

THE IMPACT OF TEACHERS WITH DIFFERING LEVELS OF DEGREE ATTAINMENT
ON STUDENT PERFORMANCE IN MATHEMATICS

by

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Liberty University

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Of the Requirements for the Degree

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ABSTRACT

The No Child Left Behind (NCLB) Act states that in order for K-12 teachers to be considered “highly qualified” they must obtain at least a bachelor’s degree. However, research shows that the vast majority of states compensate teachers more highly for obtaining graduate degrees. The purpose of this study was to determine whether there is a difference in mean scores and/or pass rates of fourth-grade students on the Georgia Milestones End of Grade (EOG) Assessment in Mathematics for teachers with various levels of degree attainment (bachelor’s, master’s, educational specialist, and doctoral degrees). The theoretical framework that this study was rooted in most deeply is the human capital theory. This study took into account testing results from all fourth-grade students in the state of Georgia who took the Georgia Milestones EOG Assessment in Mathematics, and used an ANOVA to compare data among the different levels of teacher educational attainment levels. Additionally, Tukey’s post-hoc test was done in order to determine if there were significant differences between groups. The results of the analyses indicated significant differences existed in student average math scores and passing rates between degree attainment groups. Due to the fact that teacher degree levels have an impact on student scores, the null hypothesis can be rejected.

Keywords: educational attainment, student achievement, mathematics, fourth-grade

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List of Abbreviations

Analysis of Variance (ANOVA)

Annual Yearly Progress (AYP)

Council for Higher Education Accreditation (CHEA)

Education for All Handicapped Children Act (EHA)

End of Grade (EOG)

English Language Learners (ELL)

Every Student Succeeds Act (ESSA)

Georgia Teacher Academy for Preparation and Pedagogy (GaTAPP)

Highly Objective Uniform State Standard of Evaluation (HOUSSE)

Honestly Significant Difference (HSD)

Individuals with Disabilities Education Act (IDEA)

Institutional Review Board (IRB)

Interstate New Teachers Assessment and Support Consortium (INTASC)

National Board for Professional Teaching Standards (NBPTS)

National Commission on Teaching and America's Future (NCTAF)

National Council for Accreditation of Teacher Education (NCATE)

National Council on Teacher Quality (NCTQ)

National Educational Longitudinal Study of 1988 (NELS:88)

No Child Left Behind (NCLB)

Teacher Education Accreditation Council (TEAC)

Teacher-Student Relationship (TSR)

CHAPTER ONE: INTRODUCTION

Background

Over thirty years ago, T. H. Bell founded the National Commission on Excellence in Education (1983). At that point in United States history it was clear that changes needed to be made within the educational system to keep up with a global market (National Commission on Excellence in Education, 1983). The report *A Nation at Risk* described how education in the classroom must prepare students for the workforce in the real world (Sunderman, 2010). This educational reform was not a short-term innovation or fix; rather, it was reinforced even more deeply by the No Child Left Behind (NCLB) Act of 2001. NCLB further emphasized the necessity for all students to show growth by stating that having teachers who are highly qualified is a key to student success in the classroom (U.S. Department of Education, 2004). Since the early 2000's there have been three main requirements for teachers to be considered highly qualified across the entire nation: 1) attainment of a bachelor's degree, 2) completion of state certification/licensure, and 3) proficiency in the subject they teach (U.S. Department of Education, 2004).

Although there has been an abundance of research to link the impact of teacher preparation programs and other factors such as compensation and years of service in the field of education to student achievement over the past three decades (Darling-Hammond, Chung Wei, Andree, Richardson, & Orphanos, 2009; Darling-Hammond, 2010; Dee & Cohodes, 2008; Scribner & Akiba, 2010), research on the link between teacher educational attainment levels and student achievement is lacking (Conway, Eros, & Stanley, 2010). Teacher quality is "repeatedly cited as the most important schooling factor influencing student achievement" (Goldhaber, Liddle, & Theobald, 2013, p. 29). This conclusion, however, does not clarify what factors

specifically lead to some teachers being superior to others in terms of their impact on student achievement scores.

A large number of studies have been conducted over the past few decades to determine how to improve student achievement. Ultimately, it has been concluded that teachers are certainly one of the leading factors impacting pupil success (Goldhaber et al., 2013; Timperley & Alton-Lee, 2008). Ample research has been done investigating teacher preparation programs and their impact on student achievement, but research that addresses teachers' educational attainment level and its impact on student performance is difficult to find in current literature (Conway et al., 2010; Darling-Hammond, 2006, 2010).

The justification for drastic educational reform came over thirty years ago, when *A Nation at Risk* was published (National Commission on Excellence in Education, 1983). Factors ranging from socioeconomic status to attendance rates influence student achievement (Anderson, 2008), which the current educational literature in the field makes clear. Although numerous outlying factors contributing to student failure or success are considered in almost all scholarly articles, the literature fails to address how teacher educational attainment levels impact student achievement (Anderson, 2008; Badgett, Harrell, Carman, & Lyles, 2011; Capps et al., 2005, Gottfried, 2009, Scanlon & Devine, 2001). A persistent gap in literature remains in the area of teachers with graduate degrees and what impact that this higher level of educational attainment has on student performance.

The National Commission on Teaching and America's Future (NCTAF) has influenced educational policies since 1994 and proposes that teachers should be required to earn a master's degree or higher to become a fully certified teacher (Ballou & Podgursky, 2000). According to Knapp, McNergney, Herbert, and York in 1990, the states of New York, California, Arizona,

Oregon, and Massachusetts required teachers to have completed graduate studies in order to become certified, or in some cases recertified. Although there is no clear evidence on the impact that teacher education attainment has on student achievement, general educational policy recommendations continue to push for teachers to obtain a master's degree (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009; Conway et al., 2010; Darling-Hammond, 2006, 2010).

At present, very few states require teachers to obtain a master's degree in order to become fully certified, though financial compensation is consistently correlated to teachers' levels of educational attainment. The National Council on Teacher Quality (NCTQ) includes over 112 major school districts across the nation (NCTQ, 2013). Data shows that 96% of these districts compensate teachers with master's degrees more highly than those with only bachelor's degrees (NCTQ, 2013). In the state of Georgia, teachers are compensated for earning graduate credits, a master's degree, and higher levels of education (NCTQ, 2013). Nationally, the average difference between a teacher with a bachelor's degree versus a master's degree is "\$3,205 in the first year of teaching, \$4,176 in the fifth year, and \$8,411 at the top of the salary schedule" (NCTQ, 2013, p.1). In the state of Georgia teachers are compensated very generously for earning higher degrees. A teacher with a bachelor's degree earns a minimum of \$33,812, while teachers with a master's degree earn a minimum of \$38,757 (Georgia Association of Educators, 2015); nearly \$5,000 more annually.

However, with budget cuts and lack of funding for public school systems, providing teachers with additional compensation for educational attainments which are not proven by research to improve student achievement can be viewed as fiscally irresponsible. Policymakers continually push for measurable data (Darling-Hammond, 2006), but there is an absence of this in the field of graduate degrees and their impact on student academic achievement.

The framework for this study is based on a variety of different theories, but the main foundation is on Schultz's (1971) human capital theory. Schultz's work describes how education and the knowledge gained from formal schooling are keys to success of society as a whole. Schultz explains how education in and of itself works just like any other economy with goods and services; the better the goods produced, the better the economy will run. In the state of Georgia teachers are required to hold a bachelor's degree in order to be considered "highly qualified," but no higher levels of college educational attainment are required (Georgia Department of Education [GaDOE], 2016). It is thought, however, that these standards are enough to make a teacher highly qualified, and therefore will help to produce students who are productive citizens of society.

Problem Statement

Research continuously shows that teacher quality is the most important factor impacting student achievement (Goldhaber et al. 2013), but the question of exactly what makes a "quality" teacher remains unknown. A limited amount of research has been conducted which shows that teachers' graduate degrees have little to no impact on student achievement (Ballou & Podgursky, 2000; Hanushek & Rivkin, 2007; Knapp et al., 1990). However, it should be noted that a majority of the limited research existing in this area focuses on perceptions of student achievement rather than quantitative measurable data. Information on whether attainment of a graduate degree impacts student achievement remains inconclusive (Luschei & Chudgar, 2011). The problem is that policymakers continue to push for teachers to obtain higher degrees or graduate credits and to compensate them for the same, all without clear and measurable data to see if higher levels of teacher education actually do contribute to higher levels of student achievement.

Purpose Statement

The purpose of this causal-comparative study is to determine whether there is a positive relationship between teachers with graduate degrees and fourth-grade student scores on the Georgia Milestones End of Grade (EOG) Assessment in Mathematics at all public elementary schools within the state of Georgia.

Significance of the Study

Research has made clear that teacher quality impacts student achievement, but exactly what defines “quality” and the extent to which graduate degrees among teachers impact student performance is still uncertain (Goldhaber & Anthony, 2007). Educational policies and practices should be based around improving student achievement (McDonnell, 2009), and it is clear that further investigation is needed in the area of teacher educational attainments and student achievement. To simply assume that a higher level of teacher education results in a higher level of student academic success is doing the educational system a disservice.

Research Question

There is one research question for this study:

RQ1: Is there a difference in the mean scores of fourth-grade students on the Georgia Milestones End of Grade Assessment in Mathematics for teachers with various levels of degree attainment (bachelor’s, master’s, educational specialist, and doctoral degrees).

Null Hypotheses

The null hypothesis for this study is as follows:

H₀1: There is no statistically significant difference in the mean scores of fourth-grade students on the Georgia Milestones End of Grade Assessment in Mathematics for teachers with

various levels of degree attainment (bachelor's, master's, educational specialist, and doctoral degrees).

Definitions

1. *Achievement*- positive academic performance; often associated with high levels of support and low levels of conflict (Hughes & Jiun-Yu, 2012).
2. *No Child Left Behind Act (NCLB)* - NCLB has been used to define highly qualified teachers in the United States since becoming a national law in 2001. NCLB states that in order to be considered highly qualified, a teacher must have earned a bachelor's degree and demonstrate proficiency by earning full state certification in their area of expertise (Marszalek, Odom, LaNasa, & Adler, 2010).
3. *Pedagogical content knowledge (PCK)* - A combination of content knowledge and pedagogy (Shulman, 1987).
4. *Georgia Milestones End of Grade (EOG) Assessment*- A standardized assessment given across the entire state of Georgia on an annual basis to measure students' end of grade mastery. The tests are designed by the Georgia Department of Education and align with state standards of learning (Georgia Department of Education, 2016).

CHAPTER TWO: LITERATURE REVIEW

Overview

One of the most important factors influencing student achievement is teacher quality (Goldhaber et al., 2013). Not only does empirical research state how much teachers influence student learning, but the president's 2016 budget explicitly states: "Teaching is one of the most important and challenging careers, and of all the school-related factors that impact student academic performance, great teachers matter most" (U.S. Department of Education, 2016, p. 1). However, the details of exactly what makes a so-called "high-quality" teacher remain unclear.

The NCLB Act streamlined minimum requirements that teachers must have across the nation (specifying the necessity of a bachelor's degree, for example), but various other standards and requirements, such as requiring advanced graduate degrees, still vary from state to state (U.S. Department of Education, 2004). It has been concluded that teachers are one of the leading factors which impact student achievement (Goldhaber et al., 2013; Timperley & Alton-Lee, 2008); however, research does not pinpoint which background factors help them to have the largest impact on student achievement (Goldhaber & Anthony, 2007; Palardy & Rumberger, 2008).

The purpose of this study is focused solely on determining whether the level of teacher educational attainment has an impact on student performance. This in-depth literature review, however, seeks to provide readers with a well-rounded understanding of all the factors which contribute to what makes a high-quality teacher, according to other research and experts in the field. In addition, other variables which impact student achievement will be covered because these also have an impact on student performance. The literature review will begin by covering the theoretical framework on which this study is based. In order to understand the viewpoint

from which this study was done, it is imperative that there be an in-depth overview of the framework utilized. After the theoretical framework is described, the literature review will provide an extensive overview of the most prominent factors which potentially lead to high-quality teachers, and it will conclude with a summary of the literature which was investigated for this study.

Conceptual or Theoretical Framework

In order for the findings of this research to be connected to a greater context, it is necessary to understand the theories and ideas on which this study has been built. Human capital theory is the main foundation for this study's conceptual framework, but the constructivist theory and essentialism are also integral building blocks of this work. Understanding the three pillars upon which this study has been built will help readers to better understand the overall purpose of this study and the research findings.

Human Capital Theory

It is common knowledge that in the United States teacher quality is seen as a leading factor in improving education and student achievement (Harris & Sass, 2011). This belief was truly emphasized when the national government took a leading role in how education is run with its implementation of the NCLB Act in 2001. Through NCLB, the government began requiring that all teachers attain at least a bachelor's degree in order to gain licensure and be considered "highly qualified" (U.S. Department of Education, 2004). This prerequisite was not merely seen as a means to increase the academic achievement of students, it was utilized as a way to improve the economy as a whole.

According to Schultz (1971), education as a whole can be seen as an economic good. Moss (2012) further supports this viewpoint by stating that "[education] is not easily obtainable

and needs to be apportioned” (p. 12). Through education, people gain skill sets and fundamental knowledge which help them become contributors to the economy as a whole (Schultz, 1971). Essentially, it is believed that when one invests in students and provides them with a high-quality education, those same students will end up being productive members of society who then foster economic growth (Olaniyan & Akemakinde, 2008).

This same logic not only applies to students, but to teachers as well. When education is seen as a form of human capital, individual teachers are able to increase their value by taking part in trainings, staff developments, and through obtaining advanced formal education (Schultz, 1971). When people have higher levels of education they ultimately have more career choices, earn more money, and have higher satisfaction levels (Schultz, 1971). Simplified, the basis of Schultz’s human capital theory is that high-quality education is an essential element of a productive population (1971).

Figure 1 shows a simplified example of how teacher education levels play a role in human capital. If the hypothesis that higher teacher educational levels directly correlate to higher quality teachers, then according to the human capital theory the logical conclusion is that it makes sense to spend extra money to hire teachers with advanced degrees (Goldhaber & Brewer, 1996). Education is assumed to directly impact not only the national but the global economy as well, and because of this, schools are highly accountable for producing students who are ready to become part of the workforce upon graduation (Cochran-Smith, 2008). The president’s 2016 budget report stated “our Nation’s economic well-being depends on it” (U.S. Department of Education, 2016, p.5), where “it” referred to students who are prepared for and able to go to college.

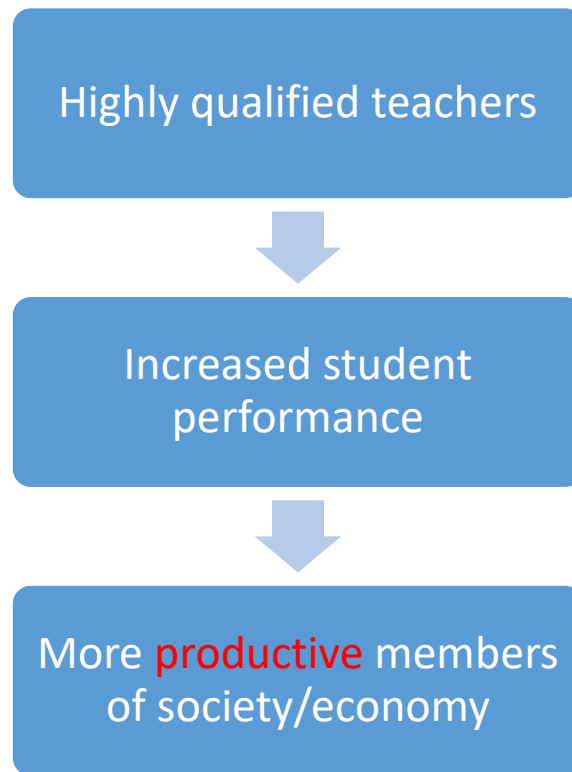


Figure 1. Teacher performance flowchart.

Public schools in the United States are responsible for teaching students the content found within state or national standards in order to ensure that they are well-rounded individuals upon graduation, and they are expected to use the most efficient means possible to accomplish this goal. Although current literature still fails to find a direct correlation between teacher degree attainment level and student achievement, there is still pressure for teachers to earn higher level degrees, with some states even making it a requirement (Ballou & Podgursky, 2000; Goldhaber & Brewer, 1996; Hanushek & Rivkin, 2007; Knapp et al., 1990). Because teacher degree level is thought to correlate with higher quality teachers, and higher quality teachers are associated with higher student achievement (Hanushek 1997), the government and school districts will often willingly provide additional funding and support for teachers with advanced degrees (U.S. Department of Education, 2016; The Teaching Commission, 2004).

Constructivist Theory

Although the constructivist theory is known as Piaget's Theory in current literature, its fundamental roots date back to Socrates' practice of having students create their own understanding instead of following authority figures (Powell & Kalina, 2009). Piaget's constructivist learning theory states that learning requires students to build upon prior knowledge and experience (Brooks & Brooks, 1993). It is believed that intellect is something that human beings intrinsically possess from the moment they are born, but must still be fostered and built upon over the lifespan of each individual (Simatwa, 2010).

From a constructivist viewpoint, a knowledge base is essentially built when humans put together different concepts and ideas, like pieces of a puzzle, by using different portions of their brain (Feldman, 2014). Although each individual builds knowledge in her own way (Seimears, Graves, Schroyer, and Staver, 2012), and there is no clear consensus on whether building upon prior knowledge to gain a master's or a doctoral degree makes a teacher superior to others in the field, educational attainment is consistently linked to student achievement, especially when a teacher's degree attainment matches the subject taught (Wayne & Young, 2003).

Students in the K-12 setting learn and grow by building upon prior knowledge from year to year, and then they use this knowledge as a foundation to build upon when entering college. Education is a multitude of elements, from knowledge of skills to academics, and it even encompasses the ability to process information (Webb, 2009). Knowing that education plays so many roles in the development of an individual leads to the conclusion that if teachers continue to grow academically by obtaining higher levels of education they will simultaneously grow into better educators as well.

Essentialism

In Essentialism, it is believed that students should learn core subjects such as reading, writing, and arithmetic thoroughly through a curriculum which has its main focus on these areas (Miller, 2011). Although there are many conflicting views regarding this theory, the fact is that the educational system has been headed in this direction ever since NCLB implemented standardized testing in 2001 (U.S. Department of Education, 2004). It is important for students to have a high-quality education which covers the basic subjects thoroughly, because the future status of the economy will be highly dependent upon the skillsets and knowledge which students are learning in schools today (National Academy of Sciences, 1993).

According to Richardson and Liang (2008), it does not matter how a teacher obtains licensure, as long as they are able to use sound pedagogical approaches to teach the core content areas of reading, writing, math, and science. As Americans, we live in an increasingly global society where the economy is no longer tied solely to our nation, but spans worldwide. Students need to master the essential knowledge and skills found in the core curriculum (Kessinger, 2007) in order to be successful contributors to the labor market and the global economy (Fitzsimons, 1999). What we teach our students, as well as the manner in which it is taught, can have a profound impact on student success later on in life (Miller, 2011). Professor Bagley, who taught at the Teacher College of Columbia University from 1917-1940, believed that the key to a successful society was education (Null, 2009).

Related Literature

Ample research has been done investigating teacher preparation programs and their impact on student achievement, but research that addresses teachers' educational attainment levels and the impact that this has on student achievement is difficult to find in current literature

(Conway et al., 2010; Darling-Hammond, 2006, 2010). Although the published evidence of teacher education attainments effects on student achievement is limited, general educational policy recommendations continue to push for teachers to obtain a master's degree (Boyd et al., 2009; Conway et al., 2010; Darling-Hammond, 2006, 2010).

From the time the Equality of Educational Opportunity Study was initiated by the United States Department of Health, Education, and Welfare in 1966, there has been a push for schools to increase student achievement rates (Rivkin, Hanushek, & Kain, 2005). The concept of truly increasing student achievement and correlating this measure to teacher quality was further established with the NCLB Act of 2001, which pushed for statewide assessments to be implemented in order to measure student progress on a yearly basis (VDOE, 2006). Although NCLB set standards for the requirements of highly qualified teachers and required that states show adequate yearly progress (AYP) through assessments, the standards for each of these factors varies from state to state.

Improving Teacher Quality Improves Student Achievement

Teachers are seen as a key factor in student achievement, and therefore the Highly Objective Uniform State Standard of Evaluation (HOUSSE) is used to evaluate teachers to ensure that they are highly qualified (Tracy & Walsh, 2004). Similar to standards set for the NCLB Act, the standards set for HOUSSE are individualized and vary from state to state (Tracy & Walsh, 2004). The standards for teachers to be considered highly qualified still require a bachelor's degree in all states, but in order to teach specific subjects at the middle and high school levels the requirements can vary from: (a) undergraduate major in the subject they teacher, (b) credits equivalent to an undergraduate major in the subject, (c) passage of a state-developed test, (d) HOUSSE (for current teachers only, see below), (e) an advanced certification

from the state, and (f) a graduate degree (U.S. Department of Education, 2004). The HOUSSSE system allows each state to decide its own way for current teachers to demonstrate proficiency (U.S. Department of Education, 2004). The individual criteria each state uses can range from teaching experience to professional development credits that teachers have earned (U.S. Department of Education, 2004).

Although a small number of states, such as Illinois and Colorado, have kept the standards comparatively high and performed well on them, over 25 states simplified the standards just to ensure that the requirements are fulfilled on paper (Walsh & Snyder, 2004). One of the main problems with HOUSSSE is that there are extremely large differences from state to state, making it impossible to have a uniform and accurate evaluation system (Tracy & Walsh, 2004). In 2004, one example of how inconsistent these standards could be from one state to another was that in Georgia, if a teacher attended two professional conferences he earned the same weighted points toward the status of being considered highly qualified as a teacher who earned a doctoral degree (Tracy & Walsh, 2004). This process was flawed not only because teachers who are not truly as qualified as those in other states could teach at upper-grade levels, but more importantly it was unfair to students who were not getting the same high-quality teachers as students in other states. Beginning in the 2016-2017 school year, Georgia teacher evaluation became more rigorous than ever before; at least 50% of teacher evaluations were based upon student performance on state approved assessments such as the Georgia Milestones Assessment (NCTQ, 2016).

Teacher quality is “repeatedly cited as the most important schooling factor influencing student achievement” (Goldhaber et al., 2013, p. 29). Educational researchers focus much of their work on investigating how student performance can be improved through teacher-related factors such as experience and education levels (Zhang, 2008). In 2005, Rivkin et al. concluded

that although there is existing empirical research in the field of teacher quality, there is no clear understanding of what factors truly define the concept. In more recent literature, Harris and Sass (2011) state “there is no consensus on what factors enhance, or even signal, teacher quality” (p. 798). One of the most obvious reasons why measuring teacher quality is so difficult is that it cannot be done in isolation. Each student’s individual ability level influences that of his peers, and other outlying factors such as gender and school characteristics also affect achievement outcomes of students (Harris & Sass, 2011).

One way to improve the overall quality of teachers is to have more rigorous entrance and exit exams for teacher preparation programs across the nation (Allen, 2002). Research has shown that countries with better school systems than the United States have only a 10% acceptance rate in their teacher preparation programs (Barbour & Mourshed, 2007). Studies show that American student teachers often do not have a deep understanding of the subject matter which they are teaching, making it difficult for them to organize and efficiently explain the content to students (Gess-Newsome & Lederman, 2003). A correlation has been found between more selective teacher education programs and more effective teachers (Walsh & Tracy, 2004).

Although research attempting to pinpoint which teacher characteristics influence students the most academically is inconclusive, there is still a push for teachers to attain higher levels of education (Huang & Moon, 2009). NCLB of 2001 ultimately made it a requirement that all teachers hold a minimum of a bachelor’s degree in order to become fully certified (U.S. Department of Education, 2004). On the National Educational Longitudinal Study of 1988 (NELS:88) it was found that all fully accredited teachers in public schools had at least an undergraduate degree (Goldhaber & Brewer, 1996). Research has not yet provided adequate

data to show that there is a correlation between teacher educational attainment and student achievement (Goldhaber & Brewer, 1996). “These findings raise the question of whether it makes sense from an economic standpoint, for schools to spend large sums of money hiring teachers with advanced degrees” (Goldhaber & Brewer, 1996, p. 200).

Past research has “frequently suffered from inadequate data” (Rivkin et al., 2005, p. 417); one of the main reasons being that researchers did not control for prior achievement of students (Goldhaber & Brewer, 1996). Previous literature reviews on teacher degrees and student achievement have often come up with contradictory results (Xin, Xu, & Tatsuoka, 2004). In 1986, Hanushek concluded that there is “no strong evidence that...teacher education...[has] an expected positive effect on student achievement” (p. 1162).

Teacher quality is not only a concern in the United States. Research shows that because teacher quality is so closely linked to student achievement, teacher quality is considered to be a global concern. Although an awareness of teacher quality and its impact on student achievement is a worldwide issue, other countries’ research on teacher quality and student achievement fails to take into consideration outlying factors such as the socioeconomic status of students and their initial ability levels (Huang & Moon, 2009).

In 2001, the year that NCLB was implemented, 92% of U.S. state governors’ State of the State address speeches discussed teacher quality (Allen, 2002). When government officials and policymakers discuss education, they consistently point out that “if they are going to make significant improvements in the quality of education, attention to the quality of teaching is of the very highest importance” (Allen, 2002, p. 8). When looking at historical events, it is clear that teacher quality and high-quality student education are inextricably linked.

Education Level and Achievement

It is known that the quality of a teacher directly impacts the quality of the education which her students receive (Barbour & Mourshed, 2007). What remains unclear is what exactly makes a “quality teacher.” Research based on teacher education level and its impact on student achievement began in the 1960s (Hanushek, 1997). Studies done during that time were conducted across a span of grades ranging from elementary to secondary education levels (Hanushek, 1997). When researching scholarly articles and studies that investigate the relationships between teacher education level and student achievement, a majority of the studies cite data from the more recent NELS:88 (Goldhaber & Brewer, 1996; Ye, 2000). Although the NELS:88 is a valid instrument for measurement purposes (Goldhaber & Brewer, 1996), the data that is being pulled from it is still over two decades old. “Teacher education level refers to the highest educational degree obtained by a teacher” (Zhang, 2008, p. 6), and the results of studies which reference this information from NELS:88 are widely varied, hindering researchers from drawing sound conclusions (Zhang, 2008).

In an effort to provide greater generalizability of results, research was conducted across various levels of education spanning from the elementary grades all the way through and including high school. Despite this effort, the overall consensus was that the correlation between teacher education level and its impact on student performance remained inconclusive (Goldhaber, & Anthony, 2007; Hedge, Lain, & Greenwald, 1994; Wayne & Young, 2003; Zhang, 2008).

Although the government portrays the intentions of NCLB as good, there have been many critics who say that all of the “high stakes” testing is taking away from the overall quality of education by pushing teachers to exclusively teach the standards that will be assessed, while

leaving other educational areas completely omitted (Cochran-Smith, 2008). Still others are dissatisfied with NCLB because they say that it has not helped to improve the actual overall quality of teachers at all (Cochran-Smith, 2005; Southeast Center for Teaching Quality, 2004). Some do praise NCLB and its efforts to reduce the achievement gap between students; but the fact that schools often simply teach and practice the skills and information that is likely to be on the standardized tests is seen as a major drawback (Cochran-Smith, 2008).

Under NCLB a teacher must have at least a bachelor's degree in order to be considered highly qualified (U.S. Department of Education, 2004). In some states and school districts the requirements are even more rigorous and teachers are even required to have a master's degree in order to become fully certified (Huang & Moon, 2009). Yet another factor in a teacher's education level is that some school systems require teachers to gain an advanced degree after a given number of years of employment (Goldhaber & Brewer, 1998). Although many educators are pushed towards higher education levels, research on teacher education does not provide conclusive results on whether or not the attainment of higher levels impacts student achievement (Goldhaber & Brewer, 1996; Hanushek, 1986; Harris & Sass, 2011; Ye, 2000; Zhang, 2008).

Teacher Confidence

Teacher confidence level, or self-efficacy, is loosely defined as a teacher's belief that she can have an impact on the learning outcomes of her students (Tournaki, Lyublinskava, & Carolan, 2009). One of the best ways for teachers to increase their own confidence in their personal abilities is by observing and emulating the success of their peers (Gavora, 2010). Another way that self-efficacy is increased among educators is through emotional support given them by peers, other school staff members, and even those outside of the school environment (Gavora, 2010). Some documented qualities of "confident" teachers are that they take

responsibility for their actions, do not quit when faced with challenging tasks or situations, and set high standards for themselves and their students (Tournaki et al., 2009).

When teachers have a deep pedagogical content knowledge they truly understand the content that they teach (Loughran, Mulhall, & Berry, 2008). Furthermore, research shows that when teachers demonstrate a deeper understanding of content knowledge they display more positivity and confidence towards teaching (Johnston & Ahtee, 2006). Links have been noted between teacher confidence and student achievement, specifically the observation that confident teachers believe their work with students to be relevant and meaningful, and therefore they work harder (Corkett, Hatt, & Benevides, 2011). Research shows that confident teachers believe that they have an impact on all students in their classroom, can handle classroom disruptions, and feel that they make a difference in the lives of their students (Darling-Hammond, 2000a).

Alternatively, teachers who feel insecure and unconfident about their practice do not believe they can teach all students in their classroom and believe that outlying factors such as a student's home environment have a greater impact on student learning than teachers do (Darling-Hammond, 2000a).

Teacher attrition during the first years of employment is high due to higher salaries in related fields, but the turnover rate is highest among those new teachers who are not confident (Donaldson & Johnson, 2011). Safeguarding teacher retention is an essential element to successful schooling because research shows that schools that have high turnover rates also have higher levels of students who earn low scores on assessments, show an increased number of dropouts, and have a larger number of students who graduate but simply are not ready to enter the workforce (Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005; Futernick 2007; Ingersoll & Rossi, 1995). According to the president's 2016 budget report, "teachers today too often do

not have the preparation, support, opportunities for leadership, or autonomy they need to succeed” (U.S. Department of Education, 2016, p.4).

Standardized Testing

Over the past decade, educational accountability in the United States has been an extremely visible issue (Tretter & Jones, 2003). Formal and standardized assessment of student achievement is imperative to accountability in today’s educational system (Mitchell, 2006). Overall student achievement is measured by how students perform on state assessments (Gimbert, Cristol, & Sene, 2007). With the passing of NCLB in 2001, the pressure to have students perform well on accountability tests grew due to the threat of punitive consequences such as funding cuts and even school closure if schools were unable to make the required yearly progress (Mitchell, 2006).

Standardized tests vary from state to state in the following ways: (a) knowledge tested, (b) style of questions, (c) measurement of competency, (d) how achievement is based (performance toward standards or comparing students to peers) (NCES, 2007).

Although standardized tests vary from state to state, due to NCLB they all require students to master certain levels of proficiency in reading, math, and other subject areas depending upon grade level (Moss, 2012). Popham defines a standardized as, “any assessment that is administered and scored in a predetermined, standard manner” (1999, p. 8). Within each state, students take the exact same test under the exact same testing conditions, which helps ensure that the test results are an accurate depiction of student performance levels and are not influenced by variations in testing environments, test administration, etc. (Wilde, 2004).

Even though there are drawbacks to “high-stakes” testing, most literature that relates to improving the quality of teachers recommends that educators be held accountable for teaching

content through not only assessments created “in-house,” but through external means of measurement as well (Barbour & Mourshed, 2007). Research shows that the data gained from formal assessments can be used to pinpoint areas of need, and then further identify the work that needs to be done in these areas (Barbour & Mourshed, 2007).

Assessments can be useful tools to gain data and drive improvement, but they can also be harmful to a teacher’s morale and overall work ethic/effectiveness in the classroom if the teacher is evaluated on something that she cannot control (Allen, 2002). For instance, if a sixth-grade student comes into an English classroom at a second-grade reading level and improves to the fifth-grade reading level by the end of the school year, that student would have achieved three grade levels of growth in a single school year, a remarkable accomplishment. Even so, the same student would still be very unlikely to pass the standardized grade six reading assessment at year’s end, which would reflect poorly upon the teacher despite the student’s notable improvement. Because of scenarios such as this, some states are beginning to consider value-added data which measure each student’s individual growth per school year (NCTQ, 2007).

Teacher-Student Relationships and Achievement

Over the past decade, an abundance of research has been done to link the impact of social interactions in the field of education to student motivation and engagement. According to Hughes et al. (2012), a number of longitudinal studies clearly show that there is direct correlation between positive teacher-student relationships (TSRs) and student behavior and engagement. Each school, and every classroom within it, is a form of social system (Fan, 2012). According to Gehlbach, Brinkworth, King, Hsu, and McIntyre (2016), people learn from those whom they love, which logically drives the observation that TSRs are one of the most important factors in the successful schooling of children. The quality of the relationships within a classroom is

dependent upon both the students and the teacher (Fan, 2012). Longitudinal studies show that positive and supportive TSRs have positive effects on students' academic adjustment, engagement, and behavior (Hughes & Jiun-Yu, 2012).

It has been shown that during middle school, students' views of what they believe their teacher expects of them predicts their future academic endeavors better than students' own perceptions of their individual capabilities (Gehlbach, Brinkworth, & Harris, 2012). A study performed in 1989 indicated that students who believed their teachers were supportive had higher scores on their standardized math tests than those who did not feel this way (Midgley, Feldlaufer, & Eccles, 1989). In addition, another study conducted in 1993 indicated the same correlation of positive relationships to higher levels of achievement in English (Goodenow, 1993). Lastly, in 2002 a study was done which determined that when teachers held high expectations for their students overall, achievement would be higher regardless of the academic area (Wentzel, 2002).

Cornelius-White's (2007) study showed that when students perceived more positive relationships with teachers, student participation increased ($r=.55$) and disruptive behavior decreased ($r=.25$), which ultimately allowed for more classroom time to be directly dedicated to learning. Research proves that TSRs have a definite correlation with motivation and school engagement across a large span of grade levels (Gehlbach et al., 2016). It is clear that relationships do matter, and that TSRs impact students not only in the present, but can be used as indicators of long-term student growth and potential (Gehlbach et al., 2012).

How teachers view their relationships with students also has an impact on student achievement. According to Itskowitz and Strauss (1981), teachers subconsciously group their students into three different categories: those they feel attached to, those they feel indifferent

about, and those whom they reject. The impact of teacher preparation on student achievement will be covered in-depth in a later section, but research does show that preparing teachers to be reflective practitioners who use metacognitive strategies to look at how they teach and view their students can ultimately lead to better relationships between teachers and students, which means that students will have higher rates of success (Gehlbach et al., 2016).

Teacher Experience and Student Achievement

Although some research finds that the number of years of teaching experience in general does not have an impact on student achievement, other research shows that the years of teaching experience a teacher has at a specific grade level or in a specific subject area does typically increase student academic success (Huang, & Moon, 2009). Teacher experience can range from entry level to seasoned teachers with twenty or more years of in-classroom experience (Wossmann, 2005). In general, teachers in the United States have an average of ten to fifteen years of teaching experience (Wossmann, 2005). Teacher longevity and the impact that experience has on student achievement has been an ongoing area of interest and debate, but it is important to note that teacher experience not only encompasses the number of years a teacher has been employed, but includes various positions held, subjects taught, and other factors.

There are other researchers in the field who believe that cumulative years of teaching experience alone are not a valid predictor of increased student achievement (Boyd et al., 2009). Some researchers believe teachers who teach a single grade level or subject area for a long period become more effective over time (Boyd, Galdhaber, Lankford, & Wyckoff, 2007). Due to the fact that teachers gain expertise when serving extensively in a single subject area or grade level, schools should consider rewarding them not only for years of employment, but more specifically for serving in a particular grade/subject and increasing student achievement in that

focus (Huang & Moon, 2009). Other research, however, has arrived at almost the opposite conclusion, namely that teacher experience has no significant impact on student achievement (Croniger, Rice, Rathbun, & Masako, 2007; Link & Ratledge 1979; Summers & Wolfe, 1977). Although the effect that teacher experience has on student achievement remains largely inconclusive, research does show that teachers exhibit the greatest improvement in effectiveness during the first three to five years of their careers (Goldhaber, 2004).

Improving Traditional Teacher Education Programs

“Traditional teacher preparation programs need to change, we need to innovate or we will miss a critical opportunity to advance our profession and lead students into the future” (Hansen, 2016, p. 82). Teacher training is not a new concept; formal teacher education first began in the United States in the year 1810 (Columbia Electronic Encyclopedia, 2011). By the year 1867 a majority of the states required teachers to pass a formal test that covered basic skills in order to receive official state certification (Ravitch, 2003). However, even though many factors in the field of education have changed over the past 200 years, from technology to inclusion practices, teacher preparation programs are not keeping up with the changes in our society (Hansen, 2016).

Twenty years ago, reformers began taking a stand in favor of changing how teachers are educated and trained for the classroom (Hansen, 2016). Currently there are two main routes to attaining teacher licensure: traditional teacher preparation and alternative teacher preparation (Boyd, Goldhaber, Lankford, & Wykoff, 2007). Hansen (2016) states that traditional teacher preparation programs are “spending more time looking backward, keeping the status quo in how they develop candidates as opposed to moving forward” (p. 82). In traditional teacher preparation programs, teachers typically progress through college courses to earn their degree

and take part in one or more phases of unpaid student-teaching jobs prior to taking state exams for official certification (Carr, 2013). In alternative teacher preparation programs, such as innovative teacher academies, students who already hold degrees in other fields such as biology or math are targeted and exposed to an innovative curriculum focusing on clinical experiences and effective strategies for the classroom (Hansen, 2016). In the United States, alternative teacher education officially began in 2002 with the passing of the Every Students Succeeds Act (ESSA) (Every, 2015). Section two of this act states that when teachers graduate from whichever teacher academy programs they have enrolled in, their certification will be recognized at the master's degree level (Every, 2015).

Although of the two main routes to teacher licensure in the United States, the traditional teacher education programs are considered more outdated (Hansen, 2016), alternative teacher preparation programs have significantly lower ratings on feelings of preparedness than those who took part in traditional teacher education programs (Darling-Hammond, 2000b). Teachers who became certified through alternative routes such as Peace Corps, Teach for America, or transcript reviews often showed that they felt unprepared, had problems in the classroom, and ultimately had higher turnover rates than teachers who went through traditional training programs (Darling-Hammond, 2000b). The state of Georgia embraces an alternative teacher preparation program known as the Georgia Teacher Academy for Preparation and Pedagogy (GaTAPP) (Georgia Professional Standards Commission, 2016). GaTAPP is designed for those who did not complete a teacher education program but want to switch from another career to teaching, and who do not hold a teaching certificate (Georgia Professional Standards Commission, 2016). GaTAPP is a condensed program which takes from 18 months to two years in order to gain full licensure (Georgia Professional Standards Commission, 2016). Due to the high quality of the

GaTAPP program it has been nationally recognized by the U.S. Department of Education as an exemplary alternative route program (Georgia Professional Standards Commission, 2009).

Teacher quality is linked to student achievement, yet teacher preparation programs have been lacking unified standards for teacher certification and licensure (Chung & Kim, 2010). In 2008, three major stakeholders in teaching standards, the National Council for Accreditation of Teacher Education (NCATE), the National Board for Professional Teaching Standards (NBPTS), and the Interstate New Teachers Assessment and Support Consortium (INTASC) met to discuss teaching standards and update their policies as needed (Chung & Kim, 2010).

INTASC (Council of Chief State School Officers, 2013) is a consortium that believes if new teachers are educated and thoroughly display the ten standards, they will be successful in teaching the accepted content standards to all students. The ten standards are as follows: (1) Learning Development, (2) Learning Differences, (3) Learning Environments, (4) Content Knowledge, (5) Application of Content, (6) Assessment, (7) Planning for Instruction, (8) Instructional Strategies, (9) Professional Learning and Ethical Practice, and (10) Leadership and Collaboration (Council of Chief State School Officers, 2013).

Historically, NCATE standards were adopted by colleges and universities that set high standards of learning for their students (NCATE, 2008). Schools that were accredited through NCATE had to show how their students were being equipped to become fully licensed teachers who followed the NCATE standards (NCATE, 2008). NCATE standards were reviewed and revised as necessary every seven years, and many states require that students graduate from a school that is accredited by the NCATE standards in order to become fully state certified (NCATE, 2008). In addition to NCATE, the Teacher Education Accreditation Council (TEAC), which was founded in 1998, was another formal national accreditation agency utilized by teacher

education programs across the nation (Council for Higher Education Accreditation [CHEA], 2013). TEAC had slightly different standards than NCATE but was very similar in nature, and upheld high standards of learning (CHEA, 2013).

In 2013, TEAC and NCATE blended together in order to form a new and unified national accreditation council and became the Council for the Accreditation of Education Preparation (CAEP) (CHEA, 2013). CAEP is sanctioned by the CHEA. There are over 1,200 teacher preparation programs across the United States (Ingersoll, 2002), and the goal of CAEP is to ensure that all of them use proven practices and methodologies in educating their students in order to continue to improve teacher quality and ultimately K-12 education (CHEA, 2013). Georgia has recently adopted a modified version of CAEP standards for teacher preparation. These standards were assessed per program beginning in the fall of 2017 and addressed both traditional and non-traditional preparation programs.

In order for those teachers who are fully licensed to gain more advanced certifications, the NBPTS was established (NBPTS, 2012). The NBPTS requires teachers to have at least three years of teaching experience, compile examples of work they have done, and pass rigorous tests to prove their mastery of content knowledge (NBPTS, 2012). Teachers who become National Board Certified Teachers are considered well-prepared, high-quality educators (NBPTS, 2012).

Although attempts are being made to improve teacher preparation programs across the nation through various boards and councils, the general consensus found through research is that teachers who are trained in traditional teacher preparation programs are being taught through an outdated curriculum (Carr, 2013). It is imperative that teacher preparation programs are revamped in order to prepare teachers to be well-equipped and well-rounded by the time they

reach licensure (Dove, 2004). Not only do well prepared teachers perform better, but teacher preparedness also helps increase teacher retention rates (Dove, 2004).

Professional Development

Most schools require that teachers partake in a set number of professional development opportunities over the course of the school year, but exactly what these sessions entail varies greatly from district to district and sometimes even from school to school within a district. In order to conduct an effective professional development session, “the first step is to conduct a needs assessment” (Fisher, Frey, & Nelson, 2012, p. 563). While traditional one-topic professional development sessions for the entire staff of a school are generally not effective (Barbour & Mourshed, 2007; Darling-Hammond et al., 2009), recent research shows also that when professional development is individualized and utilized as a type of adult learning it becomes a key factor in improving teaching (Elmore, 2007; Fullan, 2007).

Professional development is needed in all schools in order to ensure that a common educational language is built across the curriculum and across grade levels (Fisher et al., 2012). As mentioned in the theoretical framework, Piaget’s constructivist learning theory shows that students learn by building upon prior knowledge (Brooks & Brooks, 1993). In order for students to apply concepts from one class to the next and from school year to school year, professional development must be used to implement a common vocabulary (Fisher et al., 2012). Professional development for teachers not only ensures that a common language and curriculum are used by all the educators in any given school, it also helps to improve school quality, classroom practice, and teacher quality (Borko, 2004; Desimone, Smith, & Frisvold, 2007; Desimone, Smith, Hayes, & Frisvold, 2005). High-quality professional development can increase a teacher’s self-efficacy, which in theory improves the quality of the teacher which in

turn contributes to improved student learning (Ford, 1992, Johnston & Ahtee, 2006; Lumpe, Haney, & Czerniak, 2000).

Teacher Licensure/Certification

According to the NCLB Act, one of the requirements to be considered a highly qualified teacher is to be fully state certified or licensed (U.S. Department of Education, 2004). One of the main problems with teacher licensure is that the requirements vary from state to state, so that although a person may not qualify to be a teacher in one state, they may qualify in another (Birman et al., 2007). No single evaluation method or assessment has been developed in order to ensure equal licensure requirements across the states (Birman et al., 2007), which is unfortunate since such a standard would result in more equal teacher quality. When states require more rigorous performance levels and higher tests scores for teacher licensure, they may even be deterring potential teachers (Boyd et al., 2007). Although it seems logical that teachers who had to persevere through more rigorous licensure requirements are of a higher caliber, thereby leading to higher levels of student learning, research on the effects of teacher certification requirements and student achievement is just “too thin” (Boyd et al., 2007, p. 63).

Although there are various routes to teacher licensure, there is a high turnover rate of new teachers which often forces schools to replace beginning teachers with other new teachers who are even less qualified and who sometimes do not even hold full teacher certification yet (Ingersoll & Rossi, 1995). In a study done by Ingersoll and Rossi (1995) in the 1990s, 13.2% of teachers did not return to teach in the same school the following year. There are two main ways to define turnover when referencing teachers: “leavers” and “movers” (Harris & Adams, 2005). Leavers are teachers who end up leaving the profession altogether and move to another career (or

unemployment), and movers are those who continue to teach but leave one school or district for another (Harris & Adams, 2005).

Regardless of the type of turnover being referenced, research shows that the turnover rate of teachers is highest in low-income and high minority population percentage schools (Ingersoll, 2002). Highly qualified and fully certified teachers leaving struggling districts (or the teaching profession altogether) leaves the schools and students who need the most reinforcement to suffer the greatest losses (Ingersoll, 2002; Ingersoll & Rossi, 1995). Data from 1998-2008 shows that teachers in high-poverty schools have a turnover rate of 21% while those in low-poverty schools only lose 14% overall (Planty, Hussar, Snyder, & Provasnik, 2008).

Outside Factors and Student Achievement

Student academic achievement is often reported as a direct result of teacher and/or school quality. However, it is important to remember that there are a number of outside factors which teachers cannot control, and which are certainly significant factors in student academic success. Some of these include: attendance rates, environmental factors, parenting, cultural barriers, socioeconomic status, and students with disabilities (Assaf, Garza, & Battle, 2010). At an even more indirect level, the national economy affects children's education because it impacts the jobs and health care of their parents/guardians, which in turn affects the education process as a whole (Cochran-Smith, 2008).

As the demographics of the United States begin to shift, teachers need to be well educated and prepared in order to serve student populations of all types, including English Language Learners (ELL) and those coming from poverty (Buck & Cordes, 2005). Although the nation's population is becoming more diverse, the majority of teachers are still middle-class Caucasians who speak only a single language (U.S. Department of Education, 2008). Some

teacher preparation programs have taken steps to ensure that teachers are ready to provide students from different backgrounds and cultures with an equal educational opportunity. One of the most common methods is requiring that potential teachers take part in cultural diversity courses, but the simplicity of the content of these courses is criticized because it does not truly prepare educators to work in a diverse field (Assaf et al., 2010).

In the 1970s, the Education for All Handicapped Children Act (EHA) established that all students, including those with disabilities, must be educated in the freest and least restrictive environment possible (U.S. Department of Education, Sec. 612 (a) (5), IDEA). In 1990, congress reauthorized EHA and changed the name to Individuals with Disabilities Education Act (IDEA), but regardless of the title both EHA and IDEA are legal mandates, and schools have worked diligently on integrating all students into the general population as much as possible (Byrnes, 2009). Mainstreaming education is considered to be beneficial to both special education students and their non-disabled peers (Byrnes, 2009). Additionally, research shows that students with disabilities perform better when integrated with their peers and faced with the same high standards and expectations (Byrnes, 2009). However, some points that are often overlooked by research and educational systems are the extra workload, stress, and anxiety that fully inclusive classrooms can have on general education teachers (Nahal, 2009a). General education teachers, especially those who are new to the career field, often do not feel prepared to work in mainstreaming classrooms and end up leaving the profession early when these feeling of self-doubt develop (Nahal, 2009).

“Factors outside of the classroom, such as student poverty, health, and parent education levels, require societal shifts and are not easily influenced by teachers and administrators” (Flood & Anders, 2005, p. 551). There are many different social groups within the United States, whose

myriad classifications range from ability to sexual orientation (Carlisle, Jackson, & George, 2006). With the declared intent that teachers need to understand how to teach *all* students, in 2000 the National Council for Accreditation of Teachers (NCATE) made rating pre-service teachers on social justice a part of their evaluation process (Enterline, Cochran-Smith, Ludlow, & Mitescu, 2007). Due to the subjectivity of the raters in this area of performance, there was a great deal of controversy surrounding the requirement, so it was removed from the evaluations of potential teachers in 2006 (Enterline et al., 2007). Although no longer a formal measure on pre-service teacher evaluation forms, it is still highly encouraged that social justice remains part of teacher curriculums (Enterline et al., 2007).

Schools which have a larger population of students coming from low socioeconomic backgrounds are more likely to be under-resourced (U.S. Department of Education, 2016). Although these schools may receive additional monetary funding from the state, teacher attrition in schools with larger numbers of students coming from poverty is higher, and research shows that this has a negative impact on student achievement (Donaldson & Johnson, 2011; The Teaching Commission, 2004).

Teacher Salary

When teachers are hired, they are not first observed in the classroom but rather are screened on paper based on characteristics such as degree levels and certification area. Due to the screening process schools use to hire teachers, it raises incentives for teachers to pursue higher levels of education and obtain additional areas of licensure in order to become more competitive in the market (Johnson & Cornman, 2008). However, hiring teachers who appear to be more highly qualified on paper ends up causing school districts to have to spend more money on compensation for its employees (Johnson & Cornman, 2008). Teachers are almost always

rewarded in higher compensation for possessing advanced degrees (Huang & Moon, 2009, p. 213).

The amount of money that a school spends on general expenses does not seem to increase the quality of the institution (Greenwald, Hedge, & Lain, 1996; Hanushek, 1986). However, the impact that increasing teacher salaries has on education is an oft-discussed and somewhat controversial topic in the field of education. The general belief is that a teacher's compensation should reflect both her effectiveness as an educator and the longevity of her career (NCTQ, 2009a). Although this seems like a rational way to set teacher salary scales, there is some research which shows that teachers improve their teaching practices and techniques the most during their first few years of teaching (NCTQ, 2009). Because teachers show the largest amount of growth during their first years of work, one study proposes that the pay scales should be set up so that teachers get the largest pay increases earlier on (NCTQ, 2009). Currently the vast majority of teacher salary scales are set up in steps which correlate to years of experience; teachers begin at the bottom of the scale upon initial employment and then move up a single step for each year of teaching regardless of their quality or effectiveness (Hanushek, 1986).

In 2004, The Teaching Commission itself stated that when traditional salary scales are used, schools not only do not attract high-quality teachers, but also do nothing to help decrease teacher turnover rates. Salaries in the field of education are typically far less than those for careers in fields requiring similar degree levels, which causes many potential teachers to turn to other professions (The Teaching Commission, 2004). In addition, teacher tenure means that teachers are getting compensated a larger amount of money for each year they work at a school district based solely on the longevity of their employment, rather than on their students' performance (Munoz & Chang, 2008).

Teacher salaries are a key factor in attracting qualified and motivated educators, but the wages teachers are paid vary drastically from state to state and even within states. In order to economically appeal to high-quality teachers, some school districts increase their base pay in high-needs schools and subject areas (The Teaching Commission, 2004). Another way that districts may try to recruit and retain high-quality teachers is by providing them with student loan forgiveness if they commit to a certain number of years of employment (Allen, 2002). One of the only ways that teachers can reliably increase their salary is by earning a master's or other advanced degree (NCTQ, 2009b), and possibly as a direct consequence over half of the teachers in the United States hold a master's degree in some area (NCTQ, 2009b). In the state of Colorado, the average starting salary for a teacher with a bachelor's degree is \$36,700 and the average base pay for a teacher with a master's degree is \$51,000 (Johnson & Cornman, 2008).

According to all research in the field of education, it is widely accepted that unless basic teacher salaries are increased to compete with other career fields, there will continue to be a shortage of teachers, especially among minority demographics (Murnane & Steele, 2007). As stated by the president's 2016 budget report, too many children who come from low-income families are not allotted equal access to a high-quality education (U.S. Department of Education, 2016). In a study done by the U.S. Department of Education which asked what teachers thought would be an effective way to attract and keep high-quality teachers, 82% of the participants stated that salary increases would be beneficial (U.S. Department of Education, 2004). The Teaching Commission (2004) has stated unequivocally that in order to get high-quality teachers into the classroom the pay scale must be changed.

Filling the Gap in Literature

The relationship between teacher education level and student achievement has not been studied enough to provide empirical data in any subject area or at any educational level (Wayne & Young, 2003). When reading current data, it is not possible to draw any definite conclusions, so more research certainly needs to be conducted in this field (Wayne & Young, 2003).

Although unfocused studies have been conducted on the topic of teacher education level and student achievement, many of them encompassed other factors such as years of experience or teacher preparation programs as well (Gansle, Noell & Burns, 2012; Harris & Sass, 2011; Jones et al., 2015; Lopez, Huling & Resta, 2013). The few studies which have more deeply analyzed only teacher education levels and their impact on student achievement have produced mixed or inconclusive findings (Goldhaber, 2004).

The literature review makes clear that there has been ample research done on various factors which impact student achievement, from teacher-student relationships to outside factors (Hanushek, 1989; Harris & Sass, 2011). However, it also brings to light the deeper need for an understanding of teacher education level and its impact on academic achievement. Unlike various other factors such as route to teacher certification or teacher mentorship, higher teacher education level directly correlates with increases in teacher salary (Johnson & Cornman, 2008; NCTQ, 2009a). As mentioned in the theoretical framework for this study, an educational system as a whole runs like its own economy (Goldhaber & Brewer, 1996; Schultz, 1971).

Compensating teachers with advanced degrees more highly than those teachers who hold a standard bachelor's degree is no longer a valid strategy for a successful school system in the nation because the literature review makes clear that the impact of teacher education levels on

student achievement levels remain inconclusive, and much of the research in the field states that further study is necessary (Hanushek, 1986; Harris & Sass, 2011; Zhang, 2008).

Summary

The criteria that are used to define what makes a high-quality teacher are vast (Harris & Sass, 2011), and the general factors which impact student achievement are correspondingly large (Buck & Cordes, 2005). Although formal studies of teachers' impact on student achievement began in the 1960s (Hanushek, 1997; Rivkin et al., 2005), there has never been a true resolution to this particular area of study. When NCLB was passed in 2001, a new phase of research created a tremendous amount of literature on the subject (Goldhaber, 2004; Gimbert, Cristol & Sene, 2007; Moss, 2012), but even with such an influx of new and relatively recent data, to this day there is no sound conclusion on the impact that teacher education level has on student achievement (Zhang, 2008). It is imperative that this research study helps to further define whether or not teacher educational levels are something that impact teacher quality, because research shows that students who have a "good" teacher versus those who have an inadequate teacher can show more than an entire grade level of difference on their standardized evaluations (Hanushek, 1992). Research shows that there are clear relationships between high-quality teachers and student achievement (Goldhaber & Brewer, 1998; Hanushek, 1992; Loughran et al., 2008; Luschei & Chudgar, 2011; Rivkin et al., 2005), but pinpointing the particular characteristics that make a quality teacher stand out from an average educator remains elusive.

Past research clearly shows that there are certain factors, such as teacher-student relationships, which greatly impact student achievement (Gehlbach et al., 2016). It is also clear that there are outlying factors, such as socioeconomic status and ability level, which remain outside of teachers' control (Assaf et al., 2010). High-quality teachers are associated with a

high-quality education which produces highly educated students, but identifying the exact determinant of what makes a high-quality teacher remains an inconclusive area of educational research (Goldhaber & Brewer, 1998; Hanushek, 1992; Huang & Moon, 2009; Loughran et al., 2008; Luschei & Chudgar, 2011; Rivkin et al., 2005). Specifically, research has failed to provide a determination of what, if any, impact teacher education level has on student achievement. This study's goal is to determine whether there is a clear relationship between teacher educational attainment levels and student academic success. "By investing in what works, learning more about what works, and sharing what we learn, we can help more students succeed" (U.S. Department of Education, 2016, p.1).

CHAPTER THREE: METHODS

A number of studies, including a 1996 analysis of more than 3,000 schools, clearly show that there is a relationship between teacher quality and student achievement (Darling-Hammond, 1996, 2000a; Rivkin et al., 2005). Although NCLB states that for teachers to be “highly qualified” they must hold a bachelor’s degree and show subject-matter proficiency (Marszalek et al., 2010), specific teacher characteristics such as educational attainment level remain an active area where research and inquiry are needed (Wilson, Floden, & Ferrini-Mundy, 2001). This study seeks to perform further research in order to understand the impact that various levels of teacher degree attainments have on fourth-grade students’ Georgia Milestones EOG Assessment scores in mathematics. Past research studies have collected data on general teacher preparation program differences and various routes to teacher licensure, but there is a clear gap in the literature with regard to teacher educational attainment levels and student achievement.

Design

The research design used for this study is causal-comparative in nature. In this study the factors being analyzed are the impact of teachers’ different levels of degree attainment (bachelor’s, master’s, educational specialist and doctoral) on fourth-grade students’ scores and overall student passing rates on the Georgia Milestones EOG Assessment scores in mathematics.

Research Question

There was one research question for this study:

RQ1: Is there a difference in the mean scores of fourth-grade students on the Georgia Milestones End of Grade Assessment in Mathematics for teachers with various levels of degree attainment (bachelor’s, master’s, educational specialist, and doctoral degrees).

Null Hypothesis

The hypothesis for this study is as follows:

H_01 : There is no statistically significant difference in the mean scores of fourth-grade students on the Georgia Milestones End of Grade Assessment in Mathematics for teachers with various levels of degree attainment (bachelor's, master's, educational specialist, and doctoral degrees).

Participants and Setting

The data for this study was drawn from information which has been formally requested from the Georgia Department of Education (GaDOE). Data was collected for the entire state of Georgia. The reason for requesting records from all educational regions in the state was to obtain a large enough sample size of teachers with doctoral degrees for a valid comparison to be made. Data was collected for all teachers in the state who teach fourth-grade mathematics, but only the teachers who work in traditional elementary classes that take place in a face-to-face setting were considered as participants for this study. Figure 2 depicts the geographical regions selected for this study.

During the 2015-2016 school year, there were a total of 1,319 elementary schools in the state which were included in this study (GaDOE, 2016). Figure 2 shows outlines of all the educational regions within the state of Georgia. Racial and ethnic population distribution for this study was based on data collected for all districts in the state in March of 2016. The GaDOE (2016) reports that statewide there were: 256,633 Hispanic students, 3,392 Indians, 67,134 Asians, 645,940 Blacks, 1,936 Pacific Islanders, 715, 722 whites, and 59,095 multiethnic. Figure 3 provides a clear visual representation of what the racial distribution across all schools in the state of Georgia looked like in 2015-2016.

Regional Educational Service Agencies (RESAs)

Click on a RESA name for a list of counties within that region.

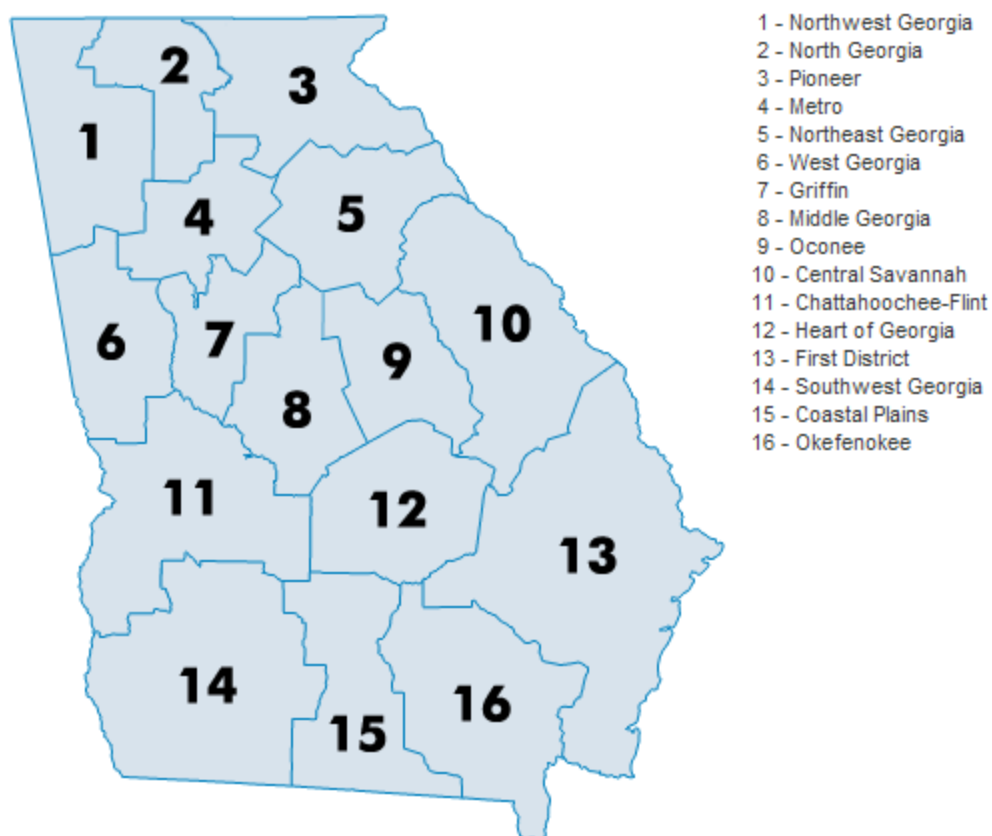


Figure 2. Regional educational service agencies map (GaDOE, 2016).

In the state of Georgia, the maximum student to teacher ratio was 18:1, or 20:1 with a full-time aide for core subjects (Education Commission of the States, 2014). As seen in Figure 4, across the state of Georgia, 62.29% of students received free and reduced lunch during the 2015-2016 school year (GaDOE, 2017). This means that over half of the students in the Georgia public school system came from poverty afflicted or financially needy homes.

All regions and elementary schools in the state of Georgia were selected for this study. The districts chosen for this study included a total of 129, 852 students who were tested on the fourth-grade mathematics EOG assessment during the spring of 2016 (GaDOE, 2016). No

personally identifiable data from teachers or students was included in the data collection of this study.

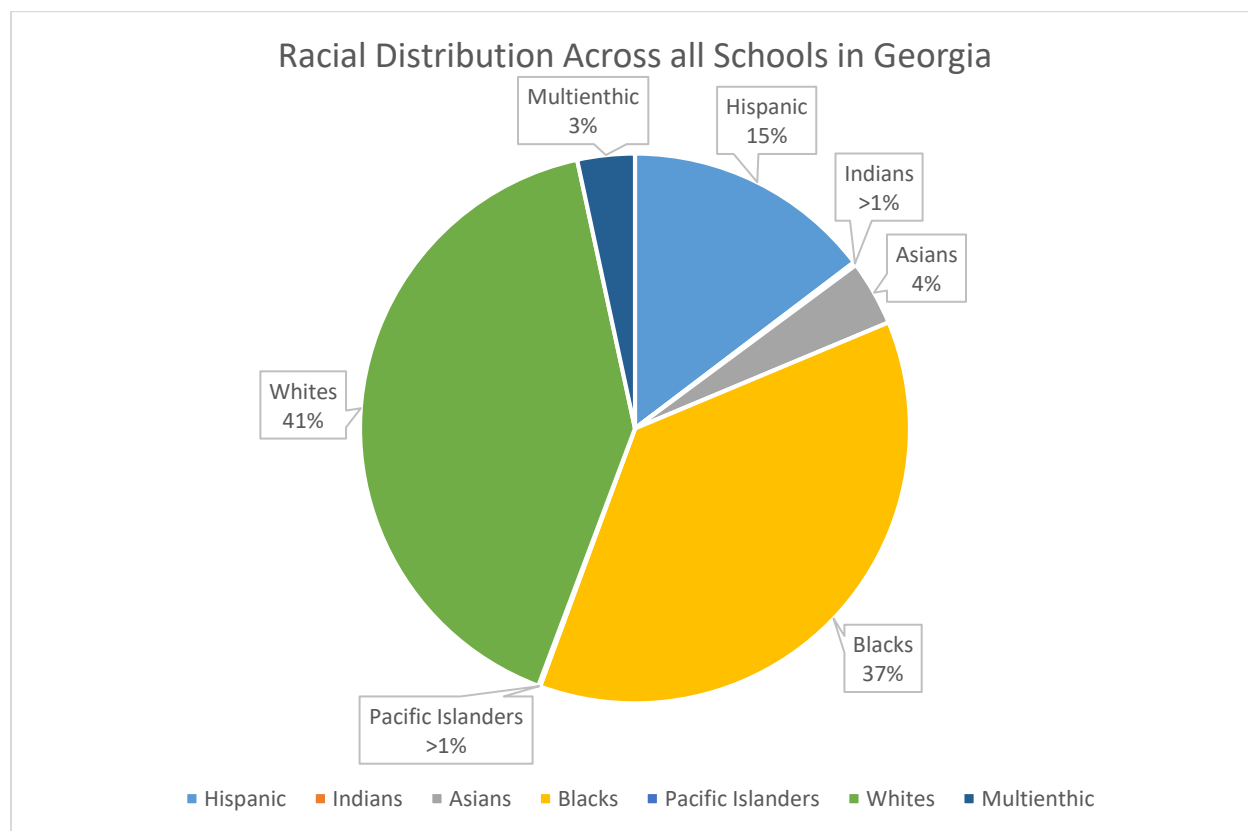


Figure 3. Racial distribution pie chart.

The researcher was able to gather data on the overall number of fourth-grade math teachers in each educational attainment category. There was a total of 1,728 teachers with a bachelor's degree, 2,256 teachers with a master's degree, 936 teachers with an educational specialist degree, and 83 teachers with a doctoral degree (GaDOE, 2017). Figure 5 provides a clear visual representation of the distribution of teacher educational attainment levels.

The student scores used for this study were taken from the mean pass rates of all fourth-grade mathematics students on the Georgia Milestones EOG Assessment. The pass rate data was then broken into the number of students that fell under each teacher educational attainment level. The students whose scores were analyzed in this study are diverse in gender, race, and academic

ability. It is also important to note that the public elementary schools in the state of Georgia use a full-inclusion model.

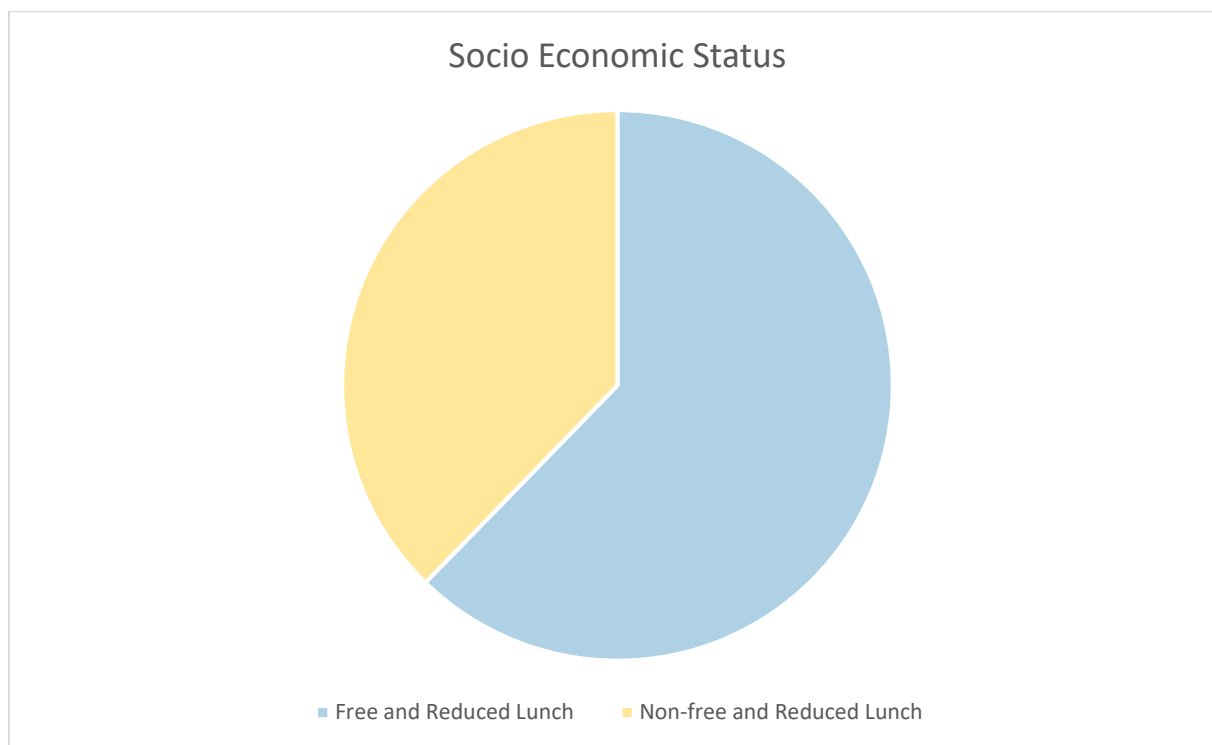


Figure 4. Socioeconomic status.

Georgia requires all students to participate in statewide assessment programs. For any grade where all students are assessed, students with disabilities must participate in the regular assessment or the Georgia Alternate Assessment (GAA). The GAA is designed for students with the most significant cognitive disabilities, approximately one percent of all students enrolled in assessed grades. All students must be included to the fullest extent possible in all statewide assessments and have their assessment results included with Georgia's accountability system. The GaDOE participation requirement is supported by federal legislation requiring the participation of students with disabilities in standards-based instruction and assessment initiatives. (GaDOE, 2015, p.6).

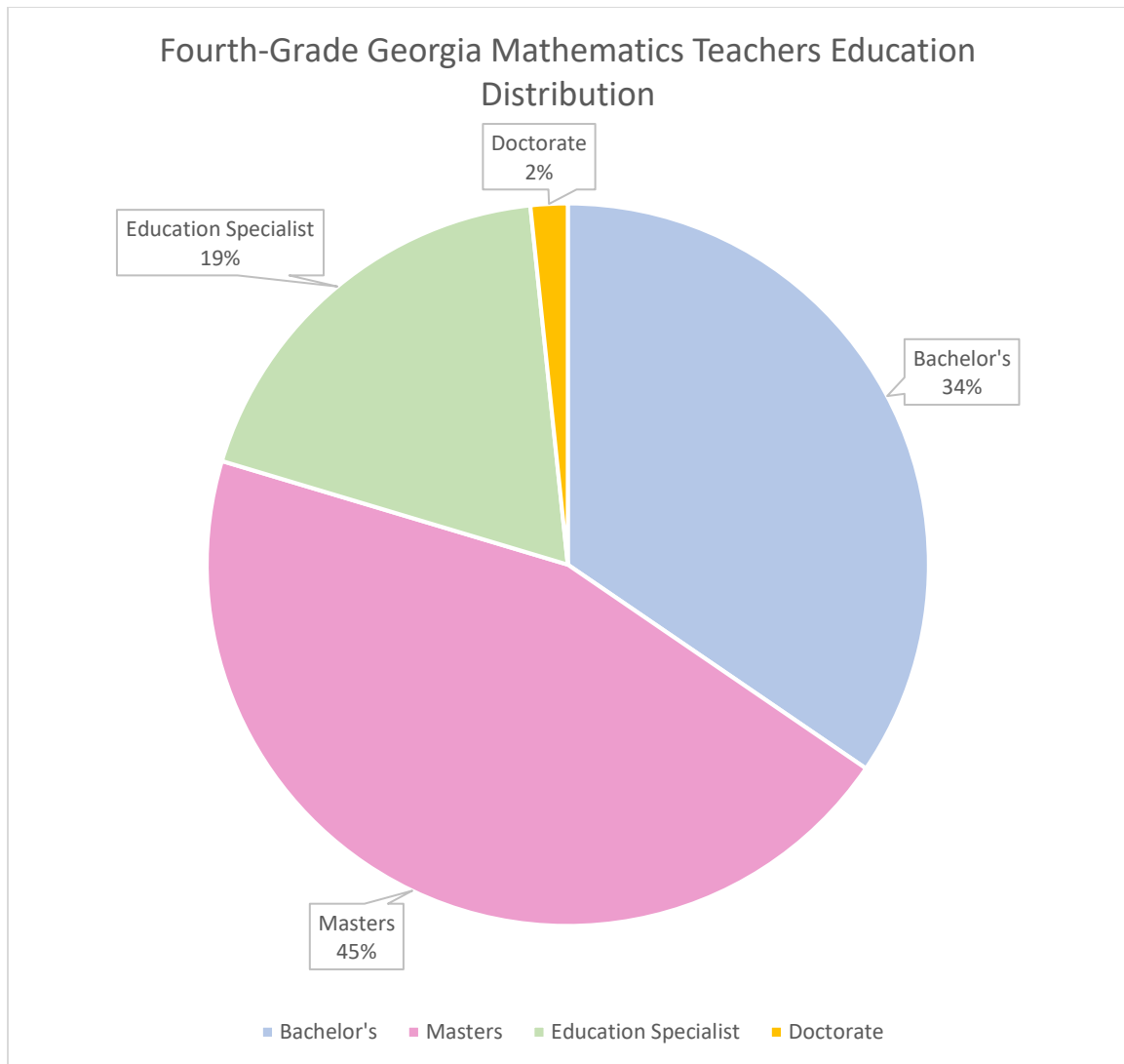


Figure 5. Distribution of teacher educational attainment levels.

It is not the total number of teachers at each school that was taken into account, or the individual teachers' degree levels, but rather the entire group of teachers across the state who held a degree at each of the four levels (bachelor's, master's, educational specialist and doctoral). In the state of Georgia, all fully licensed teachers are required to hold a minimum of a bachelor's degree; in this study, the term "graduate degree" encompasses either a master's, educational specialist, or doctoral degree.

Instrumentation

The instrument used for this study is the Georgia Milestones EOG Assessment in fourth-grade mathematics from the 2015-2016 school year. The Georgia Milestones EOG Assessment was selected because it is given on an annual basis, and is a standard assessment given across the entire state (GaDOE, 2016). The purpose of the Georgia Milestones assessment is to measure students' mastery of state content standards (GaDOE, 2016). The GaDOE ensures the validity of Milestones assessments through careful development of test items which align to the curriculum (GaDOE, 2016). Educators, test designers, and content area specialists all work through collaborative efforts to create items for the statewide assessments (GaDOE, 2016). Before any items are added to the Georgia Milestones assessments they are first added in as field questions, and then they are reviewed (GaDOE, 2016). The median reliability indicator for the 2015-2016 Georgia Milestones EOG Assessment in grade 4 mathematics was 0.92, with the minimum reliability value at 0.91 and the maximum reliability at 0.93 (GaDOE, 2016). High reliability values provide researchers with ample evidence that the Georgia Milestones EOG Assessment is a reasonably homogeneous measure (GaDOE, 2016).

Procedures

Prior to gathering any data for this study, the researcher gained approval from the Institutional Review Board (IRB). Once approval from the IRB was obtained, the researcher contacted the GaDOE to collect archival data. The researcher then started gathering data by requesting Georgia Mathematics EOG Assessment in Mathematics scores for fourth-grade. The researcher requested that the data be broken down by teachers' highest degree attainment (bachelor's degrees, master's degrees, educational specialist degrees, and doctoral degrees). The researcher asked that the data be provided for individual teachers (coded for anonymity). The

researcher also stated that although individual data would be preferred, grouped data could work as long as mean test scores, standard deviations (or SEM), and the number of teachers in each category were provided. The data was requested for the following Regional Education Service Agencies: Pioneer, Northeast, North, Metro, and Northwest if broken down by individual teachers, or for the entire state if data was grouped.

Data Analysis

To begin the data analysis process, the researcher looked up the mean overall pass rates on the Georgia Mathematics EOG Assessment Mathematics scores for fourth-grade students and how the number of passing students related to the teachers' degree level category. Once the researcher compiled a list of the number of passing students on the mathematics test in each teacher degree category, the researcher calculated the percentage of students that passed the test in each teacher degree level category.

The mean scores of the student pass rates on the Georgia Mathematics EOG Assessment fourth-grade test were then compared for various teacher degree levels using an analysis of variance (ANOVA). An ANOVA is used to see if there are variances in studies involving more than two groups (Gall, Gall, & Borg, 2007). In descriptive statistics, the independent variable's direct relationship to the dependent variable is described in-depth (Gall et al., 2007). The variables found within a study using an ANOVA are not experimentally controlled or treated (Gall et al., 2007).

This study was conducted using an ANOVA statistical procedure. In this type of study, the sample population is neither controlled nor treated (Gall et al., 2007). An ANOVA was used because it "is a statistical procedure that compares the amount of between-groups variance in individuals' scores with the amount of within-groups variance" (Gall et al., 2007, p. 106). An

ANOVA was conducted in order to compare the means of the four distinct categories of educational attainment: bachelor's degree, master's degree, educational specialist degree and doctoral degree. A t test for multiple comparisons was also done. The t test is a statistical measurement used to determine if there are significant differences between more than two different groups of means (Gall et al., 2007). The ANOVA was the most appropriate method of analysis for this study because the research attempted to see what type of difference there was between four different groups. An advantage of using the ANOVA as a research analysis method for this study over other methods was that once the ANOVA was conducted, post-hoc comparisons could be made in order to provide solid information on exactly where any differences exist (Gall et al., 2007).

CHAPTER FOUR: FINDINGS

This study sought to determine the relationship between teacher level of degree attainment and students' fourth-grade scores on the Georgia Milestones EOG Assessment in Mathematics. In order to gain a clearer picture of these relationships, mean scores from the entire state of Georgia's testing population were used for this study. The purpose of this chapter is to report the results of the analyses described in Chapter Three. First, descriptive statistics are presented, and then inferential statistics are disclosed. The study used an ANOVA to determine if there is a difference in the mean scores of fourth-grade students on the Georgia Milestones EOG Assessment in Mathematics for teachers with various levels of degree attainment (bachelor's, master's, educational specialist, and doctoral degrees). The validity of the Georgia Milestones EOG Assessment in Mathematics was covered in Chapter Three. This chapter will provide the reader with detailed results for the analysis of the research question and hypothesis.

Research Question

The study was based on the following research question:

RQ1: Is there a difference in the mean scores of fourth-grade students on the Georgia Milestones End of Grade Assessment in Mathematics with teachers with various levels of degree attainment (bachelor's, master's, educational specialist, and doctoral degrees).

Null Hypothesis

The study was based on the following null hypothesis:

H₀1: There is no statistically significant difference in the mean scores of fourth-grade students on the Georgia Milestones End of Grade Assessment in Mathematics for teachers with various levels of degree attainment (bachelor's, master's, educational specialist, and doctoral degrees).

Descriptive Statistics

A total of 129,852 students took the Grade 4 milestones EOG math test in this summary dataset, taught by a total of 5,003 teachers. Many teachers had a master's degree (45.09%), and the highest proportion of the students were taught by those teachers with a master's degree (43.77%). Overall, 40.47% of the students passed, and pass rates were similar between each teacher's degree type. The highest average math score was from students taught by teachers with a master's degree ($m = 516.75$, $SD = 50.12$). Table 1 and Table 2 present the full frequencies and percentages of these characteristics. Table 3 presents the means and standard deviations for the math scores on the Grade 4 milestones EOG test.

Table 1

Frequencies and Percentages of Demographic Information

Variable	Highest Degree Completed by Teacher	<i>n</i>	%
Students who Completed Gr. 4 Milestones EOG	Bachelor's degree	44487	34.26%
	Master's degree	56831	43.77%
	Education Specialist	26628	20.51%
	Doctorate	1906	1.47%
	Total	129852	100.00%
Teachers	Bachelor's degree	1728	34.54%
	Master's degree	2256	45.09%
	Education Specialist	936	18.71%
	Doctorate	83	1.66%
	Total	5003	100.00%

Table 2

Frequencies and Percentages of Student Performance

	Fail		Pass	
	<i>n</i>	%	<i>n</i>	%
Bachelor's degree	27905	62.73%	16582	37.27%
Master's degree	33258	58.52%	23573	41.48%
Education Specialist	15004	56.35%	11624	43.65%
Doctorate	1135	59.55%	771	40.45%
Total	77302	59.53%	52550	40.47%

Table 3

Means and Standard Deviations of Math Scores

Variable	<i>M</i>	<i>SD</i>
Gr. 4 Milestones EOG Math		
Bachelor's degree	512.84	48.10
Master's degree	517.87	49.87
Education Specialist	520.88	50.63
Doctorate	516.75	50.12

Results**Null Hypothesis One**

To assess the summary data, a one-way ANOVA was performed. The ANOVA allowed for evaluation of the null hypothesis and showed that there is a statistically significant difference

in the mean scores of fourth-grade students on the Georgia Milestones EOG Assessment in Mathematics for teachers with various levels of degree attainment (bachelor's, master's, educational specialist, and doctoral degrees). An ANOVA is the appropriate analysis to perform when seeking to examine statistical differences in a single dependent variable between groups of one independent variable (Field, 2013). The following section presents the results of the ANOVA. Prior to conducting the ANOVA, the Hartley's test of variance proportions was used to compare variances between groups. Each variance proportion in Hartley's test was less than 1.5, which means that the assumption of homogeneity of variances was met (Stevens, 2009).

RQ1: Is there a difference in the mean scores of fourth-grade students on the Georgia Milestones End of Grade Assessment in Mathematics with teachers with various levels of degree attainment (bachelor's, master's, educational specialist, and doctoral degrees).

A one-way ANOVA was used to compare mean scores of fourth-grade students on the Georgia Milestones EOG Assessment in Mathematics whose teachers had various levels of highest degree attainment (bachelor's, master's, educational specialist, and doctoral degrees). The results of the analysis were significant, $F(3, 4999) = 164.45, p < .0003$. This result indicates that significant differences existed between teachers with different levels of degree attainment. Tukey's Honestly Significant Difference (HSD) was used as a *post hoc* analysis to determine where these differences lie. Students who were taught by teachers with bachelor's degrees scored significantly lower than those taught by teachers with a master's degree. Students with teachers holding a bachelor's degree scored significantly lower than students with education specialist teachers. Students with bachelor degree holding teachers scored significantly lower than those with teachers holding doctorates. Students with master's degree holding teachers scored lower than those with education specialist teachers but the difference was not large

enough to be considered significant. No significant difference was observed between students with master's degree or doctorate holding teachers. Students with education specialist teachers scored higher than those who had teachers with doctorates; however, the difference was not significant. Thus, the null hypothesis can be rejected. Table 4 presents the comparisons of teacher degree levels and student scores. Table 5 presents the ANOVA source table for the analysis of mean grades.

Table 4

Teacher Degree Comparison of Students' Scores

Variable	<i>p</i>	mean difference
Bachelor's degree vs. master's degree	0.008	5.030
Bachelor's degree vs. specialist degree	0.001	8.040
Bachelor's degree vs. doctorate degree	0.894	3.910
Master's degree vs. specialist degree	0.394	3.010
Master's degree vs. doctorate	0.997	1.120
Educational specialist degree vs. doctorate degree	0.884	4.130

Table 5

ANOVA Source Table for Mean Grades

Source	<i>SS</i>	<i>df</i>	Variance	<i>F</i>	<i>P</i>
Between Groups	45186.5266	3	15062.1755	6.2255	.0003
Within Groups	12094695.7618	4999	2443.64	-	-
Total	12139882.2884	5002	-	-	-

Summary

The results of the analyses indicated significant differences existed in student average math scores and passing rates between degree attainment groups. Due to the fact that teacher degree levels have an impact on student scores the null hypothesis can be rejected. In both passing rates and average math scores, education specialists had the students with the highest scores. The next chapter will present a discussion of these results in terms of the relevant literature. It will also discuss the strengths and weaknesses of the study, as well as directions for future research.

CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Chapter Five will provide an in-depth discussion of the research problem and data which was presented in Chapter Four. This chapter will draw upon information from the literature review section in order to provide a discussion that is rooted in connections to prior research. Additionally, conclusions, implications, limitations, and recommendations for future research sections will follow the discussion.

Discussion

The purpose of this causal-comparative study was to determine whether there were differences in fourth-grade student scores on the Georgia Milestones EOG Assessment in Mathematics at all public elementary schools within the state of Georgia for teachers with various levels of highest degree attainment. Zhang defines teacher education level as, “the highest educational degree obtained by a teacher” (Zhang, 2008, p. 6).

The null hypothesis for this study was that there is no statistically significant difference in the mean scores of fourth-grade students on the Georgia Milestones EOG Assessment in Mathematics for teachers with various levels of degree attainment (bachelor’s, master’s, educational specialist, and doctoral degrees).

A one-way ANOVA in mean scores of fourth-grade students on the Georgia Milestones EOG Assessment in Mathematics was performed between four groups of degree attainment (bachelor’s, master’s, educational specialist, and doctoral degrees). The results of the analysis were significant ($F(3, 4999) = 164.45, p < .0003$), which means that meaningful differences actually do exist in student scores for teachers with different levels of degree attainment.

The results of this report are relevant to educational research because many studies relating to teacher education level and student achievement are outdated and provide

inconclusive results (Zhang, 2008). The bulk of literature found on this topic cites data from the 1988 National Educational Longitudinal Study (NELS:88) (Goldhaber & Brewer, 1996; Ye, 2000). Although NELS:88 is a valid study for measurement purposes (Goldhaber & Brewer, 1996), it is over two decades old and the results of studies which reference its findings vary widely, making it impossible to draw accurate conclusions about the current relationship between teacher educational attainment and student achievement (Zhang, 2008).

Additionally, in the early 2000s more research on the relationship between teachers' education level and student achievement was conducted (Wayne & Young, 2003). The research spanned the elementary to high school grade levels in order to provide greater generalizability of results, but the results remained inconclusive (Goldhaber, 2004; Hedge et al., 1994; Wayne & Young, 2003; Zhang, 2008).

Although the quest to increase student success and determine what factors most impact student achievement was examined in 1966 when the United States Department of Health, Education, and Welfare implemented the Equality of Educational Opportunity Study (Rivkin et al., 2005), the concept of increasing student achievement and relating this measure to teacher quality truly came to light with the establishment of the NCLB Act of 2001, which pushed for statewide assessments to be implemented in order to measure student progress on a yearly basis (VDOE, 2006). One such quantitative evaluation is the Georgia Milestones EOG Assessment in Mathematics, which was the chosen instrument for this study. The Georgia Milestones EOG Assessment in Mathematics was selected because it is a standard assessment given across the entire state (GaDOE, 2016) and provides enough current information to encompass relevant data from the last five years. Using the Georgia Milestones EOG Assessment in Mathematics for this study also provides the advantage of increasing the validity of results over an in-house created

assessment because of its comparatively high reliability. For the 2015-2016 Georgia Milestones EOG Assessment in grade 4 mathematics, the median reliability indicator was 0.92, with the minimum reliability value at 0.91 and the maximum reliability at 0.93 (GaDOE, 2016). High reliability values provide evidence that the Georgia Milestones EOG Assessment is a reasonably homogeneous measure (GaDOE, 2016) to use for this study. Additionally, using the Georgia Milestones EOG Assessment in Mathematics allows the population for this study to consist of 129,852 students and 5,003 teachers.

As mentioned earlier in the literature review, it is clear that there has been a great deal of wide-ranging research done on the various factors which impact student achievement, from teacher-student relationships to outside factors (Hanushek, 1989; Harris & Sass, 2011). However, it is equally clear that a deeper understanding of teacher education level and its impact on academic achievement is still required. This study serves to fill that gap by demonstrating a current and clear correlation between teacher degree level and student achievement.

The necessity for a complete understanding of the link between student achievement and teacher education level is not only academically necessary because of the gap in literature, but it is also practically necessary from an economic viewpoint. Unlike various other factors such as route to teacher certification or teacher mentorship, higher teacher education level directly correlates with increases in teacher salary (Johnson & Cornman, 2008; NCTQ, 2009a).

Authors of past studies have expressed strong opinions about school systems compensating teachers with advanced degrees more highly than those teachers who hold a standard bachelor's degree, since there was no clear evidence that teacher education levels have an impact on student achievement (Hanushek, 1986; Harris & Sass, 2011; Zhang, 2008). The results of this study indicate that significant differences do exist in student average math scores

between degree attainment groups, and therefore aligning compensation with these results would be appropriate.

Conclusions

The results of this study, along with an in-depth literature review, allowed the researcher to conclude that teacher degree level has a direct and measurable impact on student achievement. Even though there are many factors which influence student achievement and overall teacher quality, teacher degree level was an area that needed to be examined not only for the benefits of student growth, but from a financial standpoint as well. It is important to point out that although all teachers who held degrees above the bachelor level had students with higher passing rates than those with only bachelor's degrees, this increase was not linear, as is shown in Figure 6.

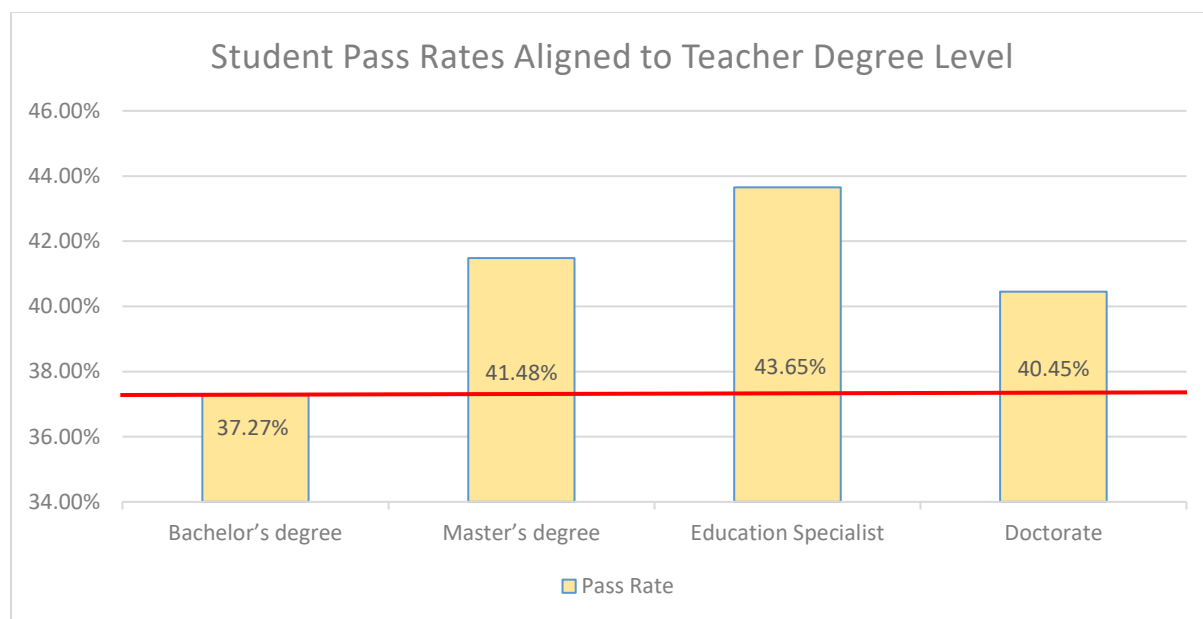


Figure 6. Student Pass Rates Pie Chart

The red line in Figure 6 illustrates that the student pass rates for teachers with graduate-level degrees were higher than those who held only bachelor's degrees. Interestingly, it also depicts that teachers who held a doctorate degree had lower student pass rates than those who held master's degrees and educational specialist degrees. This serves to show that teacher

quality as rated is not always universal. The literature review covered the fact that through NCLB, the government began requiring that all teachers attain at least a bachelor's degree in order to gain licensure and be considered "highly qualified" (U.S. Department of Education, 2004), but research from this study suggests that teachers with educational specialist degrees, when rated purely by their students' EOG Assessments, may actually be the most highly qualified teachers.

According to Schultz (1971), education as a whole can be seen as an economic good. The whole point of NCLB and its provision to positively identify teachers as "highly qualified" was to increase the academic achievement of students, which ultimately was intended to improve the economy as a whole. Essentially, it was a tangible expression of the philosophy that when one invests in students and provides them with a high-quality education, those same students will end up being productive members of society who then foster economic growth (Olaniyan & Akemakinde, 2008). According to data from this study, in order to have the highest quality of teachers (measured by student pass rates) possible in the classroom, an educational specialist degree would be the most applicable requirement. The entire idea of teachers with higher degree levels having students who achieve at higher rates aligns with Schultz's (1971) human capital theory that high-quality education is an essential element of a productive population.

This study shows that higher teacher educational levels directly correlates to higher student passing rates, and thus to higher quality teachers. The human capital theory would conclude that it makes sense to spend extra money to hire teachers with advanced degrees (Goldhaber & Brewer, 1996). Some states already require teachers to earn degrees above the bachelor level (Ballou & Podgursky, 2000; Goldhaber & Brewer, 1996; Knapp et al., 1990; Hanushek & Rivkin, 2007) and many often provide additional funding and support for teachers

with advanced degrees (U.S. Department of Education, 2016; The Teaching Commission, 2004). The basis for supporting and compensating teachers with higher degrees stems from the belief that higher teacher degree level is related to higher quality teachers, and consequently higher quality teachers are associated with higher student achievement (Hanushek, 1997). This study corroborates that hypothesis.

Implications

Teacher quality has been “repeatedly cited as the most important schooling factor influencing student achievement” (Goldhaber et al., 2013, p. 29). However, exactly which factors make a high-quality teacher have remained unclear. There is a definite gap in literature on research which explores the link between teacher educational attainment levels and student achievement (Conway et al., 2010). Through this study, data showing direct correlations between different teacher degree attainment levels and student achievement scores have been gained. Identifying the link between teacher education level and student achievement scores is monumental in the field of education for two reasons:

- (a) Teachers are often compensated more highly for advanced degrees (NCTQ, 2013), and prior to this study this was just done on the assumption that teachers with advanced degrees were of better quality than those who held only a bachelor’s degree.
- (b) Educational attainment levels of teachers (bachelor’s, master’s, educational specialist, and doctorate) have a direct impact on student achievement, which allows for a clear route to school improvement when it is needed.

The data gained from this study may assist the nation’s educational system to properly compensate teachers based upon their true quality and improve student achievement by providing all students with high-quality teachers who can help them thrive. This study found

that all levels of teachers with advanced degrees had superior pass rates as compared with those that did not, but it also found that teachers holding an educational specialist degree, not a doctorate, provided the highest student achievement scores. The reason for this seeming incongruity will need to be investigated through future research in this area. The knowledge that has been gained through this study can help districts make better financial choices in terms of teacher compensation, allow them to refine their hiring practices, and pinpoint ways in which they can help current teachers grow.

Limitations

This study was limited to the state of Georgia; more specifically, it was limited to only fourth-grade math students and their teachers. According to Gall et al. (2007), external validity is threatened when generalizability of a study's results are not sufficient. In this study, the sample size was appropriately large but Georgia is not regionally similar to states in other parts of the nation, which makes generalizability of results more difficult. The convenience sampling used in order to gain a large sample size for this study decreased its overall generalizability to the entire population. Additionally, the incredibly large sample size of this study predisposes the chances of a Type I error, which means finding a significant result that happens by chance.

The data gathered for this study were based upon student test scores on the valid and reliable Georgia Milestones EOG Assessment in Mathematics. It is important to point out, however, that not all students perform well on high-stakes testing due to various factors such as anxiety, and this too could impact the results. Additionally, students of all ability levels from the gifted to special education population took the Georgia Milestones EOG Assessment in Mathematics, and different correlations between students' pass rates and teacher degree levels may have been obtained if student sub-groups had been analyzed.

Recommendations for Future Research

The results of this research study show that there is a relationship between teacher degree level and student pass rates on standardized tests. When combined with past literature on the relationship between teachers and student achievement, this study is a definite positive step toward a more efficient means of measuring teacher effectiveness, and by association, proper pay. Overall, however, this study has only begun to investigate all the available information relating to research in this field. Subsequent studies on this topic should cover the following areas:

1. This study was done in the state of Georgia alone. Future research should focus on a more diverse sample population that is generalizable across the entire nation so that results can be generalized outside of a single region.
2. Future studies should expand the subject areas assessed. This study only focused on mathematics.
3. This study was done with fourth-grade students. It would be beneficial to replicate this study at middle school and high school levels in order to allow for greater generalizability.
4. The current study looked at the highest level of education attained by teachers, but it did not look at whether the degree corresponded with the content the teacher was teaching; more research is needed on this topic.
5. Years of teacher experience were not taken into account for this study. Determining if there is a correlation between years of experience is recommended for future studies in this area.

6. This study did not take into account outlying factors which may have affected student test scores such as race, gender, socio-economic status, and religion; future studies should conduct research with a smaller sample with individual data points.

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Appendix A: Approval for use of the Georgia Regions Map

Good afternoon,

Yes, you may use the map in your dissertation. Please be sure to properly credit the Georgia Department of Education.

Thanks,
XXXXXX

From: Call, Marie [mailto:mcall@liberty.edu]
Sent: Tuesday, March 14, 2017 4:39 PM
To: XXXXXX XXXXX <XXXXXXX@doe.k12.ga.us>
Subject: Re: GADOE Document Use

Hello again Mrs. XXXXXXXXXXXX,

I was wondering if I may use the map that I mentioned in my initial email to you.

I have highlighted the link in the old message in yellow below.

Thank you so much,

Marie

From: Call, Marie
Sent: Monday, March 6, 2017 3:38 PM
To: XXXXXX XXXXX
Subject: Re: GADOE Document Use

Hello,

I apologize for the slow response; I was out of town. As of right now I only have the map from the link in my previous email in my document. May I have permission to use this map?

If any other documents are used along the way are you the person I should contact to get approval from?

Thank you so much for your time. I truly appreciate your help.

Marie

On Mar 2, 2017, at 4:11 PM, XXXXXX XXXXX <XXXXXXX@doe.k12.ga.us> wrote:

Dear Ms. Call:

Ask DOE forwarded your email to me for review and response. What other information would you like to use in addition to the RESA map?

Best regards,
XXXXXX

XXXXXX XXXXX
Interim General Counsel
Legal Services Office
Georgia Department of Education
2052 Twin Towers East
205 Jesse Hill Jr. Drive, SE
Atlanta, GA 30334
XXXXXXXX@doe.k12.ga.us
(XXX) XXX-XXXX - Phone
(XXX) XXX-XXXX - Fax
<http://www.gadoe.org>

“Educating Georgia’s Future”

XXXXXX

From: Call, Marie [<mailto:mcall@liberty.edu>]
Sent: Sunday, February 26, 2017 9:38 AM
To: askdoe@gadoe.gov
Subject: GADOE Document Use

Hello,

My name is Marie-Katharina Call and I will be writing my doctoral dissertation this year. I would like to use some of the tables and figures found within on the Georgia Department of Education website. Are you the correct office to contact to gain permission to use and/or replicate portions of documents? If not could you please put my in contact with the correct person?

Here is a link to one of the map I plan to use:

[http://www.gadoe.org/Pages/Regional-Education-Service-Agencies-\(RESAs\).aspx](http://www.gadoe.org/Pages/Regional-Education-Service-Agencies-(RESAs).aspx)

Regional Education Service Agencies (RESAs)

www.gadoe.org

ACCESS for ELLs; Georgia Alternate Assessment (GAA) Georgia Kindergarten
Inventory of Developing Skills (GKIDS) Georgia High School Graduation Tests
(GHS GT)

Thank you,

Marie

Appendix B: IRB Approval Letter

LIBERTY UNIVERSITY

INSTITUTIONAL REVIEW BOARD

IRB Application 2916: How Do Teachers With Differing Levels Of Degree Attainment Impact Student Performance In Mathematics?

Dear Marie Call,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your research with the data safeguarding methods mentioned in your IRB application.

Your study does not classify as human subjects research because it will not involve the collection of identifiable, private information.

Please note that this decision only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued non-human subjects research status. You may report these changes by submitting a new application to the IRB and referencing the above IRB Application number.

If you have any questions about this determination or need assistance in identifying whether possible changes to your protocol would change your application's status, please email us at irb@liberty.edu.

Sincerely,

The Graduate School

LIBERTY
UNIVERSITY

Liberty University | Training Champions for Christ since 1971

Appendix C: Data Collection Correspondence with Georgia Department of Education

RE: New Data Collection Request submitted; Request ID : DR-20170210-3

XXXX XXXXXXXXX<XXXXXXXXXX@doe.k12.ga.us>

Reply all|
Tue 5/9, 7:50 AM
Call, Marie
Dissertation Emails

You forwarded this message on 5/9/2017 8:57 AM

Those numbers are not identical – they simply round to the same hundredth. If you select the individual field and look at the raw value in the formula bar of Excel, or if you select those fields and increase the number of decimal places in the display, you will see that they are not identical. They're obviously very close, but that's just how the base values used in the calculations worked out.

XXXX XXXXXXXX
Systems Analyst
Office of Technology Services
Georgia Department of Education
205 Jesse Hill Jr. Drive SE
1970 Twin Towers East
Atlanta, GA 30334
404-651-5546
XXXXXXXXXX@doe.k12.ga.us
<http://www.gadoe.org>

"Educating Georgia's Future"

From: Call, Marie [mailto:mcall@liberty.edu]
Sent: Monday, May 08, 2017 6:27 PM
To: XXXX XXXXXXXX <XXXXXXXXXX@doe.k12.ga.us>
Subject: Fw: New Data Collection Request submitted; Request ID : DR-20170210-3

Hello Mr. XXXXXXXX,

I forwarded the data which you sent to me to my dissertation chair for review since it covers the entire state of GA instead of individual RESA and he said that this will still work (I've left the email below for you to view). However, Dr. XXXXXXXX also made note that there appears to be an odd calculation for the "Avg. Scale Score". Could you please see his message below and confirm whether or not the data is correct as is?

I am re-attaching the original Excel sheet to this email for your review.

Thank you so very much for your time and help,

Marie

From: XXXXXX XXXX (Doctor of Education)
 Sent: Friday, May 5, 2017 11:08 AM
 To: Call, Marie
 Subject: RE: New Data Collection Request submitted; Request ID : DR-20170210-3

Marie:

Yes, we can deal with this data. It might have been better to have it by individual RESA, but I think we can justify using what amounts to all regions in the northern portion of the state. It (probably) also represents at least half of the population for the whole state, so it could be defined that way as well.

I only see one issue in the Excel tables (see below):

AVG_SCALE_SCORE
512.84
517.87
520.88
516.75
516.75

There is something wrong with the two bottom figures (doctoral average and overall average), as they can't be identical. You might have to go back to the Georgia people for help with this minor issue.

The next step is to figure out how to analyze all of this. It can be done by percentage in each category and by scale score, so you will end up with two different hypotheses. The analysis by score should be easy (ANOVA?), but you need to do some reading about any problems associated with drastically different n vales in each category.

Let me know if you find out that Dr. XXXXXX did facilitate all of this. We will both owe her big time!

Thanks!

XXXXXX XXXXXX PhD

Professor of Education

Chair, Quantitative Research
 Science Education Specialist
 School of Education
 Liberty University
 Lynchburg VA 24515

XXX-XXX-XXXX

From: XXXX XXXXXXXXXXXXXXXXXXXX@doe.k12.ga.us>

Sent: Thursday, May 4, 2017 9:09 AM

To: Call, Marie

Subject: FW: New Data Collection Request submitted; Request ID : DR-20170210-3

Ms. Call:

I have received and reviewed the data request you submitted to the Georgia Department of Education in February of this year concerning grade 4 mathematics data broken out by teacher degree level (DR-20170210-3). The Georgia Department of Education does not have or receive NAEP data, so we are unable to help with regards to those data, but the attached Excel file contains the statewide data for the Georgia Milestones End of Grade assessment data for Grade 4 Mathematics. Assuming that you wanted the widest net possible cast for data, it was easier to run the data for the whole state rather than limit it to a handful of RESAs. The Excel file has a state total at the bottom with the breakouts by degree levels above it. Each row contains the total grade 4 students taking the assessment with a teacher of the indicated degree level, a breakout of those students into the four defined performance levels, the average (mean) scale score and standard deviation for each group, and finally the distinct count of teachers in each group. The PDF file attached is included because the chart on page 12 has the scale score ranges for each performance level for this test administration. Let me know if you have any questions.

 XXXX XXXXXXXX

Systems Analyst
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 Georgia Department of Education
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 Atlanta, GA 30334
 XXX-XXX-XXXX
 XXXXXXXXXXX@doe.k12.ga.us
<http://www.gadoe.org>
"Educating Georgia's Future"

From: Data Request Application [mailto:Do-Not-Reply@doe.k12.ga.us]

Sent: Friday, February 10, 2017 4:12 PM

To: XXXXXXXX XXXXXXXXX <XXXXXXXX@doe.k12.ga.us>; XXXX XXXXXXXX

XXXXXXXXXX@doe.k12.ga.us>

Subject: New Data Collection Request submitted; Request ID : DR-20170210-3

The data request below has been submitted through the Online Data Request Application on 2/10/2017 4:11:05 PM and is currently in Triage. Please review and assign this request as appropriate.

Request Details:

Request ID: DR-20170210-3

Requester Name: Call, Marie

E-Mail: mcall@liberty.edu

Phone: XXX-XXX-XXXX

Requester Type: Researcher

Request Description:

My name is Marie Call , and I am a doctoral candidate at Liberty University. My chair is Dr. XXXXX XXXXXX in the School of Education. Georgia has been selected as the target state for this study because of the large number of teachers who now have doctoral degrees, and also because many of those teachers completed the doctoral program at Liberty University. Specifically, we are requesting both NAEP Mathematics 4th grade scores and Georgia Mathematics EOG Mathematics scores for 4rd grade broken down by teachers' highest degree attainment (bachelor's degrees, master's degrees, and doctoral degrees). Although there might be advantages if data were provided for individuals (coded for anonymity), we could also make grouped data work if we had mean test scores, standard deviations (or SEM), and number of teachers in each category. We are requesting this information for the following Regional Education Service Agencies: Pioneer, Northeast, North, Metro, and Northwest. The reason for requesting data from so many regions is that we must locate enough teachers with doctoral degrees for a valid comparison to be made. Thank you!

[Click here to review the request](#)

[Click here to access all open requests](#)

Thanks,

GaDOE Data Request Team