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An Investigation of the Relationship Between Teacher Factors and Academic Performance of High School Students

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AN INVESTIGATION OF THE RELATIONSHIP BETWEEN TEACHER FACTORS AND
ACADEMIC PERFORMANCE OF HIGH SCHOOL STUDENTS

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Submitted in partial fulfillment of the requirements for the degree of
Doctor of Education
Department of Education Leadership, Management and Policy

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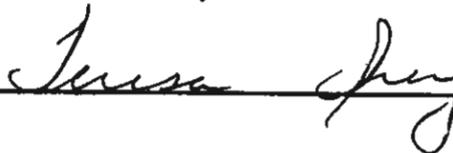
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SETON HALL UNIVERSITY
COLLEGE OF EDUCATION AND HUMAN SERVICES
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Abstract

This study examined the relationship between teacher factors and student achievement, measured by high school grade point average while controlling for student and school-level factors. The study focused on teacher certification, teacher experience, full-time employment status, level of academic degree, and teacher absenteeism for the first semester of the school year. The student factors that were included are gender, race, socioeconomic status, the number of students enrolled in Advanced Placement, and International Baccalaureate courses the students took during their high school careers. The school-level factor included in the study was the percentage of students who receive free and reduced lunches. This research method was a nonexperimental, relational, explanatory design with quantitative methods. This study used the Educational Longitudinal Study of 2002, a survey that was sponsored by the U.S. Department of Education National Center for Education Statistics (Lauff & Ingels, 2014). The analysis included a multinomial logistic regression and variance inflation factors test. The sample size was 6,861 students from 750 schools within the United States. Students whose teachers possess certain characteristics were more likely to be academically successful, measured by HSGPA. Specifically, these characteristics include the total number of years teaching for K–12 mathematics, the total years teaching for K–12 English, and whether the teachers held full-time math-teacher status and were certified mathematics teachers were determined to be statistically significant. The empirical evidence outlined in this study, as well as the recommendations provided in this dissertation, can assist policymakers and administrators in obtaining the information needed to address minimum teaching requirements and their hiring practices to increase academic achievement.

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In addition to my committee, I would also like to thank all the professors at Seton Hall University Department of Educational Leadership, Management and Policy. I had the pleasure of learning from such an amazing program. This has truly been an incredible experience.

Dedication

I dedicate this dissertation to my beautiful wife, Meghan Castellane, my five wonderful children and my parents, William and Maria Castellane. Without their love, support, patience, and confidence, I would not have been able to accomplish this important research.

To my amazing wife, Meghan, thank you for everything. Thank you for supporting me through this journey in life. Your understanding of my competitive nature and drive for success has helped me push through this journey. It is no secret that our lives are filled with chaos and I would not trade it for the world. Through this process, we were able to relocate our five children and two dogs, and we said goodbye to Zoey, all while managing full-time jobs. You are my inspiration to continue to grow and show our children that we can accomplish anything we desire.

To my five beautiful and amazing children, Liam, Declan, Quinlan, Seamus, and Isla, it is all of you who kept me focused on my goal. Each of your personalities helped me in a different way. Thank you, Liam, for teaching me that with sheer determination and persistence, I can accomplish my goals. From the time you were born, you have demonstrated the ability to focus on a goal and achieve it with hard work and determination. Thank you, Declan, for showing me the importance of academics. You were the one I could count on to sit with me during late nights while I completed my coursework and research. Seeing your joy for learning fueled my internal drive. Thank you, Quinlan, for teaching me that I need to maintain a sense of humor in life. I could always count on you to make me take a break and laugh during my dissertation. Thank you, Seamus, for being the most positive person I know. Your ability to always be optimistic no matter how difficult or challenging a task might be has allowed me to know that there is light at

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Chapter I

Introduction

In the United States, students spend the majority of their days interacting with teachers, which is why teachers are arguably the most influential people in their lives. Schools are viewed by the public as community anchors that drive the culture and standards of the community. Peshkin (1978) identified schools as symbols of the community that focus on community tradition and the community identity. According to Lyson (2002), schools “serve as important markers of social and economic viability and vitality.” Schools play integral roles in building town/community culture. How the schools integrate into the community and collaborate with families is important, and this influences students. The research of Warren (2005) supports the impact of social capital and the relationships that are developed between the teachers, principals, parents, and community residents. This level of influence takes place through the actions of the teachers and administrators in the buildings. The role of the schools in communities has become so important that states, such as California, are requiring a community-relations component to state qualifications for a teacher to obtain his or her certification (Epstein, 2011). In addition to California, research supports the necessity to have positive school communities. Schools are viewed as stable and accessible sites for students, peers, and families to come together for positive interventions and connectedness with the schools and communities (Bond, Butler, Thomas, Carlin, Glover, Bowes, & Patten, 2007). Student success can manifest in several different ways, including how the student acts as a community member and in his or her contributions to society. On the other hand, community members and legislatures tend to focus on the academic achievement in schools through testing and high school grade point average (HSGPA).

When community members research levels of academic achievement, many focus on how well students perform on standardized assessments and which colleges the students are attending post-high school graduation. One area in particular that is important to concentrate on is students' academic achievement, as measured by their HSGPAs. High school GPAs are important because they determine how the school's class rankings are calculated, which impacts a student's future regarding college and career opportunities. It is understood that not all students attend college; however, all students should be given the opportunity to have the tools in place to attend a college or university if they choose. Student achievement is one factor that dictates the type of college or university a student will attend. College-admissions offices grant entry into their institutions based on high school GPA because it "likely relates to both the cognitive and the noncognitive components of college GPA" (Nobel & Sawyer, 2002). Academic achievement denoted by HSGPA was determined to be a strong predictor of college success (Nobel & Sawyer, 2002). Mould and DeLoach (2017) reported that HSGPA was a more effective predictor in academic success at the collegiate level. Additionally, their research has supported that HSGPA is a better predictor for higher-achieving students.

Student achievement as measured by grade point average (GPA) in high school is important because it helps set the stage for options after graduation. Achievement improves students' chances of attending selective universities, which students may choose to increase their chances of graduating with bachelor's degrees (Carnevale & Rose, 2003). Carnevale and Rose's (2003) research breaks down the graduation rates among different colleges. Carnevale and Rose break down the colleges into four tiers and list the graduation rates of the enrolled students. Reviewing the 146 colleges that are listed as top tier, 86% of the enrolled students graduate. Moving down the list, the graduation rate for the tier 2 colleges is 71%, tier 3 is 61%, and finally,

tier 4 is 54% (Carnevale & Rose, 2003). The research clearly demonstrates that the students attending the higher-tier colleges have better chances of graduating with bachelor's degrees. Research by Scott, Spielmans, and Julka (2012) further supports that the level of academic achievement in selective universities will be higher. The level of retention in the selective universities will be greater for students who demonstrate higher levels of academic achievement in HSGPAs and SAT scores (Scott et al., 2012). For this reason, high school educators need to increase student achievement as measured by HSGPA.

Researchers have suggested that a student's post-secondary educational success can be increased through attending a more selective university. Carnevale and Rose (2003) discuss the higher potential for students' graduate schooling, which includes a greater acceptance into graduate and professional schools. In the research, the discussion of the benefits of attending a selective university focuses on the increased level of student support in the universities, preparation by the faculty and staff, and finally the prestige of the university name (Carnevale & Rose, 2003). The increased level of support and faculty instruction will allow students to benefit from attending more selective universities.

Increased educational attainment generally leads to higher monetary benefits. Several studies have focused on and developed correlations between educational attainment and earning capacity. Research supports that students who obtain bachelor's degrees will have higher starting salaries than those who did not (Wise, 1975). Wise's (1975) research supports that the type of degree influences the starting salary of postsecondary graduates. Although Wise's research is older, it was supported by Day and Newburger in 2002. The earnings of students who did not complete high school compared to the students who obtained an advanced degree have been reviewed and analyzed by researchers, and it has been concluded that the earning average is

significantly higher for students who obtained advanced degrees (Day & Newburger, 2002). In order to reach higher academic levels, such as advanced degrees, one needs to demonstrate a certain level of academic achievement.

The benefits of student achievement are emphasized within the human capital theory. According to Olaniyan and Okemakinde (2008, p. 479), “Human capital theory emphasizes how education increases the productivity and efficiency of workers by increasing the level of cognitive stock of economically productive human capability which is a product of innate abilities and investment in human beings.” In the realm of social change, Olaniyan and Okemakinde (2008) report that a qualitative citizenry is supported by positive social changes through increased education. People with stronger educational backgrounds promote economic growth (Olaniyan & Okemakinde, 2008).

Problem Statement

Policies are created and designed from the top down. Policies created at the federal level control the disbursements of Title I money to school districts. While student participation of National Assessment of Educational Progress (NAEP) is voluntary, policies under the Title I monies require states and districts to implement testing in reading and mathematics for fourth and eighth grades (NAEP, 2016; NCES, 2016). Historically, guidelines have been created at the federal level under the No Child Left Behind Act and Individuals with Disabilities in Education Act, which require states to comply (Owings, Kaplan, Myran, & Doyle, 2017). Often, state departments of education will make determinations based on data that are collected from standardized assessments. Current researchers have focused on different family and community variables and how accurately they can predict student achievement using standardized test scores (Tienken & Orlich, 2013). This research focuses on standardized tests and does not predict

HSGPAs.

Achievement gaps have been identified in research studies throughout history. Achievement gaps are linked to several factors and will not fully dissipate without being addressed through meaningful cross-sector collaboration (Scherrer, 2014). This collaboration is important, as prior research dating back to the Coleman Report (Coleman, 1966) links the disparities to poor health, hunger, and insecurity (Scherrer, 2014). Identifying achievement gaps and their predictors allows policymakers and administrators to implement policy and programs to close them. Achievement gaps are evident, as seen in consistent problems with college readiness over the years. These gaps exist for several reasons. Recent research has identified that students are not properly prepared at the high school level. Tierney (2013) identified recommendations to better prepare students for college and career readiness. Tierney (2013) stresses that some factors are out of the students' control because they do not have access to courses and curricula that will prepare them for college-level work. One example of how students are impacted is through the resource-based perspective (Scherrer, 2014). Capable students are unable to prepare for college-level work if they do not have access to the same resources as others; this creates further discussion about the inequity of resources across school districts (Scherrer, 2014). Closing the achievement gap is a national problem that encompasses student-level factors, teacher-level factors, and schoolwide factors. Each state has a certain amount of control to implement change and policies. However, several states share the concern that the gap is increasing or, at the very least, not closing and have decided to get their state departments of education together to work on closing the gap across state lines. Although each state does not share the exact same policies or graduation requirements, together, they share a common goal. A total of 12 state agencies came together to form the State Education and Environment Roundtable. Its goal is to "improve

student learning by integrating the environment into K–12 curricula and school reform efforts” (Lieberman & Hoody, 1998). The agencies that participate in the roundtable are as follows: California Department of Education; Colorado Department of Education; Florida Office of Environmental Education; Iowa Department of Education; Kentucky Environmental Education Council; Maryland State Department of Education; Minnesota Department of Families, Children, and Learning; Minnesota GreenPrint Council; New Jersey Department of Education; Ohio Department of Education; Pennsylvania Department of Education; Texas Education Agency; and Washington Office of the Superintendent of Public Instruction. Focusing on closing the achievement gap in the United States, the roundtable creates a forum that allows educators from across the country to share best practices, new strategies, and information, and to collaborate with one another.

The roundtable is not specifically tied to one geographical location in the United States. Outside this roundtable created by the previously mentioned state agencies, the conversation about closing the achievement gap has led to a debate in rural schools. Eppley (2009) has focused her research on the impact of the highly qualified teacher provision, as defined by No Child Left Behind Act (NCLB), and rural schools. While her debate is not focused on the actual closing of the gap, it is more focused on the parameters that surround the definition of “highly qualified teachers.” Several states chose to address the achievement gap independent of other states. Connecticut, North Carolina, Arkansas, Kentucky, and West Virginia have all been documented as states addressing the achievement gap through the improvement of teacher quality (Darling-Hammond, 2000).

The problem is that the achievement gap continues to grow in the United States. Reardon (2011) provides evidence through his research that the achievement gap has grown substantially

when focusing on students from high and low-income families. Families from higher-income backgrounds have additional means to invest in their children to assist them in their cognitive development and academic growth (Reardon, 2011). This additional support increases the achievement gap between higher- and lower-income families. It becomes necessary lower-income families to focus on investing in the teachers in their schools and communities in order to reduce the academic gaps, which will better prepare them for college or careers and will potentially increase adult earnings.

A direct outcome of the gaps in student achievement is the number of students who are not being accepted into colleges. Lack of preparedness for college has led to a large number of students needing remedial education in college. Colleges have taken the concern further by looking at the number of students who are in remedial classes upon acceptance into the colleges. Studies have demonstrated that approximately 40% of the students who enroll in undergraduate degrees are required to take a minimum of one remedial course (Woodham, 1998). This means that the students are accepted into programs that they are not academically ready to complete. Another way to look at this problem is that schools have lowered their standards for admissions (Attwell, Lavin, Domina, & Levey, 2006). The ripple effect of not receiving credits for courses impacts the students because they are then sitting in classes without receiving credit. This can create issues in motivation in the classes; the students might not perform at their best.

Teachers are arguably the most influential factors for student academic achievement. The number-one reason to support this argument is the amount of time that students spend with teachers. According to the School and Staff Survey, 2007–08, students are in an academic school setting between 6.22 hours a day in Washington State and 7.17 hours a day in Texas (NCES, 2008). When one calculates the number of hours spent attending school during the day and

compounds the additional time for extracurricular activities, it is apparent that teachers have the most contact time with the students throughout the day. In addition to the calculated hours, the range for number of days in school is as low as 171 mandatory days in Colorado and as high as 184 mandatory days in the state of Florida. During this time, the students are in front of their teachers. In some instances, the teachers are highly qualified and in other instances they are not.

A challenging issue that impacts student achievement is the quality of teachers. When determining teacher factors, I am most focused on the state certifications of the teacher. If the people who are in front of our students for an average of 6.5 hours a day are not qualified, how can we confirm that the students are given the best opportunity to learn? How do we know that they will be taught the information in the appropriate manner using the best, newest teaching techniques and strategies? The answer is that we will not know until it is too late.

The problem with the literature on factors regarding teachers is that it focuses on standardized assessments, which vary between states and are not the best measures of teacher quality. The literature suggests that there is a lack of understanding of the requirements of teacher certifications, as they vary between states. Most states have modified their requirements to include examinations in order to become certified. This process began in the 1960s and has gained momentum across the country. One of the differences of standardized testing for teacher certifications that exists between states is the National Teacher Examination, or Praxis examination. This examination has been published and is administered via the Educational Testing Service (Angrist & Guryan, 2005). Angrist and Guryan (2005) review the level of certification through standardized testing of teachers and compare the quality of teaching that exists. This research examines the teachers' scores on standardized assessments by breaking down their SAT scores and local testing assessments required for them to obtain their

certifications. My research varies from theirs for the very reason that we are focusing on the students' academic achievements as recorded via HSGPAs upon their graduation. Angrist and Guryan do not review the actual student academic achievements.

Throughout the last decade, research has demonstrated that there is a lack of teachers, which has an inverse effect on the quality of teachers. The U.S. government acknowledges the teacher shortage in certain content areas or disciplines. According to the U.S. Department of Education, the top six teaching certification shortages are in bilingual education and English language acquisition, mathematics, science, reading specialists, special education and foreign language (Cross, 2017). Since schools lack qualified teachers to fill these voids, teachers are often scheduled to teach classes outside of their certification areas. This consideration is situational and often reviewed by administrations. A school district might hire an uncertified person because it is unable to find a person with the appropriate certification or a person who meets the NCLB definition of a highly qualified teacher. This is often the case in rural areas (Eppley, 2009). Another situational scenario is that the school might have a part-time teacher that it wants to keep and may offer another part-time opening to that teacher so that it has a full-time position within the school. This allows the districts to keep proficient and effective teachers when there is only a part-time need for their content areas.

To strengthen my research study, several variables were considered. Student achievement has been reviewed by looking at different variables. Research suggests that student achievement is directly connected to several different variables, such as high-income versus low-income families (Reardon, 2011); White students versus African American students (Jencks & Phillips, 1998; Magnuson & Waldfogel, 2008); and White, African American, and Hispanic students (Burriss & Welner, 2005). This study did examine many of these variables more closely. These

variables, which exist outside of school and community variables, play a role in predicting how well students will perform in college based on their HSGPAs.

Studies have analyzed student achievement using several predictors. Income is noted as being a predictor of student achievement (Reardon, 2011). In addition, research studies have demonstrated gaps in student achievement when focused on race/ethnicity. Finally, colleges and universities need to understand that students with different family and community variables have disadvantages when it comes to overall high school achievement. The community variables will further address the outcomes of the schools that do not have adequate funding for additional supports and test preparation and classes. At this point, I have not been able to identify any studies that have looked at predicting high school academic achievement by looking at HSGPAs for students when controlling for teacher characteristics/qualifications.

Research that focuses on HSGPA is limited, which is the main reason that my study is important. Much of the existing research focuses on college-level GPAs, SAT scores, or the prediction of college freshmen's GPAs. Teacher factors are limited in research, specifically when researching the impact of teacher factors on academic achievement. Between these two limitations in the research, it is important for me to develop a focus on HSGPAs and how they are impacted through teacher factors.

Overview of the Study

My research study will determine whether teacher qualifications impact student achievement. This study will serve several purposes. It will allow educators to understand how teachers' characteristics are related to high school students' GPAs. Although the teacher qualifications will be the concentrated variable, I will be controlling for identified family and community variables. With this understanding, the study will allow us to make recommendations

to educational administrators regarding teacher variables. Since I will be looking at teacher certifications, some of the recommendations will assist in the hiring practices of school districts. Focusing on the importance of HSGPA, I will be able to highlight its importance over standardized assessments to higher-education institutions and their admissions counselors. This will also assist them in making informed decisions during the application process.

In this study, I will look at how teachers' characteristics and qualifications play a role in the overall high school academic achievement for the students who participated in the longitudinal study provided by the NCES ELS:2002. My research will review the academic achievement of the high school students who participated in the NCES ELS:2002 and will determine whether identified teacher factors play a role in student achievement, as indicated by using the students' HSGPAs. The study will identify the differences in the qualifications and certifications of the teachers between the specific schools that participated in this study. My research will identify a measurement of student academic achievement as well.

This research will provide further support to assist boards of education across the country to demonstrate how important it is to make sure they provide certain resources to their schools. This can be especially important if a district is looking to cut programs and classes. The courses and programs that are often cut first are those that are not mandatory or have low enrollment. It can impact students' HSGPA if the courses that are cut are weighted more heavily. An example of this would be an Advanced Placement (AP) or honors-level course compared to a general elective. Therefore, schools with offerings of more classes with higher weight status, or AP or honors-level classes, will give their students advantages over those who attend schools with fewer AP or honors courses. This may impact the students when they apply to colleges and universities, potentially creating a domino effect of life outcomes. The domino effect begins

when students choose schools they do not prefer or might not be the best in the fields they would like to study. The students can miss out on opportunities from these colleges or universities. The denial of a college or university has the potential to have an emotional effect on fragile students. This can cause students to not reach their full potential, possibly causing low self-esteem or depression and impacting students' emotional intelligence.

The idea that the overall high school academic achievement can be predicted is important for people to understand. Colleges and universities accept and deny students based their academic achievement, which can be defined by HSGPAs, standardized test scores, and class rankings. Class rankings are determined by the students' grades and the weights of each class. If a student's HSGPA has the ability to be predicted based on family and community variables while controlling for teacher qualifications, then it is not the best instrument to make a college acceptance or denial.

This study will remedy the limitations in the literature by examining how student achievement as measured by HSGPA is directly impacted by teacher factors. These factors that impact HSGPA are certification, the level of education that teachers hold, and teacher attendance.

Research Questions

The primary question for the study is this: How do teacher factors relate to student achievement?

Research questions:

1. How do teacher qualifications, including certification and level of education, impact high school grade point average?
2. How does the length of time the teacher has taught in the school impact student high

school grade point average?

3. How does the full-time employment status of a teacher impact student achievement as it relates to high school grade point average?
4. How does teacher attendance impact student achievement as it relates to the college-qualification level of the student at the time of high school graduation?

Significance

Identifying the different levels of teacher factors that impact students' HSGPAs is a crucial step in raising students' overall preparedness for colleges and application into the workforce. This dissertation will offer contributions to boards of education and administrations for their hiring practices, institutional retention, and improvement of college readiness. First, it will assist students in becoming academically accomplished and being accepted into colleges. Second, the findings will impact the students' college experiences through limiting the number of remedial classes that they will need to take. This will be addressed through closing the achievement gap. Third, it will provide a list of teacher factors that are identified and can be used in hiring practices. Once these factors are identified and proven, the hiring practices in schools can be adjusted to include them. Many studies have been conducted to predict test scores based on community variables; however, there has not been much research conducted to predict the outcomes of overall HSGPAs. Class ranking is determined by the individual student HSGPA, which drives college admissions, along with scores from such standardized tests as the SAT and ACT. These two main factors are used by college-admissions counselors to determine acceptance and placement of students into their programs.

Researching the idea that the teachers' qualifications are directly connected to student achievement—specifically, students' HSGPAs—is important. The primary goal of teaching is

student success. If student success does not exist, the school is not doing its job and needs to reevaluate its instruction. When reviewing the area of teacher qualifications, it is important for people to understand that not every teacher is qualified and that not every teacher has the same certification requirements. I understand that the lack of teacher qualification can be directly related to a shortage of teachers in the industry. At this point, we are not reviewing teacher shortage as a variable, but this factor could be reviewed in a future research study.

Organization of this Study

Moving forward, this dissertation consists of five chapters. The second chapter consists of a comprehensive literature review; chapter II consists of the purpose, types of academic achievement, theoretical framework, student factors, teacher factors, school factors, and the limitations related to the literature review. Chapter III will discuss the research design, which will include the data source, sample, research methods, and analyses. In chapter IV, a comprehensive report of the findings of the data analysis will be presented. Chapter V will present the conclusions, implications, and recommendations for future research.

Chapter II

Review of Literature

The purposes of the literature review are as follows: 1) to define high school academic achievement; 2) to review theories that have been used to understand the factors that impact high school students' academic achievement; 3) to explore the factors that have been used to measure academic achievement in previous literature; and 4) to understand the teacher factors that are found to be important in predicting high school achievement, as well as other factors that influence student achievement, including student, family, and community issues.

Academic Achievement

Academic achievement, as defined by Steinmayer, Meißner, Weidinger and Wirthwein (2014), “represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically in school, college, and university.” Academic achievement can be measured in multiple ways; it is measured differently depending on the reason for analysis.

Understanding the different components required for admission into colleges/universities is necessary before moving into the background on each component. The top three factors that colleges and universities review to determine acceptance into colleges/universities are HSGPA, standardized testing scores, and extracurricular activities. Institutions rarely use strict selection criteria; rather, they use multiple measures when determining whether a student will be admitted, wait-listed, or rejected (Clinedinst, Hurley, & Hawkins, 2011). When a student looks at highly

selective colleges or universities, it is important to have a high HSGPA and standardized test scores.

Types of academic achievement

The most inclusive form of academic achievement is the HSGPA; it is the most inclusive because a GPA is generated for every student who takes a class. HSGPA is used as a qualifying factor for many organizations within education, including the national honor societies and academic-eligibility policies created by the schools. For example, many schools will have academic-eligibility policies for athletes that need to be followed while in school.

Empirical evidence suggests that HSGPA is a better predictor than other measures of academic achievement. Hu (2002) reports that HSGPA is a better predictor than a student's SAT total score. This was revealed when he conducted a correlation analysis that included HSGPA, SAT verbal, SAT math, and total SAT scores for students. He further supported his research through a regression analysis (Hu, 2002). Additionally, Sawyer (2013) supports the research conducted by Hu (2002) suggesting that HSGPA is a stronger predictor than students' scores on college performance tests. Sawyer (2013) researched the ACT composite score and determined that HSGPA was a stronger indicator for college admissions to predict academic success.

Research has suggested that schools are now placing more emphasis on HSGPA as a college predictor. In 1998, research reported that 275 colleges throughout the United States eliminated their policies of making decisions for admissions based on the ACT and SAT (Rooney & Schaffer, 1998). The trend has continued to grow since 1998. FairTest, the National Center for Fair & Open Testing, reported that 1,023 accredited bachelor-degree institutions will now make their admissions decisions without regard to ACT or SAT scores (Fair Test, 2019). This research demonstrates the importance of HSGPA. Although this research exists, the U.S.

Department of Education has its own set of rules to measure standardized tests. Outside of grade point averages, the students must participate in academic assessments given by state or national agencies (NCLB, 2011).

Student achievement can be also measured via standardized tests. These tests can be in the form of state-created exams, such as Regents Examinations in New York State or the New Jersey ASK, which is a state test used to assess students in the areas of mathematics and English. Studies have demonstrated the predictability of the outcomes of these standardized tests based on family and community variables of the students who took them (Fox, 2015; McCahill, 2015). McCahill (2015) and Fox (2015) provided research to support their theory that the outcomes of the standardized tests can be predicted by family and community variables. This demonstrates that this measure is not the most reliable.

For example, students cannot be required to take national standardized tests. The school might choose to use the SAT or ACT, but it cannot force a student to attend and sit for the exam. Many states have different graduation criteria. According to Atkinson and Geiser (2009), in 1901, fewer than 1,000 examinees participated in the first “College Boards” because of the test-optional policies. The SAT was introduced in 1926 (Atkinson & Geiser, 2009) and was accepted over the College Boards because it was easier to score; it offered a multiple-choice instrument for measuring students’ general abilities or aptitudes for learning (Lemann, 1999). It is reported that nearly three million high school seniors across the country sit for either the SAT or ACT each year. The SAT was created to measure aptitude, or innate mental ability. The idea behind the SAT was to not view students solely on the mastery of subjects that are learned in high school settings. The American College Test, or ACT, is a test that was created as a competitor to the SAT.

Different graduation criteria may or may not include a statewide assessment. In New York State, the students are required to participate in Regents Exams. These Regents Exams exist within the state but do not extend beyond the state. This will not allow the schools to measure the students' academic achievement across state lines. During the push for the common core curriculum, we have seen state examinations overhauled, creating controversy among parents, teachers, unions, administrators, and state legislatures. This controversy has led to a large number of opt-out decisions by parents. The number of opt-outs for the standardized tests will also skew the data. This is something that needs to be considered when reviewing sets of data from the standardized tests.

In addition to the standardized test scores and HSGPAs, a new form of assessing students for graduation is through project-based learning. Project-based learning has been introduced into schools across the country. Project-based learning can be viewed through many lenses with many different outcomes. In *Transforming Schools*, Lenz, Wells, and Kingston lay out blueprints of what project-based learning can look like. This is often a challenge for teachers, as many feel they already do it in their classrooms. The first step to implementing it is to define it. Without a clear definition, teachers and administrators will not know the expectations. When addressing project-based learning, the school needs to create a vision for its graduates, a culminating portfolio, and "a handful of performance assessments that synthesize the school's goals" (Lenz, Wells, & Kingston, 2015).

After researching the Common Core State Standards (CCSS), one can see that they are worded in a way that does not represent a simple bubble-sheet answer. Reading through the CCSS, one can see that they can be related to a performance assessment, which, in turn, leads to project-based learning (Lenz et al., 2015). Project-based learning allows students to develop the

analytical skills to approach certain problems within school and in life. Research supports that project-based learning is significantly more effective when compared to traditional instruction in the classroom (Strobel & van Barneveld, 2009). Research by Strobel and van Barneveld (2009) suggests that PBL promotes long-term retention.

HSGPA is one of the major factors used to determine whether a student is qualified for college. In addition, HSGPA can dictate which colleges or universities will provide an acceptance letter for the student. Standardized testing for colleges was not always required for admissions into colleges and universities. My study will focus on HSGPA. Many researchers have included HSGPA along with standardized tests to focus on additional variables. Nobel and Sawyer (2002) focused on HSGPA and the ACT; Korbrin, Patterson, Shaw, Mattern & Barbuti (2008) focused only on the SAT scores. Researchers have demonstrated that HSGPA is a better predictor than standardized tests. Sawyer (2013) and Hu (2002) both demonstrated that HSGPA is a stronger predictor than ACT and SAT, respectively. The criteria for HSGPAs have been established and are used in every school district. For this reason, it will be the best measure to focus on moving forward. Although one can argue that student achievement at the secondary level can be analyzed across state lines by evaluating SAT or ACT scores, this measure has limitations. The main limitation is that the SAT and ACT are voluntary and are used for the students that will attend colleges or universities. Using HSGPA as a measure to compare students allows colleges and universities to rank students in their admissions processes. The benefits of using HSGPA for a comparison within individual school buildings allows students to rank themselves against their classmates. Class rankings can create healthy competition and give students additional goals to reach. Understanding the different units of measure for student achievement, this study will focus on HSGPA.

Theoretical Framework

Human Capital Theory

Previous research has used theoretical frameworks related to teacher factors and student academic achievement. In order to study the relationship between teacher factors and student academic achievement, it is important to discuss the theories that have been used in prior research. The human capital theory is one of the oldest and most directly related theories to the significance of academic achievement. The human capital theory was formalized by Ted Schultz (1971), along with other researchers that have revisited the theory over time (Becker, 1994). Olaniyan and Okemakinde (2008) state that according to Schultz (1971), Sakamota, and Powers (1995) and Psacharopoulos and Woodhall (1997), human capital theory is essential in order to improve a country and create productivity. When simplified, “the human capital theorists argue that an educated population is a productive population” (Olaniyan & Okemakinde, 2008). This supports economic development based on an increase in the educational levels of people and communities.

Human capital theory connects economic theories to educational practices. This theory supports that the more money or time invested by an individual for education, the greater the rewards will be for that person in his or her future earnings. The economic theory of supply and demand manifests itself via the fact that the more educated a person is in a certain area, the more valuable the person is to an agency or a school. The increased human capital makes the individual more marketable, and therefore, he or she has more choices.

Further supporting Schultz (1971), Babalola (2003) outlines the importance of human capital and even gives three main reasons behind the need for this type of investment. First, it is important to understand that the new generations might not be aware of prior knowledge in a

field. It is important for the new generation, especially with changes and advancements over time, to receive this past knowledge. Second, Babalola (2003) states that the new generation needs to understand how existing knowledge should be used to create new products as well as the ability to introduce new processes. Finally, Babalola (2003) rationalizes the human capital theory by encouraging people to develop entirely new ideas, products, and processes via creativity. This is directly related to the educational process, as it is a process that continues to be molded and changed over time. The human capital theory speaks to using creativity to create new products and processes; the teacher certification is a direct result of this rationale for the human capital theory.

Value-Added Theory

Human capital theory provides evidence to support degree achievement differences that translate into future earning differences, which is a clear economic value (Hanushek & Rivkin, 2012). Hanushek and Rivkin (2012) support this research through the value-added theory. The value-added theory suggests that schools will see a difference in student achievement through teacher quality. Increased student achievement will then lead to higher earnings over the course of the student's lifetime. If teacher effectiveness is combined with the labor-market impact of higher achievement, it can be used to estimate economic impact via lifetime earnings (Hanushek & Rivkin, 2012).

The value-added theory trickles down into the classroom to support how teachers address their students through variations of the value-added model. In certain circumstances, the value-added model is applied through the decision of focusing teachers' instruction on the lower-achieving students versus the high-achieving students (Hanushek & Rivkin, 2012). In the educational structure, the main limitation identified is that "the teacher value-added measures in

personnel decisions, contracts, and overall policy is currently quite limited, implying that some of the gains (or losses) from changed policies remain speculative at this time” (Hanushek & Rivkin, 2012). Value-added models have the ability to take many forms over time. Hanushek and Rivkin (2006b) identified that the most flexible forms of the value-added models include prior achievement levels as an additional explanatory variable.

Control-Value Theory

Mental-health concerns in schools are at the forefronts of conversations today. The control-value theory speaks to the level of academic achievement as impacted by the students’ emotions. More specifically, the psychological components that exist in education are impacting our children and need to be better understood. According to Pekrun (2006), the control-value theory of achievement emotions involves the emotions that one connects to the achievement activities or achievement outcomes. The control-value theory is a psychological model that relates the impact to student achievement to the student’s emotions. Through the certification process, teachers are required to take psychology courses in order to better understand their students. In the areas of mental health, colleges and universities are embedding these components into their courses. Pekrun (2006) does not limit the type of emotions that are connected to student achievement or the level of emotions that he discusses, but some examples are the enjoyment or excitement of learning or the boredom and anger an individual feels during class lessons. This psychological theory is connected to teacher factors. Some of the factors that can impact the psychological theory are the type of certifications for the types of classes a teacher takes in order to develop new techniques to engage students in the classroom.

Pekrun (2006) further discusses the ideas that these feelings are recorded as momentary occurrences within the classroom. This leads the students’ academic achievement to fluctuate

between situational or educational topics. The control-value theory discusses “the goal structures of the classroom define students’ opportunities to attain success and avoid failure” (Pekrun, 2006). Proper teacher training and certain teacher factors can assist with implications of aspects of the control-value theory; these lead to mastery of goals and competitive structures for students to meet performance standards (Ames, 1992; Elliot, 1999). Through the control-value theory, teacher factors can be modified and reviewed to increase academic achievement via students’ HSGPAs.

Theories of Intelligence

Over time, researchers have debated the levels of intelligence that students possess and the different capacities in which they learn. Many researchers argue that academic achievement is controlled by the incremental theory: that intelligence can be changed and developed over time (Blackwell, Trzesnieski, & Dweck, 2007). The argument of incremental theory states that the students can continue to learn and reach higher levels over time. The incremental theory can impact academic achievement through teacher factors. This theory is important for teachers because their priority is to teach students. When students understand that this theory allows minds to be reshaped through different levels of productivity, they can increase student achievement. Henderson and Dweck (1990) determined that students who believed in an incremental theory outperformed the students with an entity view during their first year of junior high school. Entity view is the theory that one’s level of intelligence is unchangeable, or fixed. This was determined by students earning significantly higher grades while controlling for prior achievement (Henderson & Dweck, 1990).

Additional studies have been conducted by other researchers to determine the same outcomes at the college level. Good, Aronson, and Inzlicht (2003) studied the incremental-theory

intervention by teaching the theory to students at the college level. After the intervention was taught, they determined the students who received the intervention performed significantly higher on achievement test scores compared to the students who did not. The outcome from this study suggests that through the proper training, teachers can utilize the research to teach their students these same interventions to increase academic achievement at the high school level.

Student Factors Influencing HSGPA

Gender

The achievement gap is one of the most-discussed academic topics in the United States. Previous researchers have identified and provided empirical research to suggest that educational outcomes vary by gender. This research has been conducted in many studies, ranging from students entering kindergarten through those completing college. Researchers have demonstrated that “in the United States, girls outperform boys in measures of reading achievement while generally underperforming in science and mathematics” (Dee, 2005). In order to determine the achievement gaps between male and female students, researchers have looked at students entering kindergarten and have determined that they perform similarly on tests (Freeman, 2004). Dee (2005) reported that in the 1999 National Assessment of Educational Progress (NAEP), the male students had higher scores in the areas of mathematics and science. However, Dee (2005) reported that the males received lower average scores in reading. When reviewing the NAEP scores of 17-year-old students, the average male student’s score was higher in the areas of science and math, while the female students scored higher in the area of reading.

Setting the individual subjects aside, Bobbitt-Zeher’s (2007) research suggests that females are now matching or have surpassed the males in the classroom setting. Bobbitt-Zeher

analyzed data from the 2005 National Center for Educational Statistics to demonstrate the closure of the academic gender gap and also to relate the information to the closure of gender wage gaps. While wages are not related to this study, it is noted that female students have outperformed male students. Looking ahead at college success rate, Radunzel and Nobel (2013) reported that degree-completion rates were 10 percentage points higher for female students than for male students.

Race/Ethnicity

Empirical evidence has suggested that academic gaps in race and ethnicity have been established. Understanding that one predictor in academic achievement is race/ethnicity, it is an important variable when analyzing the data that will be obtained in this research. Studies have focused on the contrast of White and Black students' academic-achievement gaps. Rearden (2011) refers to Magnuson and Waldfogel (2008) as well as Jencks and Phillips (1998), and their research focuses on the scholarly and policy attention to the gaps between Caucasian students and African American students. The gaps identified that the Caucasian students outperformed the African American students.

In a longitudinal study, Reardon (2008) found that there was a gap in Black and White students' performances. His research noted that upon entrance into kindergarten, the students, both Black and White, initially had the same skills. The study then compared the same students in their later grade levels, and White students were noted as outperforming the Black students. Research provided by Hanushek and Rivkin (2006a) utilized the Texas Schools Project panel data and the Early Childhood Longitudinal Survey to identify the growing achievement gap between Black and White students. Plucker, Burroughs, and Song (2010) further defined the growing academic achievement gap in race/ethnicity for students between kindergarten and

twelfth grade. In college, the degree completion rate was 14 percentage points higher for White students than for minority students (Randunzel & Nobel, 2013). This research supports the fact that the gap in race/ethnicity has been documented over time.

Socioeconomic Status

Socioeconomic status is one of the most-researched predictors of student achievement, dating back to the Coleman Report (Coleman, 1966). Rockoff (2003) outlines the negative impact that socioeconomic status has on student achievement. Under the umbrella of socioeconomic status, it is important to understand how parental education and parental income can lead to the college-qualifying factors that teachers need to prepare the students for before they graduate. Research has predicted outcomes showing that students with lower socioeconomic backgrounds perform lower on academic achievement. This demonstrates that lower socioeconomic background is negatively related to student achievement.

Parental education falls under the realm of socioeconomic status; it has been used as a predictor in a multitude of research studies. In the area of socioeconomic variables, I will also use this predictor as a variable for this research study. For example, college-success rates increased as the family income increased. This increase was 14 percentage points higher for families with higher-income students (Radunzel & Nobel, 2013). In order to ensure that students were not left out of Radunzel and Nobel's (2013) study, data were collected at the end of a six-year study of bachelor-degree completion at four-year institutions. The impact of socioeconomic status is further supported when reviewing the success of college courses in the same subject area as AP courses that were taken by students during their high school careers. This study demonstrated that it was evident that the students of parents with higher education outperformed the students of parents with less education (Patterson, Packman, & Kobrin, 2011). This causes

low-income and minority students to be pushed out of the competition into selective universities (Atkinson & Geiser, 2009).

Advanced Placement Courses

Advanced Placement (AP) courses directly impact a student's HSGPA, depending on the weighting system that many schools utilize. Students have the ability to obtain higher HSGPA if they take courses with heavier-weighted averages, such as AP courses. These courses are designed to take the place of college-introductory courses in specific content areas; however, many students use AP courses as avenues to increase their overall HSGPA for college admissions. For this reason, a student can take the course and receive higher percentage points for the class based on the weighting system. AP tests are standardized exams that are created by the College Boards that provide a path for students in high school to earn college credit in 33 different courses in the school year 2009–10 (Patterson et al., 2011). Schools will allow students to take AP courses without taking the AP exams. This is how the students' overall HSGPAs will increase without them sitting for the exams. Some schools encourage students to take AP courses, while other schools have a selective process. The concept of a course-weighting system is directly related to a student's HSGPA, because the more AP courses the student takes, the higher the HSGPA will be, based on the weighting system.

AP exams have been used to predict the success of students during their freshman years of college. Patterson et al. (2011) conducted a longitudinal study that collected information from 195,099 students. The purpose of the study was to determine whether the students who took AP courses in high school would score higher in courses of the same subject areas in college. Since AP scores can increase a student's HSGPA, the weighting system is an important factor to discuss.

Teacher Factors

Qualified Teachers

Empirical evidence suggests that raising teacher quality will improve student outcomes (Rockoff, 2003). Schools need to identify and hire the most qualified personnel possible.

Research suggests that factors of teacher-preparation programs and certifications impact student achievement in the classroom (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009). In the United States, a highly qualified teacher receives additional guidelines through the No Child Left Behind Act (NCLB) of 2001 (Eppley, 2009). Although NCLB sets federal guidelines for a teacher to be labeled “highly qualified,” each state reserves the ability to require additional parameters for teachers to receive their state-level certifications. At a minimum, NCLB (2011) has identified three main criteria requirements for teachers:

1. A bachelor’s degree
2. Full state certifications or licensure
3. Proof that they know each subject they teach

In addition to the teacher requirements, the states must meet criteria to identify a teacher as highly qualified (NCLB, 2001):

1. Measure the extent to which all students have highly qualified teachers, particularly minority and disadvantaged students.
2. Adopt goals and plans to ensure all teachers are highly qualified.
3. Publicly report plans and progress in meeting teacher-quality goals.

Teacher qualification varies between states. The federal government gives each state the ability to require additional education and to request that teachers meet minimal requirements.

Across the country, the minimal requirement for a teacher is a bachelor’s degree. Certain states

require teachers to have master's degrees in addition to the bachelor's degrees. Most recently, states have been requiring teachers to take specialty tests. The test can work as a single examination or be part of a series of tests. The tests often cost additional money for the teachers and are only offered during certain times of the year.

Teacher Certifications

Teacher certifications include traditional means, through structured programs, and nontraditional avenues, which utilize on-the-job training processes. Additionally, the types of certifications vary between states. In certain content areas, researchers have provided arguments that teachers do not need to possess traditional certifications to obtain higher student achievement than teachers who have nontraditional certifications. In some states, private-school certification exists to circumvent traditional certification methods. Research has been reported that a negative impact exists on science test scores by teachers who either hold private-school certification or no certification when compared to teachers with traditional certifications (Goldhaber & Brewer, 2000). Researchers have found results that teachers who have received emergency certifications do not necessarily lack in classroom performance. Teachers who receive emergency certification are usually well-versed in their content areas because they have worked in the particular fields or have demonstrated the knowledge in those content areas in some capacity (Darling-Hammond, Barnett, & Thoreson, 2001). Darling-Hammond et al. (2001) continue to discuss that these emergency certifications can be given for many reasons but most commonly for a lack of certified teachers.

The National Board Certification for teachers is the only level of certification a teacher can obtain on the national level. Clotfelter, Ladd, and Vigdor (2007) described the National Board Certification process as rigorous and reported that the teachers in their study from the

North Carolina Educational Research Data Center who had National Board Certifications were more effective than teachers who did not. This research supports an increase in academic achievement for students' HSGPA. Research suggests statistical differences where National Board Certified teachers outperformed the unsuccessful applicants of the National Board for Professional Teaching Standards (Belson & Husted, 2015).

During my research, I have reviewed studies that compared traditional teacher-preparation methods to obtain a teaching certification with alternative teacher-preparation methods. These alternative programs have grown significantly throughout the United States and exist in many different forms. Many of the new alternative programs take shape via internet-based courses or programs. In some instances, the courses do not require an educational degree from an accredited university. Many of the programs have received support from both primary political parties in the federal government (Zeichner, 2010). This supports the need to fill the void of highly qualified teachers in the United States.

The American Board for the Certification of Teaching Excellence (ABCTE) was founded in 2001, as a result of \$40 million of noncompetitive grants. The ABCTE has two examinations that focus on both content knowledge and professional knowledge needed for the classroom, which will allow people to become certified in nine different states. The states that accept this form of alternative programming in lieu of the traditional educational programs are as follows: Florida, Idaho, Mississippi, Missouri, New Hampshire, Pennsylvania, South Carolina, Utah, and Oklahoma (Zeichner, 2010). Teachers who earn certification this way do not have a performance component to their certifications; this means that the individual obtaining the certification might not have the opportunity to practice or gain experience working with students until after he or she is hired.

Separate from taking the two examinations provided by the ABCTE, additional alternative programs exist. This study's focus is on the United States; it is worth noting that these alternative teaching certificates exist throughout various countries. Zeichner (2010) compares the "Teach for America" program to the British program of "Teach First," which has led to "Teach for All." Zeichner furthers his discussion on these alternative programs to understand why they are being encouraged across the world. These alternatives might look different in developing countries. The differences might include the teaching profession being viewed as more of a managerial or canned role, as opposed to one that requires the use of professional judgment (Zeichner, 2010). He uses the phrase "learn while you earn" when discussing these programs. Zeichner does not dive into the prerequisites of the programs; however, he does reference that they often have minimal requirements for acceptance. Zeichner's research is pertinent because it discusses the shortages of teaching and the quality of teachers. These shortages and alternative programs can also be addressed through emergency certifications. Previous research has noted the advantages and disadvantages of emergency certifications.

Teacher Attendance

School climate is one factor that impacts teacher attendance during the school year. The school's climate is important to both the students and the teachers. The school climate is connected to student achievement inclusive of student HSGPA. The climate can be defined several ways. For example, one can look at the school atmosphere; physical and social climates are extremely important when speaking about student outcomes in a school (Maxwell, 2016).

The climate is further described by Bryk and Schneider (2002) as representative of the personal relationships between teachers, administrators, and students in various combinations. The relationships play into how well the teachers and students perform. The more positive the

relationships between the teachers and students, the more positive of a learning environment the school will become, and the more the students will want to interact with the teachers and the administration. The climates can be dictated by creating norms that will affect the teachers and students and define how they will interact with each other on a daily basis.

School climate can become an integral factor in many different arenas within a school. Fostering a positive school climate has the ability to play a role in increasing the students' academic-achievement levels, school safety, and teacher retention (Durham, Bettencourt, & Connolly, 2014). The school climate is what drives a school. Some researchers will go as far as mentioning that it does not matter what new strategies one puts into place, because if one cannot create a positive climate, the new programs and systems will not work.

In Australia, research reported that teachers' attendance rates have increased based on their colleagues having high absenteeism rates (Miller, 2012). This is part of culture that is very difficult to address. When looking in New York State, one can argue that teacher absenteeism has increased with the rollout of the CCSS and the New York State Education Department modules. In Indonesia, West Papua, and Papua, relationships that have been built between the school and the teachers have been influential in teacher absenteeism (Lee, Goodman, Dandapani, & Kekahio, 2015).

Teacher absenteeism is a factor that directly impacts student achievement. The National Council on Teacher Quality (NCTQ) reports that a teacher can be talented and engaging, but the teacher cannot have an impact on students if he or she is not in the classroom teaching (Joseph, Waymack, & Zielaski, 2014). This is major concern since the new teacher evaluations that have been put forth by the states and school districts is missing a section on teacher absenteeism. Teacher absenteeism needs to be included in the equation in order to reflect the impact of student

achievement.

The study conducted by the NCTQ (Joseph et al., 2014) includes 40 metropolitan schools across the country. The study researched teacher attendance and determined that on average, teachers were present for 94% of the school year. Districts often come up with ideas, policies, or incentives or ways to discourage teachers from abusing the number of days absent. However, the NCTQ (Joseph et al., 2014) reported that there was no significant difference between the schools that had teacher-attendance policies that discouraged people from taking off and ones that did not. If teachers do not have the ability to carry days over, they can feel pressure to use all their sick and personal days allotted in their contracts. It is a classic “use it or lose it” scenario. This can be a contributing factor when reviewing certain teachers’ data but will not be known without speaking to the individual teachers. Teacher absenteeism will further impact student outcomes.

Another factor concerning teacher attendance is a district’s socioeconomic status. Research based on the National Center for Education Statistics 2003–04 survey demonstrates that schools with higher percentages of free and reduced lunches will have higher teacher absenteeism by .5% (National Center for Education Statistics, 2004). The research broke down the percentages to demonstrate that the teachers were absent 2.2 days per year more in elementary schools and 3.9% more in the secondary schools (Speas, 2010). Understanding teacher absenteeism is essential because student achievement is impacted if the teacher is not delivering instruction.

Teachers’ Experience

Continual debates in education are the amount of time it takes a teacher to become proficient in a content area and the strategies used to teach the students in order to increase academic achievement. Researchers have analyzed the number of years teachers work as a factor

to determine the impact on student achievement. It takes three years for a teacher to gain command of the content but, most importantly, the process used for the delivery of the material. Since we will not be able to look at the delivery of the material, the number of years a teacher has been teaching will be considered. Clotfelter et al. (2007) suggest that certain teacher variables impact student achievement. They used administrative data records maintained by North Carolina Education Research Data Center, which was housed at Duke University. The data set includes a span of 10 years. One of the main variables researched was teaching experience. Clotfelter et al. (2007) found clear evidence that teachers with more years of teaching experience were more effective than teachers with fewer years of experience.

Consistent with Clotfelter et al. (2007), additional research suggests that an increased number of years of teaching will have a greater impact on student achievement (Hanushek & Rivkin, 2006b). While the research stated that the relationship between the years teaching and student achievement is not recorded as being strong, it was recorded as being impactful (Hanushek & Rivkin, 2006b). Hanushek and Rivkin (2006b) recorded that of 37 estimates, only 41% of the findings were statistically significant. Although the years of experience is not the strongest variable, it is a variable that districts can use when hiring new teachers. Of course, there are other factors involved in the hiring process to attract experienced teachers to the district.

Full-Time Teachers vs. Part-Time Teachers

Limited research exists on the effects of full-time teachers when compared to part-time teachers on student achievement. This research is limited due to the large number of part-time teachers that tend to leave the profession. School districts tend to hire full-time teachers in order to retain the most qualified personnel. Hiring mostly full-time positions limits the number of

part-time positions in each school. Another factor that limits this research is that teacher contracts contain language that limit districts' abilities to have two part-time positions when one full-time position can be created.

Student achievement is supported through the retention in the teaching staff. Smith and Ingersoll (2004) used the Schools and Staffing Survey (SASS) administered by the NCES to review the impact of full-time teachers versus part-time teachers. Smith and Ingersoll's (2004) study reported that a positive impact of full-time teachers on academic performance was better than part-time teachers. In their study, the impact was based on the turnover rate of new teachers. The study determined that 88% of the new teachers were less likely to leave the teaching profession or move to another career. Smith and Ingersoll (2004) reported the impact of teacher turnover rate related to full-time and part-time teachers. The turnover-rate concerns were defined by either teacher migration (when a teacher moves teaching jobs from one school to another) or teacher attrition (when a teacher leaves the profession). The data set provided the researchers with all teacher turnovers and departures.

Part-time teachers do not have the same impact on student achievement as full-time teachers. Full-time teachers learn to collaborate with colleagues; they understand the building and district culture, and the teachers become familiar with students' characteristics related to the district. The main concern of instability within a school is questioned when a school exhibits a higher turnover rate (Smith & Ingersoll, 2004), which is an effect of part-time teachers. When teachers are part-time, they are often not as invested in the schools because they might have additional responsibilities, commitments, or another job. If teachers are part-time, they have less opportunities to build relationships with the students. Part-time teachers do not always have the time to attend after-school activities or sporting events. Student achievement is related to the

quality of teacher-to-teacher relationships as well as the teacher-and-student relationships (Bryk & Schneider, 2002). Due to the necessity of teachers wanting or needing full-time positions, the turnover rate for part-time positions is high.

Academic Degree

Every state has different criteria regarding the required academic degree in order to become a teacher. Many states require a master's degree. Studies demonstrate mixed results when looking at the four core subjects: mathematics, science, history, and English. What is conclusive is that a teacher who holds a degree in the content area and certification is a better predictor of student achievement (Darling-Hammond, 2000). When teachers obtain advanced degrees over bachelor's degrees that are not content-specific, it is not as strong of a predictor. Darling-Hammond (2000) notes the wide range of master's degrees that teachers take may cover a variety of topics. One example is a master's of administration. This degree does not impact the classroom performance of the teacher to add value to academic achievement. However, a degree in a content-specific area is impactful for student achievement. This concept was further discussed by Wayne and Youngs' (2003) analysis of Goldhaber and Brewer's (1996) study using the 10th-grade students from the NELS:88 data. These data reviewed academic achievement of students in the area of mathematics and determined that teachers with degrees in mathematics outperformed the teachers who did not have advanced degrees or who had advanced degrees in other subjects. Goldhaber and Brewer conducted another analysis for science, history, and English but only found science to have similar results using the same three subjects. The results for English and history were inconsistent. Goldhaber and Brewer did a replica study in 2000 with a 12th-grade class and found similar results. Goldhaber and Brewer (2000) concluded that subject-specific training was more valuable in education over teacher ability when looking at

academic achievement.

Hanushek and Rivkin (2006b) assert that their research from 1997 and 2003 suggests that there is no systematic relationship that a master's degree increases the teacher quality or student achievement. Hanushek and Rivkin (2006b) recorded in their high-quality estimates, which use the value-added estimation model from a sample of individual students from a single state, as 91% statistically insignificant. In the same study, Hanushek and Rivkin included a set of all estimates, which recorded 86% statistically significant. Although both models record the findings to be statistically significant, the data set did not identify the content of the master's degree. Using a data set obtained from the North Carolina Education Research Data Center housed at Duke University, Clotfelter et al. (2007) report that a teacher's possession of a graduate degree does not impact student achievement. The study reported that there is not a statistically significant effect on student achievement and further points out that, in some cases, the coefficient is negative.

School Factors

Free and Reduced Lunch

Student achievement is impacted by the socioeconomic characteristics of school districts. Boyd, Lankford, Loeb, Rockoff, and Wyckoff (2007) reported that the teachers with the least teaching experience and the lowest academic grades are often in schools that have the highest concentration of low-income, low-performing, and minority students. They defined poverty status as measured by the percentage of students eligible for free lunch. Boyd et al. (2007) suggest that schools with higher percentages of free and reduced lunches have a lower quality of teachers and, therefore, lower student achievement. Additionally, a study of Boyd et al. (2007) reported that high-poverty schools are more likely to have novice teachers. Out of the top 10% of

the highest-poverty schools in New York City, 25% of the teachers were either first- or second-year teachers. When compared to the lowest-poverty schools (bottom 10%), only 15% of the teachers were in first or second years of teaching. Boyd et al. (2007) reported that their study suggests an increase in academic achievement over a five-year difference in teacher experience. Boyd et al. (2007) reported an increase in the importance of teacher qualifications: “Schools with large proportions of poor students and students of color, on average, have teachers whose observable qualifications are much stronger than they were five years ago.” This stresses the importance of my research regarding teacher qualifications.

Discussion

Empirical evidence has been used to support the importance of HSGPA, along with the combination of other academic measures. Radunzel and Nobel (2013) conducted a study entitled *Differential Effects on Student Demographic Groups of Using ACT College Readiness Assessment Composite Score, ACT Benchmarks, and High School Grade Point Average for Predicting Long-Term College Success through Degree Completion*. The purpose of this study was to predict long-term college success using standardized tests and HSGPAs as variables (Radunzel & Nobel, 2013). Radunzel and Nobel’s study is significant to this research as they, too, focus on HSGPA, student demographics, college readiness, and socioeconomic status. One focus that this study did not review is the teacher factors. Radunzel and Nobel’s (2013) study contains three distinct differences; this data set pulls from a longitudinal study performed by the NCES, ELS 2002. Nobel and Radunzel utilize the ACT standardized test, while my data set does not use the ACT scores; this research study is controlling for teacher qualifications. Since many studies are similar to Radunzel and Nobel (2013), the uniqueness of my research will add value to the education system.

Teacher factors are some of the most reviewed educational variables that can be discussed in education today. Academic achievement is scientifically dependent on the teachers to whom the students are assigned (Wayne & Youngs, 2003). The United States Department of Education has modified requirements for teachers in order to increase academic achievement. One of the major reasons the United States Department of Education is reviewing and modifying certain teacher factors is the U.S. ranking in the realm of educational performance. Researchers have demonstrated that standardized test scores can be predicted (Tienken, 2014), which is why HSGPA was chosen for this study. This research focuses on academic performance from the HSGPA level, as it is one of the major indicators of a college-qualified student (Berkner & Chavez, 1997). Colleges and universities are being pressured to increase their graduation rates and to limit the number of years it takes students to graduate from their institutions (Higher Education Research Institute, 2011; Saupe & Curs, 2008). This study will demonstrate what teacher factors are required to increase academic achievement, which will be reflected by a student's HSGPA.

Limitations Section

Prior research in teacher factors related to student achievement has been demonstrated to have limitations. In this section, I will discuss the limitations that exist in the comparison of the weighting of grades from school to school. I will further discuss the limitations of the differences of teacher certifications from state to state. Finally, the last limitation is that the NCES ELS:2002 data only provides teacher attendance for the first semester of the school year. Understanding that these limitations exist, I believe they should be discussed to obtain a full view of the problem and questions behind the research.

Weighted Courses

HSGPAs are weighted differently between schools. It is noted and important to understand that some student HSGPAs will be products of schools with strict grading standards, while some students attended schools with less-rigorous grading standards (Patterson et al., 2011). The NCES, ELS:2002 is the longitudinal study that collected this information. The sophomore students in the study from the school year 2002 had an expected graduation date ending the school year of 2004. The data collectors requested to receive high school transcripts from each of the sample members in 2005. The researchers made this request to close the loop on the school-based students' completion status.

Due to the diversity of students in schools, each school has classes that are weighted differently. Academic courses are weighted to provide quality GPA points to identified courses that provide a certain level of rigor in their curricula (Wehde-Roddiger, Trevino, Anderson, Arrambide, O'Connor, & Onwuegbuzie, 2012). Schools attach weights to their courses for various reasons. The main reason a school adds weights to different classes is to increase students' HSGPAs according to the difficulty of the classes that they take. School formulas for these weights vary and are attached to a formula for their weights. Schools have honors classes and AP classes that have heavier weights, which allows the students to receive higher HSGPAs and increase their class rankings. College courses in some schools hold the same weights as AP courses, but this is not the case in every school and for each course. This is a hot topic for debate among schools.

The weighting system has several effects on student outcomes, such as the ability to assist colleges and universities in the admissions process. In states such as California and Texas, the weighting system is constantly being reviewed. The reason the weighting system is important

in these two states is that the class rankings guarantee students admission into in-state public colleges and universities (Horn & Flores, 2003; Texas Administrative Code, 2010). In these states, HSGPA is looked at closely due to the nature of the competition on college acceptance. The College Boards recognized the need for additional AP courses in 2001 because of the level of competition between students. To address this, the College Board has increased the number of opportunities for students to take AP courses and has reported a 134% increase in enrollment between 2001 and 2011 (Wehde-Roddiger et al., 2012). It is reported that 1.97 million students participated in a minimum of one AP course in 2011 (College Board, 2011). This need was recognized by the College Boards and was addressed. The question remains of whether all students benefitted from the efforts put forth by the College Board.

Wealthy school districts have greater resources for their students to achieve higher HSGPAs. One of these resources in particular is the number of AP courses offered to students. Wehde-Roddiger et al. (cited in Solorzano & Ornelas, 2002), investigated the number of opportunities accessible to students in rural and urban districts in California. The average number of AP courses that were accessible to the students in rural and urban school districts was five. Five AP courses might seem appropriate until one sees that the main California universities accepted students with 16 AP courses on their transcripts. Understanding the number of AP courses taken provides additional support that students from lower socioeconomic statuses will have difficulty obtaining higher HSGPAs. This is a prime example of how weighted classes play a role in determining student achievement.

Teacher Recruitment Information

Districts have access to a variety of tools and methods when recruiting teachers. Based on this data set, I will not be able to gauge how many resources are available in the individual

districts. This data set also does not include information on teacher effectiveness via evaluations. This means that there is no distinction to determine if a teacher is highly effective, effective, developing, or ineffective. In order to remove this variable, we will need to look at the number of years a teacher has been teaching.

Inconsistency in Certifications

The inconsistency of teacher certifications has two areas of limitations. The first one is inconsistency across state lines. Since I will not be identifying the criteria for a teacher to become certified between each state, the absence of the different criteria is a limitation. The second limitation in the inconsistency of teacher certifications is the route a teacher takes to become certified. The study will identify the teachers who are certified and the ones who are not certified or teaching outside of their certification areas. For these reasons, the study will have limitations.

Professional Development

Requirements vary between school districts and states when it comes to required professional development. Teachers learn through the opportunities to work with colleagues and attend professional-development workshops. In my study, the NCES ELS:2002 data set did not account for the level of professional development to which each teacher has access. Since these data do not include the number of professional development hours that each teacher received yearly, staff development and professional development is limited. In the future, the NCES can include a question identifying the number of hours or level of professional development each teacher in the study has received. The number of years a teacher has been teaching a specific subject was unavailable in the NCES ELS:2002 data set.

Teacher Absenteeism

There are a number of contributing factors to teacher absenteeism. The NCES ELS:2002 data provide the attendance for teachers during the first half of the school year. The data do not take into consideration the remainder of the year. Since these data do not cover the full year, I cannot determine whether the teachers' attendance improved during the second half of the school year. Since there is no way to determine the reason the teacher was absent from the data source, the discussion of teacher absenteeism is limited. Some examples that could be reviewed in the future are terminal illnesses or recurring health issues, which are not provided.

Chapter III

Methodology

The purpose for this study was to determine how the teacher factors are related to high school academic achievement when controlling for student and school-level factors. The study not only provides policymakers with information to strengthen the educational system, but it may also provide information that colleges and universities can use to assist in determining the measurements and criteria to be used during their admissions processes. The literature suggests that performance will be greater from students of higher socioeconomic status, wealthier families, families with two parents/guardians in the home, and parents with higher levels of educational degrees. These variables list the out-of-school factors that have been studied. This research model includes additional in-school variables. The research used to discuss the school variables will be related to those responsible for delivery of the everyday instruction: the teachers. Specifically, I researched and analyzed teacher factors from each of the 750 schools included in the sample for this study provided by the NCES ELS:2002. Although there have been studies looking at teachers' factors on student achievement, few examined student achievement at the college-qualifying level. The uniqueness of this study is that it incorporates the levels of teacher factors for the purpose of better understanding their roles in academic achievement. This study compiled and reviewed the differences in the teacher factors that exist between the schools, should a significant difference be determined. The data set further assisted to determine whether areas that contain a greater variety of family and community variables and higher socioeconomic status have access to more highly qualified teachers. Chapter III includes the research design, data source, and instruments that were used and the plan for data analysis.

Research Questions and Hypotheses

The primary question for the study is this: How do teacher factors relate to student achievement?

The research questions are as follows:

1. How do teacher qualifications, including certification and level of education, impact high school grade point average?
2. How does the length of time the teacher has taught in the school impact student high school grade point average?
3. How does the full-time employment status of a teacher impact student achievement as it relates to high school grade point average?
4. How does teacher attendance impact student achievement as it relates to the college-qualification level of the student at the time of high school graduation?

Research Data Source

The research study was conducted as a quantitative research method. This research method was a nonexperimental, relational, explanatory design with quantitative methods. This study collected, compiled, and analyzed 10 total variables between student, teacher, and school factors. The data set for all three areas of variables was collected via the longitudinal study, NCES ELS:2002, through a series of surveys. The information from the surveys for this portion of the study was provided via parent, teacher, and administrator surveys.

The Educational Longitudinal Study of 2002 (ELS:2002) is a survey that was sponsored by the U.S. Department of Education National Center for Education Statistics. According to the NCES, ELS: 2002, its intent was to:

Serve the development and evaluation of educational policy at all governmental levels

and inform decision makers, educational practitioners, and parents about the changes in the operation of the educational system over time, and the effects over time that elements of the system have on the lives of the individuals who pass through it.

The ELS:2002 was designed to support policy issues to include the identification of school attributes with student achievement. Understanding the design included a focus of student achievement that lends itself to allowing my study to focus on the variables collected and the outcome of student achievement. Since the survey included the identification of the school attributes associated with student achievement, the data are important for my research. The design of the ELS:2002 data includes a teacher and administrator survey. These surveys include several teacher variables that form the basis for my research. The ELS:2002 data include all areas of my research with a substantial sample. For this reason, the ELS:2002 data source is the best one to use for my study.

The data set used in this study will be obtained from the ELS:2002, which was conducted by the NCES. The ELS:2002 is a longitudinal study that took place between 2002 and 2013. The survey follows a cohort of students who began their sophomore (10th-grade) year in 2002. During the course of the study, data were collected at several checkpoints along the way. The first round of surveys was conducted in 2002. The surveys were administered to students, parents, teachers, administrators, and library media specialists. In 2004, the first follow-up survey was administered to the students; it took place in their graduation year and included the collection of the students' transcripts and college and career-assessment scores. The administrators and the teachers both received follow-up survey in 2004. Since different schools have different options for their students—such as graduating early, transferring, or dropping out—questionnaires were administered to all the enrolled students in 2004. The second follow-up was collected in 2006,

and the third follow-up took place in 2012. For the purpose of this research study, the initial data from ELS:2002 will be used, along with the transcripts that were collected from the schools.

The first survey administered in the ELS:2002 was given to the sophomore (10th grade) students in the spring term of 2002, and the longitudinal study was completed in 2013, when the postsecondary transcripts were collected. The ELS:2002 contained a sample size of 750 schools. The survey included over 15,000 students and their parents. Additionally, surveys were administered to the math and English teachers, the building administrators, as well as the heads of the school-library media centers. For the purpose of this study, data were pulled from all surveys with the exception of the school-library media centers; these surveys did not have any questions/data related to the variables used in the research study.

The schools that participated in the study were first identified by the initial researchers. The 10th-grade students within these schools were randomly selected. NCES ELS:2002 reported that nonpublic schools were sampled at a higher rate. NCES ELS:2002 sampled the nonpublic schools at a higher rate to ensure that the sample was large enough to support comparisons with public schools (NCES). The researchers stated that they wanted to make sure the sample was large enough to support comparisons with public schools (NCES). The researchers sampled Asian students at a higher rate than White, Black or African American, and Hispanic students. This was done in order to ensure that the sample was large enough to support the comparisons for those groups (NCES). The HSGPAs were reviewed from the NCES ELS:2002 at the time of the students' graduation. Since the data are extracted from a longitudinal study, the information was collected at the time the students exited their secondary schooling.

Reviewing the data, I identified the questions that pertain to the variables in each of the surveys and transcripts. To identify the family and community variables, the student and parent

surveys were analyzed, and specific questions were identified. More specifically, the parent and student questionnaires pulled information on the students' genders and races/ethnicities. The parent survey provided information about the socioeconomic statuses of the students.

The research in this study focused on students' HSGPAs. Once the variables were reviewed, students' HSGPAs were analyzed and compared. The HSGPAs of the students were connected to the students' schools. The HSGPA scores were used from the student transcripts for grades 9–12. The HSGPA information for the students (collected from the 2005 school year) was provided via the NCES ELS:2002. All participating student transcripts were requested to be sent directly from the schools to the research team for the NCES ELS:2002 in 2005, regardless of the high school completion status (Lauff & Ingels, 2014). Along with the students' HSGPAs, I also included, from the transcript data, the number of AP and International Baccalaureate courses that are taken at each institution. This allowed me to see the differences in higher level courses that are offered at each educational institution. The Advanced Placement and International Baccalaureate courses carried additional weight when configuring a student's HSGPA. Since this differential exists between schools, it is important to understand whether the students have greater options to achieve higher HSGPAs depending on course offerings, which are results of school funding and opportunities.

Research Variables

Outcome Variable

The dependent variables for this study are the HSGPAs for the students in the NCES ELS:2002 who exited high school in 2004. As previously noted, the NCES ELS:2002 is a longitudinal study and was completed in 2012. Variables were selected via reviewing the literature to determine what factors may be relevant to the HSGPA component of the college-

qualified index (Berkner & Chavez, 1997) and also reviewing the variables present in the NCES ELS:2002 database that could be used as indices of the variable factors. The database included factors that were representative of the three main areas identified in this research: student, teacher, and school factors.

The economic goal of educational institutions is to provide the knowledge and tools for job readiness and/or college acceptance. For this reason, I focused on determining the threshold of a college-qualified index, which has been used by researchers. An HSGPA of 2.7 will be utilized, as it is one of the college-qualified indexes identified (Berkner & Chavez, 1997).

Berkner and Chavez (1997) identified the college-qualified index as meeting one of the following minimal values (HSGPA = 2.7, SAT 820, Aptitude Test =56, ACT =19). The college-qualified index was identified by these researchers for their NELS 88 study and will be used for my study as well.

Independent variables

The following variables will be used from the student survey:

- Gender: Percentage of males and females
- Race/Ethnicity: Percentage of White, Black/African American, Hispanic, Asian, Native Hawaiian or Pacific Islander, American Indian, or Alaska Native
- Socioeconomic Status: Parent education and parental income
- Percentage enrolled in Advanced Placement or International Baccalaureate courses

The second set of variables comprises the teacher factors. The data for teacher qualifications/characteristics are as follows:

- The length of time the teacher taking the survey has taught in general
- The employment status of the teacher (regular full-time teacher, regular part-time teacher, or long-term substitute teacher)
- Type of teaching certification
- The level of academic degree that the teacher holds
- Teacher absenteeism; the number of days the teacher missed during the first semester of the current year

The third set of variables comprises the school factors:

- Percentage of students who receive free and reduced lunch

Statistical Model

The research study used quantitative methods and secondary data. This was a quantitative study, as I was analyzing the relationships between individual variables within each of the identified sets of data. The research study is a nonexperimental design that is defined as a relational study. I followed the statistical analysis procedure for my analysis. This procedure included cleaning the data, recoding the variables, and performing descriptive analysis, multinomial logistic regression analysis, and a variance inflation factor test.

This study used the multinomial logistic regression method to determine how predictor variables are related to HSGPA based on the conceptual framework of this study. While Hilbe (2014) modeled binary response data and reported that logistic regression was the most common method, Cawley, Talbot, and Girolami (2007) defined multinomial logistic regression as one of the classical statistical methods for multiclass pattern-recognition problems. Multinomial logistic

regression is an extension of binary logistic regression that includes more than two categories of the dependent variable, or the outcome variable (Starkweather & Moske, 2011). Chow (1970) reported that the one of the most practical advantages of a multinomial logistic regression is the ability to set rejection thresholds. In this study, the dependent variable consists of three thresholds: low-level HSGPA (0.0–2.0); middle-level HSGPA (2.01–3.0); and high-level HSGPA (3.01–4.0). Nobel and Sawyer (2002) define logistic regression as a method for estimating the statistical relationship between a dichotomous outcome (i.e., low-level HSGPA, middle-level HSGPA, and high-level HSGPA) and one or more predictor variables (i.e., student and teacher-level factors). A binary or dichotomous variable—in this study, the student and school-level factors—will be represented by either a one or a zero as the outcome (Hilbe, 2014). Survey weight will be applied to account for the nonresponses and oversampling issues, so the results of the study can be generalizable to the original population. Starkweather and Moske (2011) report that multicollinearity needs to be evaluated to determine if it exists between the variables. The variance inflation test determines whether there are any outliers or concerns within the regression analysis.

Discussion

This research study explains the relationship between how schools with specific characteristics can retain teachers with stronger credentials and qualifications. The study provides policymakers with additional information to review the funding of schools, states, and federal agencies to level the playing field for students. The analysis in this study provides additional recommendations for hiring personnel in school districts.

Limitations

One of the limitations identified within this study is that I must rely on the parent's self-

reports of their income levels. When someone is self-reporting, it can create methodological concerns. The second limitation exists within the format with which the parent survey was conducted; it was conducted in English and therefore presents an issue for parents who have either limited English or no English reading and writing skills. This survey includes students with learning disabilities and limited proficiency in English. Although I cannot clearly identify that this exists, there is a concern that these students might not have accurately been able to complete the survey; this has been noted. Another limitation is that the college-qualified index used is dated five years before the start of the survey. The criteria to determine college readiness for the NCES ELS:2002 transcripts that were collected in 2004–05 is limited because it uses an index defined by researchers Berkner and Chavez (1997), which was used for the NELS:88 data set. The variable representing free and reduced lunch was not able to separate the number of students who received free lunch and the number of students who received reduced lunch.

Chapter IV

Results

The purpose of this study was to determine whether teacher factors impact student achievement. The study was designed to examine the teacher factors related to student achievement as measured via HSGPAs, while controlling for student and school-level factors. The study focused on teacher certification, teacher experience, full-time employment status, level of academic degree, and teacher absenteeism for the first semester of the school year. Student factors that were identified in the literature as being associated or impacted by student achievement were also included; these included gender, race, socioeconomic status, and the number of students enrolled in AP and IB courses the students took during their high school careers. The school-level factor that was included in the study was the percentage of students who receive free and reduced lunches. This chapter presents the results in three sections, which coincide with the steps used in the analysis. The first section presents the descriptive statistics analysis, which lists all of the variables included in the study. The second section consists of the descriptive statistics, which serve as a baseline for the analysis. The third section reports the findings from the variance inflation factors. The fourth section of this chapter includes the findings from the multinomial logistic regression. Finally, the full model findings are reported within the chapter's summary.

Descriptive Statistics

Student factors

In this study, the final sample consisted of 6,861 respondents who participated in the NCES ELS:2002 longitudinal study and received high school transcripts. Represented in table 1,

the sample is predominantly White (69.8%), with Black or African Americans comprising 10.4%, Latinos 12%, Asians 3.4%, and Other 4.3%. Females in the study were represented by 50.8% of the participants, which was slightly higher than male participants, consisting of 49.2% of the participants in the study.

The study identified the number of students who took at least one AP course or participated in an IB program during their high school careers. The student population that took AP courses accounted for 19.6% of the students involved in this study. In comparison, the number of students who participated in an IB program was lower and consisted of only 2% of the students.

Table 1
Descriptive Statistics of Variables in the Model

Variable	%	Std. Deviation
Background Characteristics		
Female	50.8	.5
Male	49.2	.5
White	69.8	.459
Black or African American	10.4	.306
Asian	3.4	.182
Hispanic	12	.325
Other	4.3	.203
Student Factors		
Ever in Advanced Placement Courses	19.6	.397
Ever in International Baccalaureate Program	2	.140
Teacher Factors		
Full-Time English Teacher Status	97.4	.160
Full-Time Math Teacher Status	97.6	.152
Degree Earned English Master's or above	49.2	.5
Degree Earned Math Master's or Above	51.4	.5
Certified English	96.4	.186
Certified Math	96.7	.179
School-Level Factor		
Free and Reduced Lunch 0–10%	28.8	.453
Free and Reduced Lunch 11–50%	55.7	.497
Free and Reduced Lunch 50–100%	15.5	.362
HSGPA		

Low-Level GPA	11.7	.678
Middle-Level GPA	42.1	.678
High-Level GPA	46.2	.678

In terms of Socioeconomic status (SES), which was reported from the NCES, the data set used the Duncan SEI values. The SES variable was constructed using five equally weighted, standardized components that were collected from the parent/guardian questionnaire data in the NCES ELS:2002 survey. The five components for the SES composite consisted of the father's/guardian's education, mother's/guardian's education, family income, father's/guardian's occupation, and the mother's/guardian's occupation. The SES values were based on a continuous model and ranged from -2.11 to 1.80. The descriptive statistics reported a mean for SES of .141 and a standard deviation of .721.

For the dependent variable, HSGPA, a multicategory GPA was the most appropriate. For this reason, the participants' HSGPAs were categorized into three categories: high-level HSGPA (3.01–4); middle-level HSGPA (2.01–3.0); and low-level HSGPA (0.0–2). In terms of HSGPA, 46.2% of the students obtained HSGPAs between 3.01–4.0; 42.1% obtained HSGPAs between 2.01–3.0; and 11.7% obtained HSGPAs between 0.0–2.0. The low-level GPA (HSGPA 0.0–2.0) was used as the reference group.

Teacher factors

The teachers in the study reported their level of education. The level of a teacher's education was measured as a teacher that obtained a high degree, which was identified as a master's degree and beyond, compared to a teacher who earned a bachelor's degree or below. In my study, the number of English teachers who obtained master's degrees and beyond (49.2%) was less than the number of English teachers who held bachelor's degrees or below (50.8%).

Differently, more math teachers obtained master's degrees or beyond (51.4%) than those who did not (48.6%).

The frequencies of employment status for English teachers was largest with the full-time teachers. In terms of the number of full-time English teachers who participated in the study (97.4%), when compared to the number of part-time teachers (2.6%) included in the study, the number was much higher. In comparison of the number of full-time English teachers to the number of full-time math teachers, the number of full-time math teachers was slightly higher (97.6%). The number of part-time math teachers was slightly less than English teachers (2.4%) who were included in the study.

Table 1 profiles the students taught by teachers who hold teaching certifications as well as uncertified teachers. In terms of the number of students who were taught by certified English teachers (96.4%) was higher than the remainder of the students, who were taught by uncertified English teachers (3.6%). Table 1 shows that the number of students who were taught by certified math teachers (96.7%) was also higher than the remainder of the students, who were taught by uncertified math teachers (3.3%). In comparison, the students in the study were taught by more certified math teachers than certified English teachers.

Table 2 includes the descriptive statistics for the continuous teacher variables included in the model. The total years teaching for the English teachers had a range of 1–40 years, with a mean of 14.38 and a standard deviation of 10.701. The math teachers' range was 1–40 years, with a mean of 14.99 and a standard deviation of 10.679. Table 2 includes the descriptive statistics for the number of days missed for the first semester for an English teacher, as this was also a continuous variable. The number of days missed for an English teacher ranged from 1–40, with a mean of 3.14 and a standard deviation of 3.773. In comparison to the number of days

missed for a math teacher, which also ranged from 1–40, a mean of 3.10 was reported, with a standard deviation of 4.595. The mean for the number of days missed for a math teacher during the first semester was .673 less than the mean number of days missed during the first semester for an English teacher.

Table 2

Descriptive Statistics of Continuous Variables in the Model

	Minimum	Maximum	Mean	Std. Deviation
Total Years Teaching K–12 English	0	40	14.38	10.701
Total Years Teaching K–12 Math	0	40	14.99	10.679
Days Missed 1 st Sem. English Teacher	0	40	3.14	3.773
Days Missed 1 st Sem. Math Teacher	0	40	3.10	4.595

School factors

Table 1 shows the distribution of students across schools with different levels of free or reduced lunch. In the study, 28.8% of students attended schools that had 0–10 percent free and reduced lunch, with a standard deviation of .453. A total of 55.7% of students attended schools that were identified as 11–50% free and reduced lunch; this included a standard deviation of .497. Finally, the remaining 15.5% of the participants attended schools that were identified as 50–100% free and reduced lunch with a standard deviation of .362.

Variance Inflation Factor Test

In this section, the results from the collinearity diagnostics are presented. For this regression model, the variance inflation factor test was run after the multinomial logistic regression to understand how much multicollinearity existed in the regression model. The variance inflation factor indicates whether a predictor has a strong linear relationship with the

other predictors (Field, 2015). This occurs in a regression model when a minimum of two highly correlated predictors are assessed at the same time. Multicollinearity is important because it has the potential to lead to misleading or an unreliable interpretation of the results (Vatcheva, Lee, McCormick, & Rahbar, 2016). Vatcheva et al. (2016) further report the importance of verifying whether multicollinearity exists so that researchers know to interpret the data carefully.

If the variance inflation indicator is greater than 10, there is concern for collinearity in the regression model (Bowerman & O’Connell, 1990; Myers, 1990). After reviewing the variance inflation factor test, the lowest was females at 1.010, and the highest was free and reduced lunch 0–10% at 2.527. These numbers are well below 10 and therefore leave no concern for multicollinearity in the regression model.

Table 3

Variance Inflation Factor for Student, Teacher, and School-Level Variables

Variable	VIF
Background Characteristics	
Female	1.010
Black or African American	1.145
Asian	1.023
Hispanic	1.149
Other	1.024
Student Factors	
Socioeconomic Status	1.245
Ever in Advanced Placement Courses	1.039
Ever in International Baccalaureate Program	1.018
Teacher Factors	
Full-Time English Teacher Status	1.046
Full-Time Math Teacher Status	1.032
Degree Earned English Master’s or Above	1.105
Degree Earned Math Master’s or Above	1.099
Certified English	1.165
Certified Math	1.154

Total Years Teaching K–12 English	1.108
Total Years Teaching K–12 Math	1.102
Days Missed First Semester English Teacher	1.018
Days Missed First Semester Math Teacher	1.025
School Level Factor	
Free and Reduced Lunch 0–10%	2.527
Free and Reduced Lunch 11–50%	2.264

Inferential Statistics

This study focused on how teacher variables may be related to the students' HSGPAs, controlling for student and school characteristics. To understand this issue, a multinomial logistic regression was run to test the hypothesis that certain teacher variables may be significantly related to student achievement during their high school careers. The outcome in the multinomial logistic regression, HSGPA, was measured by high-level HSGPA (2.01–3.0), middle-level HSGPA (3.01–4.0), and low-level HSGPA (0.0–2.0). Low HSGPA was considered the reference group. Table 4 presents the overall findings for the multinomial logistic regression for the participants' HSGPAs.

The multinomial logistic regression findings for the student factors varied when the factors were compared to the reference group, low HSGPA. Gender was found to be statistically significant (OR=1.678, $P<.001$). Specifically, the odds of having a middle HSGPA versus a low HSGPA for females are 67.8% higher than those for males. The significance of the student factor of gender was consistent between the two models. The analysis demonstrated that for high HSGPA, female (OR=3.312, $P<.001$) was also found to be statistically significant. The odds of having a high HSGPA versus a low HSGPA for females was 31.2% higher than those of males.

The analysis included the five categories of race that were included as one of the main student factors in the model. Of the variables that measured race, when comparing the outcome of middle HSGPA and low HSGPA, Black or African American (OR=.385, $P<.001$) and

Hispanic ($OR=.625, P<.001$) was considered statistically significant. Specifically, the odds of having a middle-level HSGPA versus a low-level HSGPA for African American students and for Hispanics are 38.5% and 62.5% of the odds for White students. In other words, Black or African American and Hispanic students are more likely to have middle HSGPAs than White students. This demonstrated that race does matter in predicting students' middle HSGPA versus low HSGPAs. When comparing high HSGPAs versus low HSGPAs, each of the background characteristics for the participants was considered to be statistically significant. Of the variables that measured race, Black or African American ($OR=.110, P<.001$), Asian ($OR=2.353, P=.006$), Hispanic ($OR=.407, P<.001$), and Other ($OR=.339, P<.001$) were considered statistically significant. Specifically, the odds of having a high-level HSGPA versus a low-level HSGPA for Black or African American students, Asian students, Hispanic students, or Other are 11%, 35.3%, 40.7%, and 33.9%, respectively, of the odds for White students. The information provided demonstrated that race/ethnicity is a significant predictor for high-level versus low-level HSGPA.

The role of student factors and their relationship to student achievement for HSGPA also contained statistically significant factors. The role of the student SES seems to be consistent in predicting middle- and high-level HSGPAs when compared to the reference group, low HSGPA. Specifically, the odds of having a middle-level HSGPA or high-level HSGPA versus a low-level HSGPA are 45.5% and 170% higher for students with each one-unit increase in standardized value of SES, respectively. This statistical information represents that students from a higher SES background will have a higher HSGPA than students from a lower SES background. This demonstrates a clear positive relationship between SES and student achievement as determined by HSGPA.

The regression provided information regarding the student-level factors that were related to the type of courses that were taken during the student's high school career. The analysis reported students who enrolled in at least one AP course for middle HSGPA (OR=1.692, P<.001) was determined to be statistically significant. The odds of having a middle HSGPA versus a low HSGPA is 69.2% greater for students who took Advanced Placement courses than those who did not. Additionally, the odds of earning a high HSGPA versus a low HSGPA are 281% higher for students who enrolled in at least one AP course than those who did not take any AP courses (OR=3.810, P<.001). This demonstrates a clear positive relationship between students enrolled in AP courses during their high school careers and student achievement.

Several teacher factors were determined to be statistically significant for the high-level HSGPA. Of the 10 variables that represent the teacher-level factors for and their association to the high-level GPA students, four of the teacher factors were found to be statistically significant, including full-time status, certified status, and years of teaching. In comparing student achievement for high HSGPA versus low HSGPA, full-time math-teacher status (OR=.495, P=.040) is determined to be statistically significant. Specifically, the odds of having a high HSGPA versus a low HSGPA are 49.5% for students who are taught by a full-time math teacher as compared to a part-time math teacher. While the analysis demonstrated a statistically significant relationship, it is important to note that 97.6% of the students had full-time math teachers. Since the sample of students who were taught by part-time math teachers was so small, a concern of the reliability of the analysis does exist and will be further addressed in Chapter V. In comparison, a student achieving a middle-level HSGPA from a full-time math teacher (OR=.837, P=.603), was determined to be not statistically significant. This demonstrates a clear relationship between a high HSGPA and full-time math teacher. In measuring student

achievement for middle-level HSGPA, full-time English-teacher status (OR=1.161, P=.565) and high-level HSGPA full-time English-teacher status (OR=.902, P=.697) were both found as not statistically significant in the regression analysis.

The variable in the high-level HSGPA representing a certified math teacher (OR=1.656, P=.035) was statistically significant. Specifically, the odds of having a high HSGPA versus a low HSGPA are 65.6% higher for students who are taught by a certified math teacher. Certification of English teachers does not seem to be related to HSGPA, based on the findings. This demonstrates there is a positive relationship between certified math teachers and student academic performance.

In terms of high-level HSGPA, the total years teaching K–12 English (OR=1.014, P=.001) was determined to be statistically significant. In comparison to the total years teaching, K–12 English teachers for middle-level HSGPA students was found to be not statistically significant (OR=1.005, P=.196), Specifically, the odds of having a high HSGPA versus a low-level HSGPA is .5% higher for students with each one-unit increase in standardized value of the total years teaching of a K–12 English teacher. Thus, as teaching experience increases, so do the odds of a student achieving a high-level HSGPA.

The role of teacher factors measuring student achievement for HSGPA also contained statistically significant factors. In terms of middle-level HSGPA, the total years teaching K–12 math (OR=1.012, P=.005) was determined to be statistically significant. In measuring student achievement for high-level HSGPA, total years teaching K–12 math teachers (OR=1.019, P<.001) was also determined to be statistically significant. The role of the total years teaching K–12 math seems to be consistent in predicting middle- and high-level HSGPA when compared to the reference group, low HSGPA. Specifically, the odds of having a middle-level HSGPA

versus a low-level HSGPA are 1.2% and 1.9% higher for students with each one unit increase in standardized value of total years teaching K–12 math, respectively. If calculated by a 10-year period of time, 10 years of teaching experience in K–12 math is related to a 12% increase in having a middle-level HSGPA as compared to a low-level HSGPA. In addition, 10 years of teaching experience in K–12 math is related to a 19% increase in having a high-level HSGPA as compared to a low-level HSGPA. This demonstrates a clear positive relationship between total years teaching K–12 math and student achievement, as determined by the participants' HSGPAs.

Based on the results of the multinomial regression analysis for middle-level HSGPA, it is important to note that the remaining teacher factors included in the study—degree earned English teacher, master's or above; degree earned math teacher, master's or above; days missed first semester by English teacher; and days missed by math teacher first semester—were found as not statistically significant. In terms of the remaining teacher-level factors for high HSGPA, it is important to note that the variables degree earned English teacher, master's or above, degree earned math teacher, master's or above, days missed first semester by English teacher, and days missed by math teacher first semester were found not to be statistically significant for high HSGPA. The teacher factors listed that were not considered statistically significant were consistent with the findings for the teacher factors in middle-level HSGPA.

Finally, the school-level factor of free and reduced lunch at 11–50% is consistently statistically significant in determining HSGPA outcomes. Specifically, for participants who attended a school identified as free and reduced lunch at 11–50%, the odds of middle-level HSGPA (OR=.670, $P<.001$) and high-level HSGPA (OR=.643, $P<.001$) as compared to low-level HSGPA were 67% and 64.3% times higher, respectively, than students with a school level factor for free and reduced lunch at 51–100%. In comparison, for participants for middle-level

HSGPA versus low-level HSGPA, free and reduced lunch at 0–10% (OR=.835, P=.210) was found not to be statistically significant.

Summary

The objective was to interpret the differential effects of teacher factors on student achievement as measured by the students' HSGPAs while controlling for student factors. In order to facilitate the interpretations of the interaction effects, the full model was fitted with teacher factors. In this model, several factors were considered statistically significant when reviewing HSGPA. In particular, of the 10 teacher variables tested in the model, four of them were found to be statistically significant. Additionally, there was no concern for multicollinearity after the VIF analysis was conducted. As reported in the findings, math teachers were in attendance, on average, .673 more days than English teachers. In the multinomial regression, math teachers had more statistically significant factors than English teachers.

Chapter V

Conclusions and Implications

In past decades, a considerable amount of literature has examined the relationships of student achievement. This literature has focused on the relationship that teacher factors have on high school grade point average. This study attempted to remedy the limitations in the literature by examining the outcomes of the students at the end of their high school careers. Through the examination of the data from the NCES:ELS 2002, this research has illustrated that it is a viable tool to understand and create the most effective recruitment practices from educational institutions. The NCES ELS:2002 data continued to help researchers and policymakers understand the factors that contribute to students' success. These practices will allow state-level teaching requirements be adjusted to improve student achievement. Additionally, at the local level, administrators will be able to modify and adjust policies and practices to assist in hiring practices.

The main goal of this research was to understand what teacher factors are important in predicting student success. More importantly, by considering the ability for a school to provide the most qualified personnel available to ensure that the students leaving the educational institution have the college and/or career readiness needed to be successful. The information obtained in this study will identify the statistically significant teacher factors that can assist policymakers at the state and local levels, as well as the school administrators in creating more successful learning environments through the hiring process.

The primary research question that guided the analysis in the research was this:

How do teacher factors relate to student achievement, controlling for student and school

characteristics?

The research questions were as follows:

1. How do teacher qualifications, including certification and level of education, impact high school grade point average?
2. How does the length of time the teacher has taught in the school impact student high school grade point average?
3. How does the full-time employment status of a teacher impact student achievement as it relates to high school grade point average?
4. How does teacher attendance impact student achievement as it relates to the college-qualification level of the student at the time of high school graduation?

The conceptual framework for this study is a model integrating four major theories focusing on student academic achievement. By integrating the theoretical aspects of Schultz (1971) and Becker (1994), Hanushek and Rivkin (2012), Pekrun (2006), and Henderson and Dweck (1990), we were able to gain a better understanding of the complexities of the teacher characteristics associated with student achievement as determined by HSGPA. The framework considered focused on examining specific teacher factors that impact instruction for the students. The association was measured by looking at student achievement at the high school level. For this particular model, the overall HSGPA was examined. The findings of the study focused on three areas: student-level factors, teacher-level factors, and school-level factors. In addition to student characteristics such as gender, race/ethnicity, and SES, the student factors including specific courses were also identified and reviewed, specifically AP and IB programs. These student factors provide information to better understand factors their relationships with the

students' HSGPAs. The information in this study will assist administration in developing the best curriculum and types of programs, AP or IB, to include in their school districts.

The main source of the data for this research was the NCES:ELS 2002. The data were obtained from Institute of Educational Sciences, National Center for Educational Statistics. The survey was longitudinal and multileveled; it collected data from students, parents, teachers, and school administrators, from both public and private institutions. The data collected contained information related to student achievement, aspirations, experiences, influences, and what happens to them postgraduation (NCES, 2004). The study took place over the course of 10 years after they graduated from high school. As for the data containing the overall HSGPA, they were collected from the 2005 school year. All participating student transcripts were requested to be sent directly from the schools to the research team for the NCES ELS:2002 in 2005, regardless of high school completion status (Lauff & Ingels, 2014). The final sample used in the study included 6,861 participants from various race/ethnicities and socioeconomic status backgrounds. The participants were from various schools.

Based on the proposed theoretical model, the data were first analyzed, and key student, teacher, and school-level factors were identified. Once the data were determined to be appropriate, the second step was to confirm that no areas of concern existed with multicollinearity by conducting a variance inflation factor test. The variance inflation factor analysis was conducted to ensure that there were no two highly correlated predictors assessed at the same time, which could cause the data to be misleading. As reported in the study, there was no concern of multicollinearity with the data set. The next step was to conduct a multinomial logistic regression to determine how the predictor variables were related to HSGPA. A multinomial logistic regression was conducted to include the three GPA categories: low-level

HSGPA (0.0–2.0), middle-level HSGPA (2.01–3.0), and high-level HSGPA (3.01–4.0).

This chapter presents the final discussions of the findings of this study, implications for policy and practice, as well as implications for future research. The research is clear and focuses on the areas that were statistically significant in the study. The areas in this chapter include recommendations not only based on the teacher factors, but also the student factors that were found to be statistically significant. The recommendations for changes based on the information outlined in this chapter will include state policymakers as well as local, school-level administrations.

Conclusions

The results of this study have important implications for future research and policy-making. In general, this study found that teacher variables were indeed factors that are associated with student achievement. Students whose teachers held certain characteristics were more likely to be academically successful measured by HSGPA: specifically, the total number of years teaching for K–12 mathematics, the total years teaching for K–12 English, and whether the teachers held full-time math-teacher status and were certified mathematics teachers. This was determined through the overall HSGPA of students. In addition to the descriptive statistics, through the multinomial logistic regression, I determined that specific factors not only played a role in ensuring students were academically successful through achieving a middle-level HSGPA, but that they also assisted students in achieving a high HSGPA, which is needed to obtain acceptance into a selective university. As discussed in the literature, acceptance into selective universities has benefits.

Although the descriptive analysis revealed that each of the race/ethnicities differed in middle-level HSGPA compared to low HSGPA, the multinomial logistic regression analysis

revealed that the high-HSGPA was statistically significant, which is consistent with the findings in the literature. The findings indicate that this comprehensive framework is correct in determining that HSGPA may vary based on teacher factors when controlling for student and school-level characteristics.

The first research question examined how teacher qualifications, including teacher certification and level of education, relate to HSGPA. When reviewing students' high HSGPAs, it was found that students who took courses from certified math teachers performed better than students who took courses from uncertified math teachers. In the area of English, the findings were not statistically significant. The multinomial logistic regression determined that the level of teacher education for master's-level degrees and beyond was found to be not statistically significant for both middle-level-HSGPA and high-level HSGPA students. Therefore, the level of teacher education for master's-level degrees and beyond did not demonstrate relationships to either middle-level HSGPAs or high-level HSGPAs.

The second research question addressed the association of students' HSGPAs by the length of time the teacher has taught in school. The relationship of the total years a teacher has been teaching correlates to student achievement. In the area of mathematics, the multinomial logistic regression demonstrated that both middle-level HSGPA and high-level HSGPA were demonstrated to have relationships to student achievement. In terms of the students achieving high-level HSGPAs, the number of years teaching for English teachers was statistically significant as compared to students with low-level HSGPAs. For the model of middle-level HSGPA, the total number of years teaching for an English teacher was found to be not statistically significant. The findings for the total number of years teaching for English teachers demonstrated the importance of the number of years teaching for students achieving high-level

HSGPAs for a selective university.

The third research question was this: How does full-time employment status of a teacher impact student achievement as it relates to high school grade point average? For this research question, there was a difference between the English and the math teachers. When reviewing the full-time status of math teachers for students' achievements of high HSGPAs, this factor was found to be statistically significant ($P=.040$). In consideration of the findings, schools should aim to focus on creating full-time positions when hiring math teachers instead of hiring part-time math teachers.

Finally, the fourth research question was this: How does teacher attendance impact student achievement as it relates to the college-qualification level at the time of high school graduation? Reviewing the data in the study, it was determined that the number of days missed during the first semester for both English and math teachers did not have a relationship to middle-level HSGPA and high-level HSGPA. Future recommendations to revisit these research questions will be presented later in this chapter.

In respect to gender, there was a statistically significant difference for females when compared to males and their impact on HSGPA in both models, middle-level HSGPA ($P<.001$) and high-level HSGPA ($P<.001$). Reviewing the first model, race/ethnicity was determined to be statistically significant in all cases for academic achievement of high HSGPA. These findings are consistent with prior literature. Remaining consistent with prior research, socioeconomic status was statistically significant for HSGPA in both models. Finally, the school-level factor of free and reduced lunch at 11–50% is consistently statistically significant in determining HSGPA outcomes. Specifically, for participants who attended schools identified as free and reduced lunch at 11–50%, the odds of middle-level HSGPA ($OR=.670$, $P<.001$) and high-level HSGPA

(OR=.643, $P < .001$) were 67% and 64.3% times higher, respectively, than students with a school-level factor of free and reduced lunch at 51–00%. In terms of high HSGPA, free and reduced lunch at 0–10% (OR=.736, $P = .045$) was found to be statistically significant when compared to participants who attended schools that were 50–100% free and reduced lunch. This indicated a strong relationship between free and reduced lunches and HSGPA.

Implications for Policy and Practice

The findings in this study provide important implications for policymakers, administrators, and teachers in understanding highly qualified personnel. Using the ELS:2002 data set provides a reliable and valid instrument that can be used in innovative ways to improve state and federal teaching requirements, hiring practices, and student placement in high school. This research has identified several teacher factors that are associated with academic achievement.

One conclusion that can be drawn from the current research is that the variables that were found to be statistically significant need to be further examined to determine best practices to enhance the academic achievement of students in a high school setting. The findings in this study can assist state-level policymakers, school districts, personnel directors, principals, and other administrators to make informed decisions during the certification and the hiring processes. Most considerably, the findings show that the hiring personnel can create a focus on the math candidates applying for positions within their districts. The hiring personnel will be able to determine the teacher factors that play a role, such as the total years teaching, and will be able to separate the teachers who have more years of experience in the classroom. Additionally, the hiring administration will be able to improve student achievement through the hiring process of teachers that are certified. Moreover, the school district can ensure that it is offering full-time

positions to candidates for math positions as opposed to part-time positions. Schools do need to be aware of the public finances related to hiring these teachers, and school administrations need to be aware that they might have to become creative when maximizing school schedules to grant teachers full-time positions.

School districts are typically bound to salary schedules and contracts. A suggestion for future recruiting practices is to have the hiring personnel speak with the superintendent and the board of education to determine if they can offer more attractive starting salaries to new candidates. This process would include offering to bring in experienced teachers from other school districts in at higher steps on the salary scale. This will also assist in ensuring that specific departments in the school have the experience necessary to raise the level of academic achievement. It is not always best practice to have a completely new and young staff.

Each state has its own certification process. This study has created an improved understanding of teacher factors that have a statistically significant relationship to student achievement. The state policymakers can now review these factors and determine how to best integrate them into the certification process to ensure the best candidates are becoming certified and hired by the school districts.

Understanding that teacher experience is one of the factors that was determined to be statistically significant, state policymakers need to enforce a program to allow new teachers access to veteran teachers' experiences. One way in which these experiences can be shared is through the implementation of a mentorship program in each state. Once the state policymakers and school districts investigate the idea of having mentorship programs, these programs will connect new teachers with experienced teachers over the course of the first three years. Mentors can then work closely with their teachers to assist them from their personal experiences. Through

the mentorship requirement and programs that can be implemented via the state governments, new teachers will be able to learn from their mentors. The mentorship programs can provide additional support to the mentors through classes that are taught locally by state-level employees in the department of education.

Individual schools' course offerings impact student achievement as well. The number of AP courses that are accessible to the students will assist students in the obtaining higher student achievement. The College Board currently offers 39 AP courses throughout the United States. While an increase in AP course offerings can assist in obtaining student achievement, IB programs were not statistically significant. This information can be used by school administrators to revisit their current curricula and course programming to determine whether they would like to expand their AP course offerings. Additional research is suggested to review IB programs, as the sample size was small. In order to address the student course-offering factor of AP courses and the full-time math teacher factor that was determined statistically significant, additional AP math courses can be created if there is not currently a full-time math position. This will allow the students access to AP courses and create full-time positions for the math teachers.

SES and free/reduced lunch are two key factors that impact student achievement. While school districts are limited in ways to control these variables, communities need to create more avenues of advocacy for their schools. Schools can focus on addressing these two factors by teaching social justice, offering equal opportunities and discreetly providing supplies, food, clothes, and other basic necessities for their students. Additionally, schools can focus on making parent/guardian involvement more affordable and convenient. This might include adjusting transportation needs for families or holding events at different times of the day/night. Schools can focus on making the curricula more meaningful for their students. Working with teachers to

ensure that this occurs is the positive step to address schools with high numbers of students from lower SESs and a higher number of free and reduced lunches.

In summary, student achievement can be increased through state minimum requirements of certifications. The state-level certifications can include additional requirements to meet the teacher-level factors. While some states do include these factors, the certification and pathway requirements differentiate between states. At the local level, the development of hiring policies by the administrations of school districts should include the statistically significant teacher factors outlined in this research study. An increase in student achievement will increase possibilities of the students to attend selective universities as well. This study has shown the importance of focusing on teacher-level factors with hiring new personnel for their school districts.

Implications of Future Research

The results of this study have impacted implications for future research and policy-makers. The findings illustrate how applying teacher variables to the certification process will be beneficial. The first recommendation is for future studies to include additional teacher factors, such as the pathways in which they obtain their certifications. As discussed in the literature, certifications vary between states. A future study would benefit from identifying and comparing the individual certifications to determine whether the difference in state certifications impact student achievement. These pathways will include but are not limited to traditional certification through universities, certifications that include practicum components, and pathways that give credit for time served as a professional (i.e., mathematician, businessperson, editor). These professional pathways do not require teachers to go back to school for educational courses.

In this study, a teacher's level of education was categorized for teachers who held lower

than master's-level degrees compared to teachers who held master's-level degrees and beyond. In order to better understand the level of impact of teachers' educational levels, future research can focus on including the impact of student achievement for teachers who hold only an associate's degree, bachelor's degree, master's degree, or doctoral degree. Understanding the relationship that exists for all four college degrees will assist state legislatures to make more informed decision on the minimum requirements for teachers in their states. This new information will also assist local policymakers and school administrators in setting candidates apart from each other, should there be a statistically significant finding.

As teacher education can be further analyzed in future studies, the states in which the teachers received their degrees can be included in a future study. Since different states have different requirements for teacher certification, the focus or course requirements will vary between educational institutions. Future research can include understanding of which states the teachers received their degrees from and whether the degrees from particular states impact student achievement.

Another recommendation for future research is to return to the NCES ELS:2002 data set to examine the postsecondary graduation rates. The graduation-rate information will provide additional information to understand whether students were indeed prepared for college. Once we understand whether they were prepared for college, we will be able to return to this study to determine whether the teacher variables had further relationships to the long-term successes of the students in college. Postsecondary graduation rates will allow future researchers to look at which students are able to graduate from two-year or four-year institutions. The data collected in the additional surveys will also allow future researchers to see whether the students were able to graduate on time or whether they needed to take additional time. This is important research,

because the students might have been delayed with graduating on time as a result of the need to take remedial courses.

The NCES:ELS 2002 data set contains additional information pertaining to the participants 10 years after the start of the survey. In order to focus on the human capital theory and the long-term impact of the students' academic achievement, future research could review the income-level category that the students earn in 2014. This information is stored in the NCES ELS:2002 data set from the follow-up survey. These data can be compared to the teacher factors outlined in this study and will allow future researchers to make recommendations to state legislators for certification requirements as well as adjustments to the hiring practices of school districts.

Another suggestion for future research is to determine whether teacher salaries impact student achievement. The NCES ELS:2002 data set does not include teacher salaries, which change between districts. Salaries are impacted by collective bargaining units in states that have unions or the local governments. In some states, salaries have been capped by the state governments. Additionally, researchers can examine merit-pay options for schools to determine whether a monetary incentive for teachers has a direct impact on student achievement. Although merit pay is a fairly new concept in education, it has been around long enough to begin to collect data. While merit pay is a controversial topic in schools, the data on merit pay would assist policymakers and school officials on the appropriate decisions for their schools and budgets.

Since one of the limitations with this study was attendance for the first semester, it would be beneficial for a future study to include the number of missed days for teachers for the entire year. Reviewing the teacher's yearly attendance will create a clearer picture on the impact of student achievement. In this study, I was unable to determine whether teachers took more days

during the second half of the year or not. Teachers' attendance can change drastically as the year continues, which is why this is an important recommendation. Additionally, future studies can break down the number of years a teacher has been teaching a specific subject. My study focused on the number of years a teacher has been teaching K–12, but a future study can break down the number of years a teacher has been teaching one specific subject. This will create a more concentrated analysis on academic achievement.

Understanding the impact that AP courses have on the students, a future study can include the number of college courses that a student takes while in high school. This will assist in curriculum development and programs in high schools. This future research would determine whether students will benefit from taking college courses over AP courses in a high school. Once the future findings are determined, schools will be able to adjust or modify their programs accordingly. This will benefit the students in making sure they are in the best programming for their future.

After the completion of this study, researchers would benefit from extending the study to a future study that focuses on the relationship of teacher factors for different thresholds of the students' HSGPAs. This study would include different cutoff points for the students to determine whether teacher factors are statistically significant. This future study will demonstrate whether the results are sensitive to the new way in which the outcomes are recorded. The study will allow policymakers and school administrations continue to solidify the teacher factors that need to be addressed in the hiring practices of the schools. In addition to the different thresholds, future studies would benefit from analyzing the different HSGPAs by states. As the literature presents, different states have different forms and types of certifications. Looking at student HSGPA and the states in which the students achieved their HSGPAs will allow colleges and universities to

determine whether there is indeed a difference. It will also allow state policies to determine whether specific teacher factors that are not currently included in their certification processes need to be included in their state-level certifications.

Summary

As a result of the research, several factors were identified as having an impact on student achievement. Mainly, teacher factors play an intricate role in student achievement. This research provided information to support the quality of teachers that needed to be hired in school districts, particularly in the area of mathematics. Since teaching shortages are likely to continue, it is important to make sure that school districts are making every attempt to hire the best, most qualified, and experienced teachers to place them in front of their students. Since the Coleman Report (Coleman, 1966), the literature clearly demonstrates that gender, race/ethnicity, and socioeconomic status play roles in student achievement. The finding in this study supported the prior research. The purpose of this study was to review certain teacher factors. Teacher factors can be controlled, changed, or supported by state and local levels through policies and guidelines that can be created by stakeholders. There is minimal research to support how these factors are associated with HSGPA.

Student achievement is measured by college and career readiness. While colleges do not have a hard line to a minimum HSGPA, I focused on the Berkner and Chavez (1997) college and career index. This baseline is created to ensure that students are all given the same opportunities. College entrance has become more competitive, making student achievement that much more important. This research will allow schools to place the most qualified or appropriate person in front of the students to give them the chance to be successful. The background factors included in this research will assist college and universities to understand that gender,

race/ethnicity, and socioeconomic status all impact academic achievement.

In light of understanding that the United States continues to fall in the ranks of the quality of education, it becomes even more important that the government spend time and money to place the best people in front of classrooms. I am hopeful that the empirical evidence outlined in this study, as well as the recommendations provided in this dissertation, can assist policymakers and administrators with the information needed to address minimum teaching requirements and their hiring practices. By doing so, schools will be able to increase student achievement.

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Appendix A. Table 4

Multinomial Logistic Regression Results- (reference category of GPA is low-level GPA 1-2.01)

Variable	HSGPA 2.01-3.0			HSGPA 3.01-4.0		
	Odds Ratio	S.E.	Sig	Odds Ratio	S.E.	Sig
Background Characteristics						
Female	1.678	.085	***	3.312	.089	***
Black or African America	.385	.112	***	.110	.138	***
Asian	1.646	.312		2.353	.312	**
Hispanic	.625	.119	***	.407	.128	***
Other	.741	.180		.339	.199	***
Student Factors						
Socio-economic Status	1.455	.067	***	2.701	.070	***
Advanced Placement Courses	1.692	.141	***	3.810	.141	***
International Baccalaureate Program	.899	.279		.684	.303	
Teacher Factors						
Full-Time English Teacher Status	1.161	.259		.902	.266	
Full-Time Math Teacher Status	.837	.341		.495	.342	*
Degree Earned English Master's/Above	.927	.086		.856	.090	
Degree Earned Math Master's/Above	.887	.086		1.022	.090	
Certified English	1.270	.232		1.150	.243	
Certified Math	1.307	.222		1.656	.239	*
Total Years Teaching K–12 English	1.005	.004		1.014	.004	**
Total Years Teaching K–12 Math	1.012	.004	**	1.019	.004	***
Days Missed by English Teacher	.987	.011		1.002	.011	
Days Missed by Math Teacher	1.000	.009		.999	.009	
School Level Factor						
Free and Reduced Lunch 0-10%	.835	.144		.736	.153	*
Free and Reduced Lunch 11-50%	.670	.115	***	.643	.126	***

Note: Significance: $P < .001$ *; $P < 0.01$ **; $P < .05$ ***
