issues, two-factor ANOVAs could not be conducted to test RQ2, RQ3, RQ5, and RQ6. The two-sample *t* test results related to RQ4 indicated a statistically significant difference between the sample mean scores on the Kansas Reading Assessment. Scores for the students of teachers with a degree in something other than a content area were lower than the sample mean for the students of teachers with an advanced degree in their content area. Additional analysis yielded no statistically significant difference for RQ2, RQ3, or RQ5.



However, the results of the additional analysis of the Kansas Reading Assessment for RQ6 indicated there was a statistically significant difference between the students of teachers with 1 to 10 years of experience and the students of teachers with more experience. In both cases, the mean for the students of teachers with 1 to 10 years of experience was statistically higher than the mean for the students of teachers with more years of experience. A summary of the research study, connections to the literature regarding major findings, implications for action, recommendations for further study, and conclusions are included in chapter five.

## **Chapter Five**

### **Interpretation and Recommendations**

Teachers enter the field of education for a myriad of reasons, and among those is a desire to help students learn and achieve at high levels. Teachers come from different backgrounds, with different experiences, that might impact not only their teaching strategies and abilities, but also how well their students achieve. The purpose of this study was to identify, and analyze, teacher factors that improve middle school student achievement. Specifically, the study was designed to determine the extent that there is a difference in middle school student achievement among teachers who have different levels of education (bachelor's, master's, or doctorate) and whether that difference is affected by gender and years of teaching experience. Additionally, the study was designed to determine the extent that there is a difference in middle school student achievement among teachers who have different types of advanced degrees (content area or other) and whether that difference is affected by gender and years of teaching experience. This chapter contains a summary of the study, which includes an overview of the problem, purpose statement, research questions, and a review of the methodology. Additionally, this chapter presents the major findings of the study and how the findings relate to the literature. Finally, this chapter includes implications for action, recommendations for future research, and concluding remarks.

#### **Study Summary**

The following section provides a summary of the current study. The summary includes an overview of the problem identifying middle school teacher factors that could influence student achievement on standardized assessments. The specific teacher factors

identified were gender, years of teaching experience, possession of an advanced degree, and the type of advanced degree. The subsequent section states the purpose of the study and includes the research questions. A review of the methodology and the major findings of the study complete the summary.

**Overview of the problem.** The greatest influence on student achievement is an effective teacher (Hanushek, 2011). Some teachers are more effective than others. To ensure learning for all students, it is important to identify those teacher factors that most effect student achievement. Researchers have long worked to identify teacher factors that influence student achievement (Goldhaber, 2002, 2003; Goldhaber & Brewer, 1996; Goldhaber & Walch, 2014; Hanushek, 1971, 2002; Hattie, 2009). However, much of the research examining teacher factors, as they influence student achievement, has been conducted at the elementary or high school levels (Akbari & Allvar, 2010; Akyuz & Berberoglu, 2010; Badgett, Decman, & Carman, 2013; Cavanagh, 2009; Clotfelter et al., 2007, 2010; Huang & Moon, 2009; Jacob, 2012). Elementary and high schools have their unique challenges, but little research has been conducted focusing specifically on middle school student achievement as it is impacted by middle school teacher factors. In the transition from elementary to middle school, students move from being in a classroom where one teacher teaches multiple subjects, to multiple classrooms, each staffed by a different content-area specialist. The problem is identifying which teacher factors (degree, experience, gender) best predict, or identifies, teachers that improve student achievement in middle school.

**Purpose statement and research questions.** The purpose of this study was to determine to what extent there is a difference in middle school student achievement

among teachers with varying characteristics. Specifically, the study was designed to determine the extent that there is a difference in middle school student achievement among teachers who have different levels of education (bachelor's, master's, or doctorate) and whether that difference is affected by gender and years of teaching experience. Additionally, the study was designed to determine the extent that there was a difference in middle school student achievement among teachers who have different types of advanced degrees (content area or other) and whether that difference was affected by gender and years of teaching experience. Six research questions were posed.

**Review of the methodology.** The target population for this research study was all middle school mathematics and ELA teachers in District A who administer either the Kansas Mathematics Assessment or the Kansas Reading Assessment to students in grades 6, 7, and 8. The sample for this study consisted of 89 fully certified mathematics and ELA teachers across 9 middle schools during the 2010-2011, 2011-2012, and 2012-2013 school years. The variables for this research study were teachers' level of education (bachelor's, master's, or doctorate), gender (male or female), years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years), and type of advanced degree (content area or other).

The instruments utilized in this study were the Kansas Mathematics Assessment and Kansas Reading Assessment. Both assessments were administered to all middle school students in the spring. The average student assessment score data from the Kansas Mathematics Assessment and Kansas Reading Assessment was imported into IBM® SPSS® Statistics Faculty Pack 23 for Windows for analysis. Both one-factor and two-factor ANOVAs were planned for this study, but due to sample size issues the only

statistical tests utilized in this research study were two-sample *t* tests to analyze the difference between two variables.

**Major findings.** Results related to the research questions revealed that there was not an overall statistically significant difference in middle school student achievement among teachers who have different levels of education (bachelor's, master's, or doctorate). Further analysis, utilizing only teachers with graduate degrees, revealed that there was not an overall statistically significant difference in middle school student achievement between male and female teachers. Furthermore, years of experience did not affect the differences in student achievement. Results related to the research question examining the difference between teachers who have an advanced degree in the content area of mathematics and teachers who have an advanced degree in an area other than mathematics, such as administration or curriculum and instruction, showed that there was not a statistically significant difference in middle school student achievement, nor were the results affected by years of teaching experience. However, results between teachers who have an advanced degree in the content area of English were higher than results for teachers with an advanced degree in an area other than English, such as administration or curriculum and instruction.

With regard to teachers who have an advanced degree in an area other than English, as affected by years of teaching experience (1-5 years, 6-10 years, 11-15 years, and 16+ years), additional sample size issues required that the first two categories of years of experience be collapsed into one category (1-10 years) before the Kansas Reading Assessment was analyzed. Results of the analysis of the Kansas Reading Assessment indicated that the assessment score mean for the students of teachers with 1

to 10 years of experience was significantly higher than the assessment score mean for the students of teachers with 11 to 15 years of experience. Furthermore, the results of the analysis indicated that the assessment score mean for the students of teachers with 1 to 10 years of experience was higher than the assessment score mean for the students of teachers with 16+ years of experience.

### **Findings Related to the Literature**

The current study follows Jacob's (2012) call to draw on multiple years of student achievement to isolate contributions of individual teachers. Related to the current study, conducted specifically with middle school teachers, Harris and Sass (2008) found that obtaining an advanced degree during one's teaching career is positively correlated with the teacher's ability to improve student achievement in middle school mathematics. Although Harris and Sass (2008) found a positive relationship between a teacher possessing an advanced degree and student achievement, the current study's results reaffirm the findings of other researchers (Buddin & Zamarro, 2009; Cananagh, 2009; Goldhaber & Walch, 2014; Hanushek et al., 1998; Huang & Moon, 2009; Leigh, 2010; Ohlson, 2009;) that there are no positive or negative effects of having an advanced degree on student achievement as measured by any means. The results of the current study align with Pennucci's (2012) meta-analysis and indicate there is no statistically significant difference in middle school student achievement among teachers who have different levels of education (bachelor's, master's, or doctorate). Furthermore, results from this study revealed the average Kansas Mathematics Assessment score and Kansas Reading Assessment score for the students of male teachers with graduate degrees tended to be very similar to the average Kansas Mathematics Assessment score and Kansas Reading

Assessment score for the students of female teachers with graduate degrees.

Additionally, when modified analysis was conducted examining only teachers with an advanced degree and years of teaching experience, related to student achievement, the results indicated there was not a statistically significant difference.

Some researchers have found that subject-specific certification in mathematics or English generated higher student achievement (Boyd et al., 2008; Cavanagh, 2009; Clotfelter et al., 2010; Darling-Hammond et al., 2005; Harris & Sass, 2008, 2009; Kukla-Acevedo, 2009; Rice, 2003). The results of the current study were mixed. When examining Kansas Mathematics Assessment scores for students of teachers who have an advanced degree in mathematics and the scores for students of teachers with an advanced degree in an area other than mathematics, the results indicated no difference. However, when examining Kansas Reading Assessment scores for students of teachers with an advanced degree in English and scores for student of teachers with an advanced degree in an area other than English, the results indicated a statistically significant difference for the students of teachers with an advanced degree in English.

When considering teachers with advanced degrees and varying years of experience, the results of the analysis of the Kansas Mathematics Assessment indicated there was not a statistically significant difference. These findings align with a number of other researchers' results (Bietenbeck, 2011; Buddin & Zamarro, 2009; Cooper & Cohn, 1997; Ehrenberg & Brewer, 1994; El-Hajji, 2010; Ferguson & Ladd, 1996; Hanushek, 1971, 2005; Rubie-Davis et al., 2012; Stronge et al., 2011) who do not find any correlation between teachers' teaching experience and student achievement. However, when collapsing the years of experience categories into 1-10 years, the results of the

analysis of the Kansas Reading Assessment indicated there was a statistically significant difference. A follow-up post hoc was conducted to compare the means. The results of the analysis indicated that the mean for students of teachers with 1 to 10 years of experience was statistically higher than the mean for students of teachers with 11 to 15 years of experience and with 16+ years of experience. Years of experience affected Kansas Reading Assessment scores for the students of teachers with an advanced degree in something other than content. The results of this study reinforce a substantial amount of research (Betts et al., 2003; Boyd et al., 2008; Clotfelter et al., 2010; Darling-Hammond, 2000; Kane & Staiger, 2008; Pennucci, 2012; Rivkin et al., 2005; Wiswall, 2011) that concludes after only one or two years, a teacher's effectiveness may reach or surpass veteran teachers.

## **Conclusions**

This section includes conclusions from the current study addressing the impact of various teacher factors on student achievement. Implications for action and recommendations for future research are included. The section closes with concluding remarks.

**Implications for action.** The results of this study suggest districts should consider which teacher factors impact student achievement in middle school mathematics and ELA. The results of the data analysis suggest that to increase student achievement on the Kansas Reading Assessment two factors could be taken into consideration when hiring: ELA teachers with an advanced degree in English and ELA teachers with one to ten years of experience who possess an advanced degree.



Overall results of the study were mixed and mostly did not reveal statistically significant differences between many of the teacher factors: gender, possession of an advanced degree, years of teaching experience, and type of advanced degree.

Traditionally researched teacher factors do not seem to make a difference in student achievement. Therefore, caution should be heeded for teachers who attempt to use this study as evidence of what would make them better teachers. The results of this study contain only a few factors that could potentially increase student achievement and are by no means an extensive list.

**Recommendations for future research.** This study adds to the body of research focused on teacher factors that impact student achievement. The results of this study reveal a continued need to explore additional teacher factors that increase student achievement especially in middle school. The following are possible topics for future research:

1. Replicate the current study and use value-added measurement tools, such as individual student achievement across several years, to isolate the contribution of individual teachers on student achievement while accounting for students' prior achievement.
2. Replicate the current study but expand the data to include middle and high school teachers to increase sample size.
3. Replicate the current study at the high school level and use a different measurement tool such as the ACT or SAT.

4. Replicate the current study but include student characteristics and demographics such as ethnicity, English Language Learner status, socioeconomic status etc.
5. Replicate the current study but include more diverse districts, both ethnically and socio-economically.
6. Replicate the current study but track teachers' time spent teaching specific grades and/or classes.

**Concluding remarks.** Researchers have attempted to identify teacher factors that improve student achievement for many years. Examining readily identifiable teacher factors has provided mixed results. Teacher factors, as they impact student achievement, vary widely depending on both the subject taught and at what level. The current study examined teacher factors and their impact on middle school student achievement. Although this study identified factors that appeared to have an effect on student achievement, the results of this study alone should not be considered a conclusive list of factors that impact student achievement. Rather, this study provided one aspect of an educator that has the potential to affect achievement.

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## Appendices

**Appendix A: Internal Research Application Request**


 Print Form

## Research Application Request-Internal

### INSTRUCTIONS:

Please provide the following information so that your project can be considered in relation to district criteria. Allow a minimum of two (2) weeks for completion of the review process.

PLEASE NOTE: Your final application should include submission of the following requirements:

- (1) the on-line application,
- (2) a copy of your Human Experimentation Committee project review and approval (if applicable), and
- (3) a letter from your academic advisor/committee indicating that your research project has been reviewed and approved.

Requirements #2 and #3 can be scanned and sent through email to [redacted] inserted into the on-line application in word format, or sent in hard copy format to [redacted] at the Instructional Resource Center, [redacted]

1. Applicant(s)Name:
2. Position:
3. School/Location:   
Other Location (please specify):
4. Telephone:
5. Email address:
6. Project Title:
7. The proposed research is for:   
Other (please describe):
8. Anticipated Dates:  
Beginning Date:  Ending Date:  Date Final Report Available:
9. Participant Description:  
Number of schools involved in the study:   
Number of teachers involved in the study:   
Number of students involved in the study:
10. Has the project been submitted to a Human Experimentation Committee?  
 No  
 Yes

11. If no, please explain why your project has not been submitted to a committee on human experimentation.

N/A

12. Either paste a copy of the letter from the Human Experimentation Committee regarding your study (Word format) below, email a scanned copy to [REDACTED] or send a hard copy to [REDACTED] at the Instructional Resource Center.

N/A

13. Brief review of the literature:

"What Works in Education" John Hattie (2008) This meta-analysis looks at factors for advancing student achievement levels.  
 "Teacher credibility" is the third most influential factor.  
 "The Missing Link in School Reform" Carrie Leana (2011)  
 "Manage Human Capital Strategically" Allan Odden (2011)  
 There are many articles about teacher education and student achievement. Here are a few more titles used in my research:  
 Defining "Highly Qualified Teachers": What Does "Scientifically-Based Research" Actually Tell Us? Educational Researcher (2002)  
 Do We Know a Successful Teacher When We See One? Experiments in the Identification of Effective Teachers Journal of Teacher Education (2011)  
 Does Teacher Certification Matter? Evaluating the Evidence Educational Evaluation and Policy Analysis (2001)

14. Major research questions:

Is there a correlation between teacher gender, education (as defined by Masters in Curriculum and Instruction versus a Masters in content area, or even building administration), and experience (both teaching time and age) reflected in state Math and ELA test scores in grades 6-8?

15. Methodology:

Data will be gathered via an Assessment Database  
 No students names, no teacher names, no school names will be used. The data will be anonymous and teachers will be identified in my dissertation by "Teacher A" etc.

16. Method Summary:

Data will be summarized and reported in a Doctoral Dissertation

17. Research Design/Data Analysis:

Statistical Analysis. Student performance on state assessments will be linked to teachers and the types of degrees they hold (Masters in curriculum; Masters in Math; Masters in Literature etc.)

18. Perceived Benefits of the Project:

District will know if certain advanced degrees, held by [REDACTED] teachers, have any effect on student achievement as measured by the Kansas State Math and ELA assessments.  
 If there is a correlation, then, when presented with two job candidates, and all criteria are equal, the district can make an informed decision on who to hire based on the type of degree held.

19. Project Dissemination Plan:

Reported in a Doctoral Dissertation.

20. Briefly describe how this research project supports [redacted] curriculum, a district goal, and/or individual school's improvement plan.

The research will show if there is any difference in student achievement as measured by the Kansas State Math and ELA Assessments when linked to a teacher's education and experience. If there is a correlation, then the district can be better informed when it comes to hiring new teachers. They can hire the candidate that will produce the best student results on the State Assessments

21. Please provide a letter from your faculty advisor/committee indicating that the research project has been reviewed and the researcher has met all requirements necessary to conduct the proposed research. You can either paste an electronic copy of the letter (Word format) into this section, email a scanned copy to [redacted] or send a hard copy to [redacted] at the Instructional Resource Center.

Hi Brett -  
 We are good to move forward with your ideas for your study. Dr. Rogers provided some questions from a person who was also looked at teacher certification and student improvement. The questions are not the same as what you will be looking at but will give you an idea of how the questions are written.  
 We will need to visit about what assessments you will use to measure student achievement. I am a little bit concerned about using the state assessment since it is in flux right now. [This issue has been remedied since I am using data from 2011,2012,2013 that the school district already possesses]  
 We can visit more later as the time draws closer to work on your study. The most important thing right now is to read, read, and read some more!  
 Talk to you soon.  
 VE  
 Verneda Edwards, Ed.D  
 Associate Professor of Education  
 Baker University  
 913-344-1227

22. Any other comments regarding your application?

This will not interrupt any school, teacher, or student activities since the data is from 2011, 2012, and 2013.

**Appendix B: Approval to Obtain and Use Data**

**From:** Ma [REDACTED]  
**Sent:** Thursday, January 9, 2014 11:17 AM  
**To:** Brett Hartin; C [REDACTED]  
**Subject:** RE: Research Proposal - Title "Teacher Education and Student Achievement"

Okay! We will get working on the data! You can consider it approved! Just remember to refer to [REDACTED] as a district in the Midwest (not our name) and no reference to [REDACTED]. We will get data to you in the new few weeks!



**Appendix C: Baker University Institutional Review Board Request**



SCHOOL OF EDUCATION  
GRADUATE DEPARTMENT

Date: 3/9/16

IRB PROTOCOL NUMBER \_\_\_\_\_  
(IRB USE ONLY)

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

**I. Research Investigator(s)** (Students must list faculty sponsor first)

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

Name	Signature	
1. Dr. Verneda Edwards	<u>Verneda Edwards</u>	Major Advisor
2. Margaret Waterman	<u>Margaret Waterman</u>	Research Analyst

Principal Investigator:      Brett W. Hartin  
Phone:                              913-209-2066  
Email:                                hartin.brett@gmail.com  
Mailing address:                117 North Pinon, Olathe, KS 66061

Faculty sponsor:                Dr. Verneda Edwards  
Phone:                                913-944-1227  
Email:                                 Verneda.Edwards@bakeru.edu

Expected Category of Review:  Exempt     Expedited     Full

**II: Protocol: (Type the title of your study)**

The Relationship between Teacher Characteristics and Student Achievement in Middle School

## Summary

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

The purpose of this study is to contribute to and extend an existing body of research on teacher characteristics that have an impact on middle school student achievement in math and English language arts classes. The study attempts to determine to what extent there is a difference in middle school student achievement among teachers who have different levels of education (bachelors, masters, or doctorate) and different types of advanced degrees (content or other) affected by years of teaching experience and gender.

The results of this study could be used by district office administrators and middle school principals when making hiring decisions for mathematics and language arts classes. The results could also be used by middle school mathematics and English language arts teachers when deciding whether or not to pursue an advanced degree and the type of advanced degree to pursue.

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

There is no manipulation in this study. The research sample will consist of middle school teachers and archived student data during the 2010-2011, 2011-2012, and 2012-2013 school years. No identifiable teacher information will appear on the spreadsheet.

**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.**

Archived data from the Kansas Mathematics Assessment and Kansas Reading Assessment will be used to measure student achievement. There will be no other questionnaires or instruments used in this study.

**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.**

Archived data from the Kansas Mathematics Assessment and Kansas Reading Assessment will be used to measure student achievement. There will be no risk of psychological, social, physical, or legal risk.

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

The subjects will not encounter any stress as the research involves archived data only.

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

The subjects will not be deceived or misled in any way.

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

The subjects will not be contacted as part of the study, and therefore will not be asked for any information, which would be personal or sensitive. The research will utilize archived data involving the Kansas Mathematics Assessment and Kansas Reading Assessment.

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

The subjects will not be contacted as part of the study, and therefore will not be presented any materials which might be considered offensive, threatening, or degrading.

**Approximately how much time will be demanded of each subject?**

The subjects will not be contacted as part of the study, and therefore the study will not ask for any time from any of the subjects. Subjects will not actively participate in any aspect of this study.

**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.**

All data used in this study will be from the achieved data warehouse of a school district in Kansas. The subjects will not be contacted as part of the study.

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

No solicitation or participation will take place for this study, as all data is archived. The subjects will not be contacted as part of the study, and no inducements will be offered.

**How will you insure 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.**

No consent is required for this study as all data is archived. The subjects will not be contacted as part of the study.

**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 aspect of the data will be identified with any of the subjects. No personally identifiable information will be used or presented in the results. No aspect of the 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.**

Since all data is archived without identifiable teacher or student information, no subject participation is necessary. No aspect of the data will be made part of any permanent record.

**What steps will be taken to insure the confidentiality of the data? Where will it be stored? How long will it be stored? What will be done with it after the study is completed?**

Confidentially will be maintained, as teachers will not be identified. The archived data will not be used for any other purposes. No names, or other identifiable information, will be used that could identify any subjects in the study. The data will be stored on a password protected computer. The data will be retained until December 31, 2016 and afterwards destroyed.

**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 to any of the subjects involved in this study.

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

Archival data will be provided by the district's data warehouse. It will include Kansas Mathematics Assessment and Kansas Reading Assessment results from the 2010-2011, 2011-2012, and 2012-2013 school years.

**Appendix D: Baker University Institutional Review Board Approval**



*Baker University Institutional Review Board*

March 20, 2016

Dear Brett Hartin and Dr. Edwards,

The Baker University IRB has reviewed your research project application and approved this project under Exempt Status 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.

Please be aware of the following:

1. Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
2. Notify the IRB about any new investigators not named in original application.
3. When signed consent documents are required, the primary investigator must retain the signed consent documents of the research activity.
4. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.
5. If the results of the research are used to prepare papers for publication or oral presentation at professional conferences, manuscripts or abstracts are requested for IRB as part of the project record.

Please inform this Committee or myself when this project is terminated or completed. As noted above, you must also provide IRB with an annual status report and receive approval for maintaining your status. If you have any questions, please contact me at [CTodden@BakerU.edu](mailto:CTodden@BakerU.edu) or 785.594.8440.

Sincerely,

*Chris Todden EdD*  
Chair, Baker University IRB

Baker University IRB Committee  
Vemeda Edwards EdD  
Sara Crump PhD  
Erin Morris PhD  
Scott Crenshaw