

## ABSTRACT

Title of Document: THE IMPACT OF HIGHLY QUALIFIED TEACHERS  
ON STUDENTS' ACADEMIC ACHIEVEMENT AND  
GRADUATION RATES

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This study examined the relationship between the percentage of classes taught by highly qualified teachers (HQT) and students' academic achievement, as measured by students' passing rates on Maryland's High School Assessment (HSA), and graduation rates among secondary students for three academic school years (2011, 2012 and 2013) in the State of Maryland. All data relating to highly qualified teachers and students' academic achievement and graduation rates was collected from the Maryland's Annual Report Cards, published by Maryland State Department of Education for all 24 school systems in the State of Maryland during three consecutive academic school years (2011, 2012 and 2013). The individuals in this sample were 10<sup>th</sup>, 11<sup>th</sup> and 12<sup>th</sup> grade students from Maryland School System who participated in the Spring Maryland High School Assessment (HSA) for academic school years 2011, 2012 and 2013. A linear regression method was used to answer the question of possible relationships between the dependent variables, academic achievement test scores and graduation rates, and the independent

variable, percent of courses taught by highly qualified teachers. System level performance data were analyzed in a descriptive fashion in order to show the percent of students passing each of the Maryland High School Assessments (HSA) in Math, Biology and English, and the percent of students graduating from high school. In addition to the descriptive statistics, Hierarchical Linear Modeling analyses were conducted in order to determine if (1) students performed better on High School Assessments (HSA) in counties having more highly qualified teachers (noted as Between Counties) and (2) if students performed better in years when there were more highly qualified teachers (HQT) in a county, than in those years when there were fewer highly qualified teachers (noted as Within-Counties or Between Years).

Results of the data indicated that between-county or counties with more highly qualified teachers (HQT) than counties with fewer highly qualified teachers had a higher percentage of students who passed the Biology 10, 11 and 12, English 10, 11 and 12, and Math 10, 11, and 12 High School Assessments (HSA), over three consecutive academic school years (2011, 2012 and 2013). Within-counties, between-years or years when there were more highly qualified teachers (HQT) in a county compared to years when there were fewer (HQT) teachers, there was no significant relationships between the percentage of highly qualified teachers and students passing rates on the Biology 11 and 12, the Math 10 and 12, and the English 10 and 11 High School Assessments (HSA). However, for Biology 10, Math 11 and English 12 there was a significant relationship between the percentage of HQT in a county in a year, and the percentage of students passing the test that year.

Counties where there were more highly qualified teachers (HQT), a higher proportion of students graduated than in counties where there were fewer highly qualified teachers (HQT), over three academic school years (2011, 2012 and 2013). There was no relationship between the

percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students graduating in that year.

THE IMPACT OF HIGHLY QUALIFIED TEACHERS ON STUDENTS' ACADEMIC  
ACHIEVEMENT AND GRADUATION RATES

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## DEDICATION

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# Table of Contents

	Page
Acknowledgment .....	ii
Dedication .....	iii
List of Tables .....	vii
CHAPTER	
I. INTRODUCTION .....	1
Overview .....	1
No Child Left Behind (NCLB) .....	3
Defining a Highly Qualified Teacher .....	4
Teacher Qualifications and Student Achievement .....	5
Background of the Study .....	6
Statement of the Problem .....	7
Purpose of the Study .....	9
Research Questions .....	10
Null Hypotheses .....	10
Potential Significance .....	11
Assumptions .....	12
Limitations .....	13
Definitions of Terms .....	13
Organizations of the Remaining of the Study .....	16
CHAPTER	
II. REVIEW OF LITERATURE .....	17



Introduction.....	17
Teacher Qualification.....	18
Teacher Certification.....	18
Teacher Degree Levels.....	20
Teacher Subject Matter Knowledge.....	21
Highly Qualified Teachers.....	22
Impact of Highly Qualified Teachers on Student Achievement....	26
Standardize Tests.....	28
Maryland High School Assessment (HSA).....	29
Student Academic Achievement.....	31
Summary.....	31

## CHAPTER

III. METHODOLOGY.....	33
Overview.....	33
Rationale and Approach.....	35
Research Questions.....	36
Null Hypothesis.....	37
Research Design and Procedures.....	38
Population and Sampling Procedures.....	38
Description of Maryland Public School Population.....	38
Sampling Procedure.....	39
Instrumentation Used.....	39
Validity.....	40

Reliability.....41

Data Collection Procedure .....42

CHAPTER

IV. FINDINGS .....47

Introduction.....47

Questions and Hypotheses .....48

Descriptive Data.....49

Data Analysis .....52

Results.....53

Summary .....68

CHAPTER

V. CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS .....71

Introduction.....71

Summary of the Study .....71

Summary of Findings and Conclusion.....74

Implications.....81

Recommendations.....83

REFERENCES .....87

## LIST OF TABLES

1. Total number of teachers receiving initial certification or licensure by state: AY 2000 – 01 through AY 2007 – 08.....	44
2. Total number of teachers receiving initial certification or licensure by state: AY 2000 – 01 through AY 2007 – 08 (continued) .....	45
3. States Requiring Testing for Initial Certification of Elementary and Secondary Teacher, by skills or Knowledge Assessment and State: 2010 and 2011 .....	46
4. Descriptive Statistics for the Percentage of Highly Qualified Teachers (HQT), Percentage of Students Passing Maryland’s High School Assessment (HSA) in Math, Biology and English, and Students’ Graduation rates Over a Three Year Period (2011, 2012 and 2013 .....	52
5. HQT and Biology 10.....	55
6. HQT and English 10 .....	57
7. HQT and Math 10 .....	58
8. HQT and Biology 11.....	59
9. HQT and English 11 .....	61
10. HQT and Math 11 .....	62
11. HQT and Biology 12.....	63
12. HQT and English 12 .....	65
13. HQT and Math 12 .....	66
14. Graduation Rates.....	68

# CHAPTER ONE

## INTRODUCTION

### Overview

Policymakers and school leaders nationwide are racing to improve the quality of education within America's public schools. Research has shown that teacher qualifications are one of the key factors associated with student performance (Darling-Hammond, 2000; Ferguson, 1991; Goldhaber & Brewer, 2000; Laczko-Kerr & Berliner, 2002; Monk, 1994; Sanders & Rivers, 1996). The report, *A Nation at Risk*, which was submitted by the Secretary of Education to President Reagan in April 1983, started an ambitious and well-publicized elementary and secondary education reform that has lasted over three decades (Vinovskis, 2009). Focused on increasing excellence, the reform act suggested ways of increasing performance in American schools (Good, 2010). Twenty years later, President George Bush brought national attention to teacher quality when he signed into law the No Child Left Behind Act ([www.ed.gov](http://www.ed.gov), 2004). To be considered a highly qualified secondary teacher under the NCLB Act, the following prerequisites must be met: (a) the teacher had at least a bachelor's degree, (b) obtain state certification or licensure, and (c) demonstrated competence in each of the core academic subjects taught ([www.ed.gov](http://www.ed.gov), 2004; Lu, 2007).

Since that time researchers and policymakers had continued to focus on teacher quality as a mechanism for educational improvement. This focus on teachers was warranted given that teachers were the primary resource of public education and that their salaries constitute the largest share of K-12 education budgets (Wayne & Youngs, 2003). Hargreaves (2004) stated that if we wanted high-level, deep learning for students, we had to have highly skilled and

intellectually able teachers. Teachers are at the core of every educational system. As such, they have impacted the overall quality of the school and the potential of the students within the system (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Kennedy, 2008; Darling-Hammond and Youngs, 2002; Walsh, 2001; Goldhaber & Brewer, 2000; Hickman, Bartholomew, Mathwig, & Heinrich, 2008).

The No Child Left Behind (NCLB) Act recognized teacher quality as one of the key components to reforming America's educational system (Amrein-Beardsley, 2006). Researchers had concluded that there were significant amount of evidence to suggest that teacher quality was the single, most influential determinant of increased student academic achievement (Wright, Horn & Sanders, 1997). In the State of Maryland, it was not known what effect highly qualified teachers had on the secondary students' levels of academic achievement, as measured by the State of Maryland's High School Assessment (HSA), and graduation rates. According to the Maryland State Department of Education (2007), Maryland had made steady and substantial progress towards meeting the teacher quality provision of the No Child Left Behind (NCLB) Act. Since the establishment of a baseline of 64.5% of classes being taught by highly qualified teachers (HQT) in 2003-2004, the State of Maryland had reached 93.1% between 2012 - 2014, an increase of 13% since the 2005-2006 data was released (Maryland Teacher Staffing Report, 2014; Annual Performance Report – Maryland Department of Education, 2013). Despite those gains, public schools throughout the State had not met the 2005-2006 deadline of having fully qualified teachers in every core subject area. In fact, they had fallen short as much as 6.9% (Maryland Teacher Staffing Report, 2014). In schools where there were a large population of disadvantaged students, not having a 100% highly qualified teachers in core academic subject

areas might have determined whether students met proficiency in reading, math and science, and those who would actually graduate after four years with their cohort.

In most school districts, if a teacher of a core academic subject area had not met any of the qualifications necessary for highly qualified teacher status, they would not be allowed to teach again until those requirements were met (Chen, 2007). The No Child Left Behind (NCLB) Act also required that all students reach high standards, at a minimum, attaining proficiency or better in Reading and Mathematics by 2013-2014. If schools repeatedly produced students who were not proficient in those subject areas, the students at that school would have additional assistance programs available to them, such as the ability to attend one of at least two other schools in their district (Chen, 2007). Also, under extreme measures, if schools failed to meet the No Child Left Behind (NCLB) Act criteria, as measured by the Annual Yearly Progress (AYP) report, disciplinary actions would ensue, including, but not limited to state takeover (Chen, 2007). The intense pressure that this legislation placed on teachers and schools made determining if a positive relationship existed between highly qualified teachers and students' academic achievement and graduation rates a legitimate course of study.

### **No Child Left Behind (NCLB)**

NCLB was arguably the most important piece of US educational legislation in the past 35 years (Smith, 2005). This educational mandate created a new focus on the relationship between teacher qualifications and student achievement (Shen, Mansberger, & Yang, 2004). In addition to improving the educational system as a whole, Jofus and Maddox (2003) viewed the primary focus of NCLB as an effort to address the unsatisfactory learning outcomes of minority and poor students who often had the least qualified teachers (Gehrke, 2005).

For public school teachers around the nation, the No Child Left Behind Act required performance and accountability measures directed at addressing concerns over teacher quality and increasing the number of highly qualified teachers in America's schools.

According to NCLB, every classroom teacher of core academic subjects (i.e. English, Reading or Language Arts, Mathematics, Science, Foreign Languages, Civics and Government, Economics, Arts, History and Geography) had to be highly qualified by the end of the 2005-2006 academic year ([www.nea.org](http://www.nea.org)). In addition to improving teacher quality, NCLB mandated improvements in the basic skills of all students in English Language Arts, Mathematics and Science. The gauge by which improvement in those subject areas would be measured was the Adequate Yearly Progress (AYP) report. If a school failed to make AYP, a series of disciplinary actions would be administered by the school district. AYP status of a school was therefore crucial in determining the organization, funding and operation of a school (Smith, 2008). Amrein-Beardsley (2006) stated that the only way to evaluate the quantifiable aspects of teacher quality, as measured by increases in academic achievement, was to use test scores. Now more than ever, high quality teachers are vital only to the extent that they improve student academic achievement (Cavuzzo, 2004; Goldhaber, Perry & Anthony, 2003; Vandevort, Amrein-Beardsley, & Berliner, 2003).

### **Defining a Highly Qualified Teacher**

Researchers argued that teacher qualifications were positively related to student achievement (Darling-Hammond, Berry & Thoreson, 2001; Ferguson, 1991; Goldhaber & Brewer, 2000; Laczko-Kerr & Berliner, 2002; Monk, 1994). Therefore, it was not surprising that education policymakers, as well as school administrators had turned their attention to this important topic. Highly qualified teachers, as defined by the No Child Left Behind Act, were

teachers who had full state certification and had demonstrated content mastery or competency in each core academic subject they taught

(<http://www.ed.gov/nclb/methods/teachers/hqtflexibility.html>). No Child Left Behind stated that competence was demonstrated by: 1) Passing the Praxis II test in each academic subject in which the teacher taught or: 2) successfully completing either an academic major, coursework equivalent to an undergraduate academic major, a graduate degree in the subject being taught, a professional license in the subject being taught, or National Board Certified in the subject being taught.

The “expanded local control and flexibility” portion of NCLB gave states the flexibility to develop a plan to ensure teachers obtain the status of “Highly Qualified” (HQ) ([www.nea.org](http://www.nea.org)). This process could be accomplished by providing staff development, merit pay and designing alternative routes for teachers to become fully certified in the content area being taught. The law also allowed each state to design and utilize an evaluation instrument called High Objective Uniform State Standard of Evaluation (HOUSSE) to determine experienced teachers’ competency levels. HOUSSE could also be utilized to convert from a Standard Professional 1 License (initial license) to a Standard Professional 2 License (continuing license) ([www.nea.org](http://www.nea.org)).

### **Teacher Qualifications and Student Achievement**

Much of the attention already given to the No Child Left Behind (NCLB) Act had focused on its mandate to raise the achievement levels of all students (Abedi, 2004; Linn, 2003; Smith, 2008). However, it also legislated for reform in the way in which teachers were trained and recruited. The recent teacher-quality literature overwhelmingly indicated that differences in teacher quality had large effects on student performance measured by test scores (Aaronson et al.,



2007; Hanushek et al., 2005; Koedel, 2007; Nye et al., 2004; Rivken et al., 2005; and Rockof, 2004).

There were a significant amount of evidence to support the notion that the quality of the teachers teaching in a classroom was the single, most influential determinant of increased student academic achievement (Amrein-Beardsley, 2006; Darling-Hammond, Berry, & Thoreson, 2001; Ferguson & Womack, 1993; Fuller, 1999; Hawk, Coble, & Swanson, 1985; Monk, 1994; Monk & King, 1999; Rowan, Chiang, & Miller, 1997; Strauss & Sawyer, 1986). Monk's (1994) study of the relationship between teacher preparation and student achievement indicated that both subject content courses and subject-specific pedagogy courses in a teacher's preparation were positively related to student achievement. Other researchers had concluded that subject-specific teacher preparation or teachers with a major in their subjects taught had a significantly positive impact on student academic achievement, particularly in math and science (Chancy, 1995; Goldhaber & Brewer, 1998; Rowan, Chiang, & Miller, 1997; Weglinsky, 2000). Darling-Hammond's (2000) study highlighted the critical influence of highly qualified teachers on student learning. Olsen's (2003) study revealed that having a highly qualified teacher for four or five years in a row could fundamentally close the gap in student achievement between students from low-income and high-income families.

### **Background of the Study**

There are concerted efforts by policymakers and school district leaders nationwide to reverse what appeared to be a corroding educational system in America. Since the No Child Left Behind (NCLB) Act went into effect in January 2002, Maryland school districts had moved aggressively to decrease educational inequalities. Two important provisions of the No Child Left

Behind (NCLB) Act required that every classroom teacher of core academic subjects be highly qualified by the end of the 2005-2006 academic year ([www.nea.org](http://www.nea.org)), and that there are improvement in the basic skills of all students in English Language Arts, Mathematics and Science.

Each year, public schools under the mandate of No Child Left Behind (NCLB) were required to demonstrate students' proficiency through state assessments. In the State of Maryland, the High School Assessment (HSA) was administered in the spring to test students' proficiency in Math, English, Science and Government.

For this study, the Government HSA scores would not be included (neither for 2011, 2012 or 2013) due to the elimination of that course in 2011 and its reinstatement in 2012 -2013 by the Governor of the State of Maryland. However, the results of Maryland's High School Assessment's (HSA) in English, Math and Science were as follows: Student results from 2011 were 83.9%, 88.3%, and greater or equal to 95% (10<sup>th</sup>, 11<sup>th</sup> and 12<sup>th</sup> graders respectively). In the 2012 academic school year, the results were 75.5%, 87.2%, and greater or equal to 95% (10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> graders respectively). Students' results from 2013 made major gains compared to the scores in 2011. The percentage of HSA requirement met by students who took all three exams for 2013 school year were 84.1%, 89.1%, and greater or equal to 95% (10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> graders respectively) (Maryland State Department of Education – Fact Book, 2013; and [www.mdreportcard.org](http://www.mdreportcard.org)).

### **Statement of the Problem**

Although the implementation of the No Child Left Behind (NCLB) Act continue to serve as a federal school reform effort, numerous challenges remain in regards to making significant

increases in student achievement (Dupriez, 2003; Mathews, 2004). Nevertheless, states are held accountable for improving students' academic performance, as measured by state assessments, and graduation rates. As a result, policymakers and school administrators are searching for creative ways to raise student proficiency in English, Math and Science, while building a cadre of highly qualified teachers to teach students in core subject areas, and improve graduation rates so they are aligned in meeting the provisions within the mandate of the No Child Left Behind Act.

In the State of Maryland, none of the 24 school districts had shown a 100 percent proficiency on the state qualifying exams in English, Math or Science at the middle and high school level. Furthermore, the deadline which was set by NCLB, had passed that required teachers to be highly qualified in the core academic areas.

Even though Maryland has made continuous progress in staffing highly qualified teachers in classrooms where core subjects are being taught, they still fall short of the NCLB Act mandate, with 93% of their core academic teachers currently considered highly qualified. Throughout the U.S., school districts found it difficult to meet the mandate of NCLB, and therefore, filed for a waiver which essentially freed them from the restrictions of the mandate and allowed the states flexibility in pursuing new and better ways to improve teacher quality, academic performance among all students, particularly minorities, and graduation rates.

There are growing concerns in the decline in academic achievement among U.S. students at both the elementary and high school level. Hanushek (2002) observed that U.S. students started out doing well in elementary grades and then faded by the end of high school, compared to international students on International Student Assessments. For example, fourth through tenth grade students were administered the 2000 Programme for International Student

Assessment (PISA), which assessed their knowledge in reading, mathematics, science and civics. Thirty percent of industrialized nations scored significantly above the U.S. at either the middle or the secondary grade level (Hanushek, 2002). One of the possible reasons behind the U.S. decline in academic achievement in those subject areas, particularly mathematics, was attributed to teacher quality (Hanushek, 2002). The purpose of this study was to examine the relationship between the percentage of highly qualified teachers in a school and students' academic achievement, and graduation rates.

### **Purpose of the Study**

The purpose of this study was to examine the relationship between the percentage of classes taught by highly qualified teachers (HQT) and students' academic achievement, as measured by students' passing rates on Maryland's High School Assessment (HSA), and graduation rates among secondary students within twenty four public school systems for three academic school years (2011, 2012 and 2013) in the State of Maryland. This study would collect and analyze non-experimental quantitative data from Maryland's standardize assessment (HSA) in Math, Biology and English, over a three year period (2011, 2012 and 2013). Also, this study would collect and analyze data on the percentage of courses taught by highly qualified teachers and the four year graduation rates for each of the cohort years (2011, 2012 and 2013). This study could provide information that would help federal, state and local leaders determine whether the mandate for highly qualified teachers would be necessary to significantly impact student achievement and graduation rates.

## **Research Questions**

The following research questions are developed to provide structure to the study for the purpose of data collection and analysis. This non-experimental quantitative descriptive research study focuses on two central research questions which guide the current study:

- 1) Are there statistically significant relationships between the percentage of classes taught by highly qualified teachers and students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012 and 2013)?
- 2) Are there statistically significant relationships between the percentage of highly qualified teachers and students' graduation rates, over a three year period (2011, 2012 and 2013)?

## **Null Hypotheses**

The following null hypotheses were designed to address the research questions in this study:

- 1) The between-county (differences between counties) percentage of highly qualified teachers was not significantly related to students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012, and 2013).
- 2) The within-county (differences between school years) percentage of highly qualified teachers was not significantly related to students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012, and 2013).

- 3) The between-county (differences between counties) percentage of highly qualified teachers was not significantly related to students' graduation rates, over a three year period (2011, 2012 and 2013).
- 4) The within-county (differences between school years) percentage of highly qualified teachers was not significantly related to students' graduation rates, over a three year period (2011, 2012 and 2013).

### **Potential Significance**

This study was important to examine as policy makers and district school leaders race against the clock to meet the mandate of the No Child Left Behind (NCLB) Act of 2002, which required all students to reach high standards, at a minimum, attaining proficiency or better in Reading and Mathematics by 2013 – 2014). Additionally, a provision of the NCLB Act required that every classroom teacher of core academic subjects be highly qualified by the end of 2005-2006 academic school year and thereafter ([www.nea.org](http://www.nea.org)).

After reviewing the research on the relationship between teacher quality and student achievement, Goldhaber and Anthony (2003) concluded that teacher quality had the largest impact on student achievement among all education factors and school resources. Researchers had also revealed that teachers are the key to the successful learning of students, and high quality teachers could raise student achievement (Collias, Pajak, & Rigden, 2000; Ferguson, 1998; Goldhaber, 2002; Rivkin, Hanushek, & Kain, 2005; Kaplan & Owings, 2001; Wright, Horn, & Sanders, 1997). Darling-Hammond's (2000) data from a 50-state survey revealed that teacher quality variables (e.g. holding full certification and a major in the field), appeared more

influential than student demographic characteristics in predicting student achievement and it was a stronger correlate of student achievement than class size, overall spending, or teacher salaries.

In the State of Maryland, it was not known what effect highly qualified teachers had on the secondary students' levels of academic achievement, as measured by the State of Maryland's High School Assessment (HSA), and graduation rates. Therefore, it was appropriate in considering this study, which could provide information that determines if highly qualified teachers impact students' academic achievement, as well as, assist policy makers and district school administrators in deciding which teachers would be hired, and those educators who would be scheduled to teach subjects that are tested by the state. Moreover, if students are able to pass the state tests then the graduation rates would increase. This would be highly important to high school administrators because the graduation rate could be used to invoke "safe harbor," which is a provision under No Child Left Behind (NCLB) Act that allowed schools to get credit for making significant improvement even if they missed a proficiency target goal, as measured by the Annual Yearly Progress (AYP) report. Equally important, in schools where there was a large population of minority students that are being taught by teachers who are not highly qualified, discussions could be made which lead to policy changes related to requirements that enable teachers to obtain highly qualified status.

### **Assumptions**

The following assumptions were made which impacted the data of this study:

- 1) This study assumed that state standardized tests were administered under the guidance of and meet state regulations and standards for testing. Further, this study assumed that state authorized procedures and regulations were utilized for all students.

- 2) This study assumed that all schools within this system were unique and made a conscious effort to improve academic achievement.
- 3) This study assumed that student academic achievement were a priority for all schools considering the implications of local, state and federal policies. Further, this study assumed that school systems took a vested interest in the academic achievement and experiences of all students.
- 4) This study assumed that highly qualified teachers were equal to a high quality teacher.

### **Limitations**

The limitations impacting this study consist of the following:

- 1) The study examined students' academic achievement for school years 2011, 2012 and 2013 only.
- 2) The study did not examine all differences between schools and other variables that might have also affected achievement.
- 3) This study examined the highly qualified teacher (HQT) data for the school years 2011, 2012 and 2013 only.

### **Definitions of Terms**

Key terms are defined as follows:

- 1) *Academic Achievement* – In this study academic achievement was measured by increases in students' performance on state standardized tests.
- 2) *Adequate Yearly Progress (AYP)* – According to the Maryland State Department of Education (MSDE, 2014), AYP was a No Child Left Behind requirement: AYP was used



as a measure of schools, school systems, and the state for the purpose of meeting federal benchmarks. Standards or targets are associated with each benchmark and are categorized as Below Proficient, Proficient, or Advanced. Some indicators meet AYP via “appeals, confidence intervals safe harbor, or additional methods as defined in the accountability workbook” (MSDE, 2014).

- 3) *Common Core State Standards Initiative (CCSSI)* - The Common Core State Standards Initiative was a collaborative effort of the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO) to develop quality academic standards in the core subject areas that could be used in common by states across the nation. This initiative, created in 2009, provided consistent guidelines for what every student should know and be able to do in Math and English language arts from kindergarten through 12<sup>th</sup> grade (CCSSI, 2010).
- 4) *Core Academic Subjects* – This term “core academic subjects” means: English, Reading or Language Arts, Mathematics, Science, Foreign Languages, Civics and Government, Economics, Arts, History, and Geography (NCLB definition, Title IX, Section 9101).
- 5) *Graduation rate* – This term referred to the “percentage of students who entered ninth grade in a given year and were in the graduating class four years later” (MSDE, 2014). Although this study examined the four year graduation rate of students who completed all of the state requirements for graduation in school year 2011, 2012 and 2013, the State of Maryland also looked currently at five year graduation rates as well.
- 6) *Highly qualified teachers* – As defined by the NCLB Act, HQTs are teachers who had full state certification and had demonstrated content mastery or competency in each core academic subject they taught. In order to receive certification, all HQTs must have

passed the state academic subject test (PRAXIS) in each content area he/she has sought certification. (<http://www.ed.gov/nclb/methods/teachers/hqtflexibility.html>).

- 7) *High School Assessment (HSA)* – The HSAs are four tests (Algebra/Data Analysis, Biology, English and Government) that measure school and individual student progress toward Maryland’s High School Core Learning Goals. Passing the HSA are part of the graduation requirement, which started with the graduation class of 2009.
- 8) *HOUSSE* – This term referred to the State’s High Objective Uniform State Standard of Evaluation (HOUSSE) as mandated by federal legislation in conjunction with the No Child Left Behind Act of 2001. By definition, it was “an assessment system that would be used to verify a veteran teacher’s competency in academic subjects in which the teacher has taught.”
- 9) *No Child Left Behind (NCLB)* – NCLB was an amendment of the Elementary and Secondary Education Act of 1965 (Source Watch, 2011). States were mandated to give students annual standardized tests and show improvement. By 2014, all students were expected to be “proficient.” When benchmarks were not met, states were penalized in a number of ways including a reduction in federal education funding (Source Watch, 2011).
- 10) *Secondary Students* – This term referred to students in grades 9 – 12.
- 11) *Standardized tests* – This term referred to the tests that were created, generated and mandated by the state department of education as a requirement for graduation and secondary education matriculation. The successful completion of those tests were required for a student to receive his/her high school diploma.

### **Organization of the Remainder of the Study**

This study was organized into three chapters. Chapter 1 provided the introduction and overview of this study, background of the study, statement of the problem, purpose of the study, research questions, null hypotheses, potential significance, assumptions and limitations of the study, and definitions of important terms. Chapter 2 would provide a detailed review of the literature related to highly qualified teacher (HQT) and how the mandate legislate the expectation of success for all students. Chapter 3 would contain the study's methodology including the overview of this study, rationale and approach, research questions, null hypotheses, research design and procedure, population and sampling procedure, instrumentation, validity and reliability of the study, and data collection. Chapter 4 would contain a descriptive summary of the school systems used in this study, a discussion of the data analysis procedures, the results for both research questions and a summary of the research findings. Chapter 5 would provide a summary of the study and findings, limitations of the study, conclusions drawn, implications and recommendations for future research and practice.

## CHAPTER TWO

### REVIEW OF LITERATURE

#### Introduction

The purpose of this study was to examine the relationship between the percentage of classes taught by highly qualified teachers (HQT) and students' academic achievement, as measured by students' passing rates on Maryland's High School Assessment (HSA), and graduation rates among secondary students for three academic school years (2011, 2012 and 2013) in the State of Maryland. Improving academic achievement are challenging goals and would require a broad examination of the issues which would impact academic achievement attained within school systems and the quality of educators within school systems (Hargreaves, 2004; Ingersool, 2004). The No Child Left Behind (NCLB) Act of 2001, specifically outlined required performance and accountability measures directed at addressing concerns over teacher quality and student achievement in American schools. This piece of legislation, an amendment of the Elementary and Secondary Education Act of 1965, guaranteed the staffing of highly qualified teachers (HQT) in every classroom (Congressional Record, 2001; U.S. Department of Education, 2004). The ultimate goal was to insure that all classroom teachers of core academic subjects (i.e. English, Reading or Language Arts, Mathematics, Science, Foreign Languages, Civics and Government, Economics, Arts, History and Geography) are highly qualified by the end of 2005 – 2006 academic school year ([www.nea.org](http://www.nea.org)).

Using the NCLB Act only as a guided policy in addressing this study, the chapter would review the literature on teacher qualifications and research linking student achievement to highly

qualified teachers. This chapter would be divided into four sections. The first section examined the literature on teacher qualifications (i.e. Teacher Certification, Teacher Degree Level, Subject Matter and Knowledge). The second section would examine the literature on Highly Qualified Teachers and how teacher quality would be defined. This would be followed by a review of the literature that would examine Standardized Tests and Maryland's High School Assessment (HSA). Last, this section would examine literature linking student academic achievement to highly qualified teachers.

## **Teacher Qualifications**

### *Teacher Certification*

Laczko-Kerr & Berliner (2002) reported that the purpose of teacher certification (license to teach) was to ensure that every public school teacher had rigorous screening and training, and was judged qualified to teach. However, Ingersoll (1996) revealed that having teacher certification does not guarantee quality teachers or quality teaching. Goldhaber and Brewer's (2000) study, on the other hand suggested that there are "strong relationships between state certification policies and student outcomes" (p. 141). Shen and Poppink (2003) found that over a twelve-year period (1987-1988 to 1999-2000), the percentage of teachers uncertified in their primary teaching assignments increased from 2.7 to 5.7 in public schools nationwide. They further contend that urban schools had higher percentage of uncertified teachers and a higher percentage of teachers with less certification (i.e. temporary certificates, emergency certificates and waivers) than suburban and rural schools in their primary teaching assignments (Shen and Poppink, 2003). These findings reflected Betts, Reuben and Danneberg (2000) study which found that there are disproportionately higher percentage of uncertified teachers in high-poverty and high-minority enrollment schools. In 2010, states reported a total of 313,787 initial teaching

license or certification issued in AY 2008-2009. Table 1 and 2 listed the total number of teachers receiving initial certification or licensure, by state: AY 2000-2001 through AY 2007-2008 (U.S. Department of Education – Office of Postsecondary Education, 2011).

Teacher certification requirements vary from state to state in terms of the number of credit hours in a particular subject area, the content of the licensing exam, and the passing score on the exam. Those states requiring testing as a part of the initial teacher certification process might require passing scores on various teaching assessments (e.g. Basic Skills, Subject-Matter, and Knowledge of Teaching) before permission would be granted to teach in that state. Table 3 lists those states that participated in the assessment process in 2010 and 2011 (National Center for Education Statistics & National Association of State Directors of Teacher Education and Certification, 2011).

Darling-Hammond's (2000) research revealed that certification status was significantly and positively related to student achievement when aggregated at the state level for fourth and eighth grade mathematics assessments. Similarly, Goldhaber and Brewer (2000) revealed that 12<sup>th</sup> grade students of teachers with standard state certification in mathematics performed better than students whose teacher was uncertified.

In spite of the numerous empirical data reporting that teacher certification increase student achievement, there are a growing number of researchers who disagreed with the findings of the certification research. In fact, several recent studies had shown no statistically significant differences between students taught by teachers with advanced degrees and those taught by teachers lacking advanced degrees (Croninger et al., 2007; Nye et al, 2004; and Rivkin et al., 2005). A study conducted by Decker, Mayer, and Glazerman (2004) examined the achievement of students who were taught by Teach for America teachers and those taught by control teachers

(i.e. teachers traditionally certified, alternatively certified, and uncertified). The researchers used Grades 1-5 data from 17 schools, 100 classrooms, and 2,000 students in Baltimore, Chicago, Los Angeles, Houston, New Orleans, and the Mississippi Delta during the 2002-2003 school year. The results from this study found that Teach for America teachers had a positive impact on their students' mathematics achievement (Decker, Mayer, and Glazerman, 2004). Specifically, students taught by Teach for America teachers gained approximately one additional month of mathematics instruction compared with the control teachers. However, there were reported no significant differences between Teach for America and control teachers' student achievements in reading.

### *Teacher Degree Levels*

One of the criteria of a highly qualified teacher, under the No Child Left Behind (NCLB) Act, was to obtain at least a bachelor degree. A survey of teachers, conducted by the National Center for Education Statistics in 1998, indicated that nearly all public school teachers had at least a bachelor degree and about half of all teachers had a master's degree (Lewis et al., 1999). However, fewer teachers had degrees specific to the subject area that they were teaching (Goldhaber and Brewer, 1996). This study further revealed that the impact on student achievement was seen best when teachers had degrees in subjects similar to the subject area they taught, implying that teachers who pursue subject-specific degrees or advanced degrees in the subject they taught would strengthen their subject matter knowledge which would positively impact student achievement (Goldhaber and Brewer, 1996).

There are mixed results on the effect of teacher's degree level on student achievement (Hanushek, 1986). Greenwald et al. (1996) review of the literature found that teachers with master's degrees had a significantly positive effect on student outcomes in 15 percent of the

cases reviewed and a significantly negative effect in 13 percent of the cases. Goldhaber and Brewer's (1996) review of data from the National Educational Longitudinal Study of 1988 (NELS: 88), revealed that certified teachers in mathematics and those with a bachelors' or masters' degree in mathematics and science had a positive impact on student achievement. Conversely, the researchers' study also revealed that teachers with degrees in science and mathematics had less influence on student achievement in English and history, suggesting that it is the subject-specific training rather than teacher ability that results in improved performance (Goldhaber and Brewer, 1996). They further contend that teachers' advanced degrees showed no evidence of increasing student achievement from the eighth to the tenth grade. However, it was reported in this same study that teachers who taught math and science with advanced degrees impacted students' achievement in those academic subject areas (Goldhaber and Brewer, 1996).

Collectively, the body of research reviewed on "teacher degree levels" revealed very small statistical impact on student's academic achievement from teachers having degrees in subjects outside of the area in which they have taught. The implications from this research finding simply indicated that teachers, specifically secondary teachers, should obtain a subject-specific degree or advanced degree in the subject area being taught if they are to strengthen their subject matter knowledge, which would ultimately impact student achievement.

### *Teacher Subject Matter Knowledge*

Rotherham and Mead (2003) contend that an important step in improving student achievement was requiring all teachers to possess strong content knowledge in the subject area in which they taught. For example, an analysis of the National Educational Longitudinal Study of 1988 (NELS: 88) by Goldhaber and Brewer (1998, 2000) revealed that teachers trained in subject-specific areas such as mathematics and science had a significantly positive impact on



student achievement among 10<sup>th</sup> graders. Similar findings from Chaney (1995) and Rowan et al. (1997) study revealed that students who had a teacher with a major in mathematics at the undergraduate and / or graduate level showed increased gains in math. Other researchers had also reported on this teacher characteristic and claimed that teachers' subject knowledge had positive impact on student achievement (Betts and Frost, 2000; Ferguson & Womack, 1993; Hawk, Coble, & Swanson, 1985, Monk & King, 1994). Teacher subject knowledge was vital to improving student achievement, which was the reason why No Child Left Behind (NCLB) Act had required that all teachers demonstrate rigorous subject-matter preparation either through adequate performance on a test or through successful completion of a major, graduate degree or advanced credentialing (U.S. Department of Education, 2002).

In conclusion, the consensus from the limited amount of literature reviewed on teachers' subject matter knowledge, was that there are significant connections between teachers' subject matter knowledge and student academic achievement. Further, it was clear that as the content material became more difficult, particularly at the secondary level, so did the need for teachers to have a greater understanding of the subject content materials being taught.

### **Highly Qualified Teachers**

Highly qualified teachers, as defined by the No Child Left Behind (NCLB) Act, are teachers who had full state certification, demonstrated content mastery or competency in each core academic subject they had taught, and at a minimum had a bachelor degree (NCLB, 2003). Researchers had agreed that teacher preparation and qualification are important factors that had influence on student achievement (Darling-Hammond, 2000b; Ferguson, 1991; Goldhaber & Brewer, 2000; Laczko-Kerr & Berliner, 2002; Monk, 1994; Wenglinsky, 2000). Darling-Hammond (2000b) used data from a 50 state survey of policies, state case study analysis, the

1993-94 Schools and Staffing Surveys (SASS), and the National Assessment of Educational Progress (NAEP) and found that the following aspects of teacher qualifications were connected to student achievement: a) general academic and verbal ability; b) subject matter knowledge; c) knowledge about teaching and learning as reflected in teacher education courses or preparation experiences; d) teaching experience; and e) the combined set of qualification measured by teacher certification.

Even with the growing consensus among researchers that teacher preparation and qualification are important to insure the highest quality of teaching, in terms of what would be effective in bringing about positive student attainment, there still remained a heated debate within the educational community regarding these concepts as it related to a highly qualified teacher. Much of the focus centered around the following question: Which knowledge was more important for a teacher to gain, pedagogical or subject matter knowledge? The belief among policymakers and researchers was that subject knowledge played a vital role in student achievement. Goldhaber & Bredwer (2000) contend that all teachers should possess strong knowledge of the subject being taught because it has an essential element that positively affects teaching performance and student achievement. In support of this study, similar research revealed that at the secondary level, college training in the subject area being taught was one of the most important characteristics of a qualified high school teacher (Ingersoll, 1996).

There were differences in opinion regarding the amount of content knowledge one would need to be considered highly qualified. While some researchers (Ingersoll, 1997) debated that a secondary school teacher should at a minimum have a college minor in the subject being taught in order to be classified as highly qualified, antagonists (Goldhaber & Bredwer, 2000) opposed

this notion, and suggested that secondary school teachers should obtain an academic degree or advanced degree in the subject area being taught.

According to one provision of the No Child Left Behind Act, highly qualified teachers must demonstrate content mastery or competency in each core academic subject being taught. Defining competency may differ depending on a teacher's grade level, and whether he or she was a veteran or novice to the subject area being taught (NCLB, 2003). For example, Secondary teachers who were new to the profession would take either of the following steps to demonstrate their subject matter competence: passing a rigorous exam (PRAXIS), possessing an academic major or equivalent coursework, graduate degree, or advanced certification or credentialing (e.g. National Board Teacher Certification) in the subject being taught. Veteran teachers may demonstrate their competency in the core academic subject area by possessing the following criteria: 1) Bachelor's degree; 2) Full state certification (no emergency certificates); and 3) showing that they had sufficient content knowledge either through taking a subject matter test; state-developed high, objective uniform state standard of evaluation (HOUSSE); Advanced certification or credentials in the subject area being taught (U.S. Department of Education, 2004).

Many debates continue among policymakers, researchers and educators with respect to the importance of pedagogical preparation for teachers. For example, some researchers argued that the ability to teach was an innate characteristic, suggesting that it required little to no formal teacher preparation, while others opposed the previous finding and contend that highly qualified teachers needed multiple forms of knowledge and skills (which must be taught or learned) in order to impact student achievement (Shen and Poppink, 2003). Darling-Hammond (2000b) discovered that the most significant predictors of student achievement was having both full

certification and a major in the content area being taught. Conversely, she further argued that uncertified teachers, and those who held less than a minor in the content area being taught, was less of a predictor and therefore, had a negative impact on student achievement (Darling-Hammond, 2000b). In concert with Darling-Hammond's work, Grossman (1990) reported that it was important to consider both the subject matter knowledge teachers brought to the classroom and their pedagogical content knowledge if they are to see significant gains in student academic achievement, particularly at the secondary level. Simply, even though subject knowledge was important for teaching, it did not give teachers the pedagogical skills needed for teaching a wide range of students (Grossman, 1990).

Opposing views still existed among researchers and policymakers on how highly qualified teachers are defined. However, the general public was quite clear of its meaning based on one provision of the No Child Left Behind (NCLB) Act. According to the NCLB definition of "highly qualified teacher," a teacher must have at a minimum a bachelor's degree, full state certification and competence in subject area being taught.

Research indicated that students learn more from teachers with more relative experience teaching in the classroom. Ferguson (1991), stated that teachers' experience was significantly related to gains in students' math and reading achievement scores. Ferguson's study contend that the more experience a teacher had, the higher the scores were among students who took math and reading. In primary years of schooling, researchers reported that additional experience did not add to teacher effectiveness (Ferguson & Ladd, 1996; Goldhaber, 2002). Conversely, high school teachers who had taught for five years, their effect on students' academic achievement increased, and after nine years there was a significant increase in their effect on students' academic achievement (Ferguson & Ladd, 1996; Goldhaber, 2002). Researchers had

found differences in gains posted by students in classrooms, with new teachers and experienced teachers reporting over one-third of a standard deviation (0.35) in reading and almost one-half of a standard deviation (.48) reported in math (Nye, Konstantopoulos, & Hedges, 2004). Grissmer, Flanagan, Kawata & Williamson (2000), reported that teachers with more relative experience produced greater gains in academic achievement than teachers with master's degrees.

### **The Impact of Highly Qualified Teachers on Student Achievement**

Although there are differences in opinion on how to define or measure teacher quality (Lu, 2005), Lewis et al. (1999) referred to teacher quality in two broad terms: teacher preparation and qualifications, and teaching practices. Similarly, Goe's (2007) research on teacher quality focused on four categories of teacher quality indicators: 1) teacher qualifications; 2) teacher characteristics; 3) teacher practice; and 4) teacher effectiveness, which Goe believed captured the primary variables examined empirically in research studies on teacher quality published between 2000 and 2007.

Langer (2001) conducted a two year study examining the performance of students in the areas of reading, writing, and English. The study involved 88 classrooms that were representative of schools in California, Florida, New York, and Texas. The findings from Langer's (2001) research revealed that students performed higher on these assessments than expected with more skilled teachers. Ferguson (1999) stated that highly qualified teachers had an increasing effect on students' performance; therefore, students who had scored lower in early grades might still earn higher scores in upper grades, if instruction was provided by quality teachers.

Research conducted in the San Diego Unified School District related student and teacher data in elementary through high school, using 1998 – 2000 data (Betts, Zau, & Rice, 2003). This study consisted of teachers and students in 123 elementary schools, 24 middle schools, 17 high schools, and 5 charter schools. The following teacher quality variables were considered in this study: experience, level of education, credentials, and subject matter knowledge. Findings from this study revealed elementary students performing lower in mathematics and reading when taught by a teacher with less than 1 year experience or a teacher without full state certification (Betts, Zau, & Rice, 2003). Also, Betts et al. (2003) further revealed that math scores significantly increased more in elementary students who were taught by a teacher with a master's degree than teachers with only bachelors' degrees. In middle and high school, student scores in both mathematics and reading were negatively impacted by having a teacher who were not fully state credentialed.

Research conducted by Aaronson, Barrow, and Sanders (2003) reported that teacher qualifications varied with higher student achievement by grade level. Specifically, their study revealed that there was a stronger correlations between the achievement of secondary school students and their teacher's subject area expertise than exist between the success of younger students and their teacher's subject area expertise (Aaronson, Barrow, and Sanders, 2003).

Goldhaber and Brewer (1996) conducted a study of teachers' degrees and its impact on students' performance in the areas of mathematics, science, English, and history, utilizing the data from the National Educational Longitudinal Study of 1988 (NELS: 88). Research finding from their study revealed that teachers certified in mathematics and those with bachelors' or masters' degrees in mathematics and science were associated with higher student performance

scores (Goldhaber and Brewer, 1996). Cooper (2008) contend that teachers and administrators skills were sharpened when they earned advanced degrees.

Goe and Stickler (2008) conducted a controlled study of middle school mathematics and reported that students of fully certified mathematics teachers experienced significantly larger gains in achievement than those taught by teachers not certified in mathematics. Other researchers contend that having some type of advanced degree has proven to yield positive effects on student achievement at the secondary level, especially in the mathematics subject area (Clotfelter, Ladd, & Vigdor, 2007). Jacob (2012) identified three teacher qualities that affected student outcomes: graduate degrees, licensure, and experience. She reported that advanced degrees were signals that teachers had advanced knowledge of how students learn and grow, and knowledge of how to best facilitate student's learning (Jacob, 2012). Further, Jacob's (2012) study revealed that teachers who had certification or state licensure had a certain level of knowledge of subject matter and preparation.

### **Standardized Tests**

Since 1979, numerous states had required that high school students pass exit-level standardized assessments before graduation (Glenn, 2006). Standardized testing dates back to the 1840's and were used in the following manner: for diagnostic purposes, to determine student's strengths and weaknesses, and to guide future instruction (Koretz, 2008). Since the passing of the No Child Left Behind (NCLB) Act, policymakers and school administrators had approached the use of standardized test scores as a means of accountability (Koretz, 2008). Moreover, almost every state has made standardized testing mandatory and have gone through great lengths to ensure that identical content and scoring methods are utilized so that performance and learning could be uniformly measured (Koretz, 2008).

The enactment of the No Child Left Behind Act essentially focused on two specific areas: a) that students obtain the skills necessary to be proficient in reading and mathematics; and b) that states meet Adequate Yearly Progress (AYP) by administering state generated exams (accountability) which students must successfully pass prior to graduation (Greene, 2005). Although the NCLB policies did not require exit level testing as a criterion for graduation, it did require schools to take graduation rates into account when calculating and reporting AYP data. As a result, schools are finding it challenging to meet the AYP objectives (Erpenbach & Forte, 2006).

The standardized assessments, which were considered as exit level tests, were also regarded as high stakes because they provided the schools and state with a meaningful way to measure accountability (Cortiella, 2010). Further, for students, standardized assessments were high stakes because it determined whether the material had been mastered and whether students were truly college prepared and career ready (Popham, 2008). Skeptics, however, caution the reliance upon standardized assessments (as an exit requirement) because it might prevent students who had otherwise completed all their course work from receiving their diploma (Glenn, 2006).

### **Maryland High School Assessment (HSA)**

In addition to meeting the State of Maryland's course and service learning hour requirements, high school students must also pass the High School Assessments (HSA) in Math, English, Science and Government before a diploma could be granted. Government HSA had been reinstated in 2011 as a requirement for seniors graduating in 2014-2015 and beyond. Each HSA required students to learn a multiplicity of skills and competencies (Maryland State Department of Education, 2004).



In June 2004, the Maryland State Board of Education ruled that, starting with the graduating class of 2009, all Maryland students had to pass the High School Assessments before receiving their diploma. Currently, there are four subjects in which students had to pass HSAs: English, algebra/data analysis, biology, and government (Maryland State Department of Education, 2004). The Maryland High School Assessments (HSA) measured school and student progress toward Maryland's High School Core Learning Goals. Fulfilling the HSA portion of Maryland's graduating requirements might be done so by either of the following:

- 1) Taking all four HSA's in algebra/data analysis, government, biology, and English, and receiving a passing scores of 412, 394, 400 and 2005 respectively. Students' scores on these high school assessments are reported as scale scores which range from 240 to 650. Scale score are used to provide a more precise measurement of a student's achievement and to assure that tests given at different times are comparable.
- 2) Earning passing scores on state-approved substitute tests (i.e. Advanced Placement and International Baccalaureate tests) and substitute one or more of those scores for passing scores on the HSA.
- 3) Earn a minimum score on each test and earn a combined score that's equal to the total of four HSA passing scores. This combined score option allowed the student to offset lower performance on one test with higher performance on another (Maryland State Department of Education, 2011).

If students were unsuccessful in passing the HSA during the first attempt, they could schedule to retake either of the assessments in January, May or during the summer. An option for students with disabilities who had difficulties in passing either of the four HSA would be to take the Modified HSA for that particular assessment. The only difference in the HSA and

Modified HSA (Mod-HSA) was the way in which the questions were formatted (Maryland State Department of Education, 2011).

### **Student Academic Achievement**

Researchers had revealed that teacher preparation and qualification were important predictors of student academic achievement (Darling-Hammond, 2000b; Ferguson 1991; Goldhaber & Brewer 2000; Laczko-Kerr & Berliner, 2002; Monk, 1994; Sanders & Rivers, 1996). Jehlen (2009) reported that current test scores showed marked increases in academic achievement based on student success on standardized test assessments. On a national level, others had reported that the academic achievement of American students had fallen behind compared to students in numerous foreign countries, particularly as related to student performance in mathematics and science (New America Foundation, 2008; Stukart & Glanz, 2007; Turner & Rios, 2008; Warren & Kulick, 2007; Werblow & Duesbery, 2009).

Research conducted by Talbert-Johnson (2004) revealed that teacher preparation was an integral factor in increasing student academic achievement. Further, his research suggested that regardless of ethnicity, student academic achievement demanded qualified educators who were skilled, prepared and equipped in the subject area in which they taught (Talbert-Johnson, 2004). White (2007) research suggested that student academic achievement are hindered by the lack of quality teacher placement in local schools, which could be controlled by district administrators.

### **Summary**

The literature reviewed had pointed to the importance of teacher quality on students' academic achievement and graduation rates. Simply, teachers who were highly qualified in the subject being taught were strong predictors to students' academic achievement and ultimately the

student's success of reaching graduation. It was important to note that a prevailing theme in the literature review was that teachers with full certification seemed to produce higher student achievement than teachers without full certification (Fetler, 1999; Hawkins et al., 1998; Hawkins et al.; 1998; NCES, 2002).

The proposed study would focus on the relationship between the percentage of classes taught by highly qualified teachers (HQT) and student's academic achievement, as measured by students' passing rates on Maryland's High School Assessment (HSA), and graduation rates among secondary students within twenty four public school systems for three academic school years (2011, 2012 and 2013) in the State of Maryland. The findings from this study would be essential to school districts administrators as they work to fulfill the mandate of the No Child Left Behind (NCLB) Act, by increasing the number of highly qualified teachers in classrooms where core subjects were being taught, ensuring at a minimum that students were proficient or better in Reading and Mathematics by 2013-2014 and beyond, and that states met Adequate Yearly Progress (AYP), which are the gauge by which improvement in these subject areas would be measured.

## CHAPTER THREE

### METHODOLOGY

#### Overview

The purpose of this study was to examine the relationship between the percentage of classes taught by highly qualified teachers (HQT) and students' academic achievement as measured by students' passing rates on Maryland's standardized test, High School Assessment (HSA), and graduation rates for three academic school years (2011, 2012 and 2013) in the State of Maryland.

Improving academic achievement remained a complex issue and continued to require a broad examination of the issues which impacted academic achievement attained within school systems, and the quality of educators who taught within school districts (Hargreaves, 2004; Ingersoll, 2004). Jehlen (2009) indicated that the implementation of the No child Left Behind Act of 2002 was not only intended to bring about a sense of reform in the US educational system but it was intended to shame schools into making needed improvements. Nevertheless, highly qualified teachers were a needed element to secure increased academic achievement from students (Arnette, 2009).

Former US Secretary of Education, indicated that improvements in student achievement might directly relate to teacher quality (Spellings, 2005). Researchers had agreed that the quality of the educators in every school system reflected and impacted the overall quality of the school system and the students' potential within the school system (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Kennedy, 2008; Darling-Hammond & Youngs, 2002; Walsh,

2001; Goldhaber & Brewer, 2000; Hickman, Bartholomew, Mathwig, & Heinrich, 2008; and Arnette, 2009).

In the State of Maryland, it was not known what effect highly qualified teachers had on the secondary students' levels of academic achievement, as measured by the State of Maryland's High School Assessment (HSA), and graduation rates. Maryland had made substantial gains towards applying the standards of the No Child Left Behind (NCLB) Act in terms of the number of highly qualified teachers being staffed in core subject areas, increases in the graduation rates since 2012, and the number of students passing the High School Assessments in mathematics, English and science (Maryland State Department of Education, 2007). However, even with those significant improvements towards teacher quality and student academic achievement there remain no empirical data that significantly link the increase in students' academic achievement, as measured by the High School Assessment (HSA), and graduation rates to teacher quality in Maryland's secondary schools.

The data gathered was analyzed to determine the extent to which highly qualified teachers' impact academic achievement and graduation rates among secondary students. This would be done by comparing academic achievement and graduation rates of students to the level of highly qualified teachers maintained within each school system over a three year period (2011, 2012 and 2013).

This study would use non-experimental quantitative descriptive research methods to compare highly qualified teacher measurable data and its impact upon students' academic achievement and graduation rates. This quantitative study would examine the relationship between the percentage of classes taught by highly qualified teachers (HQT) and students' academic achievement, as measured by students' passing rates on Maryland's High School

Assessment (HSA), and graduation rates among secondary students within twenty four public school systems for three academic school years (2011, 2012 and 2013) in the State of Maryland. This non-experimental quantitative study would be based on archival data. The independent variable throughout this study consist of the highly qualified teacher data. Conversely, the dependent variables include the academic achievement data (student passing rates on the Maryland High School Assessment) and graduation rates. The premise of this study was that academic achievement and graduation rates of secondary students were dependent upon highly qualified teachers. All data would be acquired from archival data provided from the Maryland State Department of Education.

This chapter would begin with the rationale and approach. The following section would describe the research questions and hypotheses in order to provide structure to the study. Next, this chapter would explain the methodological procedures, population and sampling procedures, instrumentation, validity, reliability, and data collection.

### **Rationale and Approach**

A non-experimental quantitative descriptive research design was selected for this study because the researcher felt that the data would help explore a phenomenon in its present state without modifying the variables under study (Leedy & Ormrod, 2004). This study used a descriptive and correlational research design in an effort to examine the statistical relationship between the identified variables of this study (highly qualified teacher data, academic achievement and graduation rates data).

Gall, Gall, and Borg (2003) indicated that the use of quantitative research allowed the researcher to obtain large amounts of data, and thus provide a sense of ease and reliability to the

researcher's attempts to explore and explain a particular phenomenon. Creswell (1996) defined quantitative research as "an inquiry into a social or human problem based on testing a theory composed of variables, measured with numbers, and analyzed with statistical procedures, in order to determine whether the predictive generalizations of the theory held true" (p.2). Henning (1980) further defined quantitative research as, "the kind of research that involved the tallying, manipulation, or systematic aggregation of quantities of data" (p.701). Such research used statistical procedures to summarize and analyze numerical data which revealed correlation and relationships of multiple variables (Burns & Grove, 1987; Creswell, 2005; Gall, Gall, & Borg, 2003). This type of research was based on objective numerical data which could be deductively interpreted and generalized (Cormack, 1991; Duffy, 1985).

A descriptive and correlational quantitative research design might reveal relationships between highly qualified teachers and students' academic achievement and graduation rates, which could possibly offer suggestions to school administrators on how to address AYP shortfalls, and policy makers on strengthening the requirements of teachers so they are able to reach the highly qualified status which might ultimately impact student achievement and graduation rates within Maryland and other school districts across the country.

### **Research Questions**

The following research questions were developed to provide structure to the study for the purpose of data collection and analysis. This non-experimental quantitative descriptive research study focused on two central research questions which guided the current study:

- 1) Are there statistically significant relationships between the percentage of highly qualified teachers and students' academic achievement, as measured by student passing rates on

state standardized assessments in Math, Biology and English, over a three year period (2011, 2012 and 2013)?

- 2) Are there statistically significant relationships between the percentage of highly qualified teachers and students' graduation rates, over a three year period (2011, 2012 and 2013)?

### **Null Hypotheses**

The following null hypotheses were designed to address the research questions in this study:

- 1) The between-county (differences between counties) percentage of highly qualified teachers was not significantly related to students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012, and 2013).
- 2) The within-county (differences between school years) percentage of highly qualified teachers was not significantly related to students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012, and 2013).
- 3) The between-county (differences between counties) percentage of highly qualified teachers was not significantly related to students' graduation rates, over a three year period (2011, 2012 and 2013).
- 4) The within-county (differences between school years) percentage of highly qualified teachers was not significantly related to students' graduation rates, over a three year period (2011, 2012 and 2013).



## **Research Design and Procedures**

Descriptive research explores relationships between non-manipulated variables, phenomena and or existing problems with the intent of providing a potential solution (Leary, 2004). Moreover, researchers used descriptive research to explore a phenomenon in its present state without modifying the variables under study (Leedy & Ormrod, 2004). This study would use a descriptive and correlational research design in an effort to explore the statistical relationship between the identified variables of this study (highly qualified teacher data, academic achievement data and graduation rates).

Comparative analysis would be used in this study to determine whether there were some significant relationship between the percentage of classes taught by highly qualified teachers (HQT) and high school students' achievement and graduation rates throughout 24 school systems within the State of Maryland over a three year period (2011, 2012, and 2013). Inferential statistical measurements would be used to explore the possible relationship between the variables and to determine whether or not significant changes have occurred between the variables in this study. Such statistical measurements would also test the hypotheses and answer questions about the relationship between highly qualified teachers and its impact on high school students' academic achievement and graduation rates for the identified school systems within Maryland.

## **Population and Sampling Procedures**

### *Description of the State of Maryland Public School Population*

Maryland Department of Education (2013) reported having 24 school districts, 1,451 public schools and an enrollment of 859,252 students in 2012 – 2013 school year.

Enrollment figures were based on FTE (Full-Time Equivalency) counts for the Fall and Spring Semester (Maryland State Department of Education, 2013). Maryland Department of Education (2013) also reported the following: the four year cohort (students who entered school in the fall of 2009) graduation rate reached 84.97% for the class of 2013 compared to 83.57% for the class of 2012. The reported findings represented a remarkable 1.4 % increase in the graduation rate in just one year. The total number of graduates during 2013 were 58,587. Other pertinent statistics included the percent of High School Assessment (HSA) met in Biology, Math and English for school year 2013: 12<sup>th</sup> grade results were greater than or equal to 95%, 11<sup>th</sup> grade results were at 89.1% and 10<sup>th</sup> grade results were at 84%.

#### *Sampling Procedure*

This study considered the impact of highly qualified teachers (HQT) on students' academic achievement, as measured by student passing rates on the High School Assessment (in English, Math, and Biology), and graduation rates among secondary students within the State of Maryland. This study would compare data from 24 school systems within the State of Maryland over a three academic school year (2011, 2012, and 2013). The individuals in this sample would be 10<sup>th</sup>, 11<sup>th</sup>, and 12<sup>th</sup> grade students from Maryland School System who participated in the Spring Maryland High School Assessment (HSA) for academic school years 2011, 2012, and 2013.

#### **Instrumentation Used**

A quantitative analysis of data would be conducted in this study. The data would be compiled into a Microsoft Excel spreadsheet format. In addition, a Hierarchical Linear Modeling analyses would be conducted in order to determine if (1) students performed better on

High School Assessments (HSA) in counties having more highly qualified teachers or fewer (noted on the table as Between Counties) and (2) if students performed better in years when there were more highly qualified teachers (HQT) in a school district, than in those years when there were fewer highly qualified teachers (noted on the table as Between Years). A descriptive and correlational quantitative research design might reveal relationships between highly qualified teachers and students' academic achievement and graduation rates, which might offer suggestions to school administrators on how to address AYP shortfalls, and policy makers on strengthening the requirements of teachers so they are able to reach the highly qualified status which might ultimately impact student achievement and graduation rates within Maryland and other school districts across the country. The Statistical Package for the Social Sciences (SPSS) version 21.0, currently referred to as Predictive Analytics Software (PASW), would be utilized to analyze the descriptive and correlational statistics, including the Hierarchical Linear Modeling analyses.

Also, a linear Regression method would be used to answer the question of possible relationships between the dependent variables, academic achievement test scores and graduation rates, and the independent variable teacher qualification. Linear Regression methods are statistical techniques that can be used to predict the values of one dependent variable from one or more independent variables (Creswell, 2008).

### **Validity**

Construct validity was considered as tried methods of data collection because they were “significant, meaningful, useful, and had a purpose” in this study (Creswell, 2005). Therefore, the Maryland High School Assessment (HSA) and graduation rate data for each school system

would be compiled from data retrieved from the Maryland State Department of Education. This process would add consistency to data factors and formulas that would be used to determine each factor in this study. Based on the origination of the data reports for each school system from the Maryland State Department of Education, the raw data would meet the expressed content validity.

In terms of the validity of the Maryland High School Assessment (HSA), the development process provided numerous opportunities for the Maryland State Department of Education (MSDE) to review test content and make changes to ensure that the items measured the knowledge and skills of Maryland students according to course standards. Every item that were created were referenced to a particular instructional standard (i.e., goal, expectation, or indicator) ([www.marylandpublicschools.org](http://www.marylandpublicschools.org)). When the item was sent to a committee of Maryland educators for a content review, the members of the committee made independent judgments about the match of the item content to the standard it was intended to measure and evaluated the appropriateness for the age of students being tested. These judgments were tabulated and reviewed by the content experts, who used the information to decide which items would advance to the field test stage of development ([www.marylandpublicschools.org](http://www.marylandpublicschools.org)).

### **Reliability**

The data collection process would support the research reliability of this study. Sufficient data would be presented based on archival data from the Maryland State Department of Education. This study would compare data from twenty four school systems within the state of Maryland over a period of three academic school years (2010-2011, 2011-2012, and 2012-2013). All data, including graduation rates, Maryland High School Assessment (HSA) passing rates,

and teacher quality data would be retrieved from the state Report Card, produced and published by the Maryland State Department of Education.

### **Data Collection Procedures**

This study did not use questionnaires, surveys, or any other tool for collecting quantitative data. Based on the non-experimental nature of this study, this study did rely upon the collection and analysis of archival data. Archival data were considered by researchers as secondary data. Boslaugh (2007) defined secondary data as data collected by someone else for another purpose. The most typical manner in which to use secondary data for research would be to “begin with a research question and seek a data set that would allow analysis of that question” (Boslaugh, 2007, p.6). The researcher would compile data from the school system annual report cards as published by the Maryland State Department of Education (MSDE) and other reports published by MSDE such as the “Fact Book,” both of which were regulated by the Maryland State Board of Education. All data gathered for academic achievement rates and graduation rates would be gathered from Maryland’s Annual Report Cards published by Maryland State Department of Education, classified as public domain ([www.mdreportcard.org](http://www.mdreportcard.org), 2014), and transferred into a Microsoft Excel spreadsheet. Data would be entered and coded into SPSS (Statistical Package for the Social Sciences) for Windows. The same data categories would be reviewed for each school system in Maryland to ensure consistent data gathering. This information would include the following: academic achievement data including graduation rates, and passing rates on Maryland High School Assessment (HSA). In addition, highly qualified teacher data would be gathered from Maryland’s Annual Report Card published by Maryland

State Department of Education for the respective school system during three academic school years (2011, 2012 and 2013).

Due to the comprehensive nature of the data provided in the published reports, all relevant data (including facts and figures) would be extrapolated from the published reports and then summarized, tabulated, and finally analyzed for the context of this study.

**Table 1**

*Total number of teachers receiving initial certification or licensure, by state: AY 2000 – 01 through AY 2007-08*

State	Academic year								Percent change from 2000-01 to 2007-08	Percent change from 2006-07 to 2007-08
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08		
Alabama	7,329	11,651	5,633	4,063	3,929	4,292	6,014	4,096	-44	-32
Alaska	857	623	936	994	765	834	937	1,056	23	13
American Samoa	—	—	—	—	—	107	47	138	—	194
Arizona	9,041	11,241	11,174	11,093	11,643	7,395	7,184	6,852	-24	-5
Arkansas	1,950	1,631	2,053	1,693	911	1,531	1,651	1,959	0	19
California	23,926	29,536	27,136	31,397	28,039	25,879	24,176	23,320	-3	-4
Colorado	5,647	4,476	5,591	3,131	3,525	3,358	2,513	5,570	-1	122
Connecticut	3,465	3,488	3,526	3,503	3,744	3,700	4,020	2,976	-14	-26
Delaware	1,125	871	922	1,041	1,136	1,358	1,346	1,191	6	-12
District of Columbia	1,271	1,250	1,200	1,070	1,380	859	1,072	1,021	-20	-5
Federated States of Micronesia	—	—	—	—	27	—	2,123	454	—	-79
Florida	17,320	17,977	21,257	20,521	23,366	25,485	21,537	21,035	21	-2
Georgia	7,760	8,055	9,759	10,217	10,619	11,287	11,866	11,895	53	0
Guam	181	174	92	109	89	136	248	82	-55	-67
Hawaii	792	920	716	928	1,097	1,155	1,044	975	23	-7
Idaho	1,216	1,829	1,850	1,875	1,820	1,513	1,709	2,009	65	18
Illinois	8,885	9,810	11,182	11,479	9,898	13,476	14,389	10,157	14	-29
Indiana	6,389	6,629	5,687	6,027	6,067	5,548	5,017	4,865	-24	-3
Iowa	4,113	3,886	4,090	4,168	3,684	3,680	3,328	3,237	-21	-3
Kansas	1,736	1,846	1,867	2,406	2,723	2,387	2,545	2,909	68	14
Kentucky	2,519	2,657	2,980	3,319	4,333	4,364	2,385	2,230	-11	-6
Louisiana	3,749	4,558	4,198	3,903	3,492	3,143	2,892	3,098	-17	7
Maine	1,052	1,302	1,294	1,237	1,054	1,313	1,042	1,155	10	11
Marshall Islands	—	—	—	—	0	0	0	—	—	—
Maryland	4,602	4,030	4,377	3,084	4,380	4,350	4,370	4,003	-13	-8
Massachusetts	7,331	5,110	8,054	8,664	7,057	5,911	7,361	6,875	-6	-7
Michigan	6,141	8,653	7,641	8,451	8,515	8,675	8,041	7,233	18	-10
Minnesota	10,433	10,322	11,348	8,758	7,911	8,001	4,650	5,078	-51	9

*continued on next page*

**Table 2**

*Total number of teachers receiving initial certification or licensure, by state: AY 2000-01 through AY 2007-08 continued*

State	Academic year								Percent change from 2000-01 to 2007-08	Percent change from 2006-07 to 2007-08
	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08		
Mississippi	2,140	2,186	1,189	1,112	1,051	2,373	2,094	2,805	31	34
Missouri	5,505	5,919	5,326	5,059	5,958	5,113	5,931	6,374	16	7
Montana	1,238	1,203	1,381	1,376	1,473	1,130	1,494	1,266	2	-15
Nebraska	2,919	2,252	2,244	1,548	1,859	2,307	1,992	1,870	-36	-6
Nevada	2,019	2,723	2,664	2,122	2,380	2,996	5,923	4,909	143	-17
New Hampshire	1,466	1,295	1,873	1,928	1,816	1,722	1,516	1,725	18	14
New Jersey	10,093	12,556	13,276	10,836	11,144	11,521	10,858	10,977	9	1
New Mexico	2,471	2,533	2,596	2,637	2,367	3,097	1,477	2,172	-12	47
New York	25,901	28,193	32,128	28,386	15,480	29,723	35,195	30,122	16	-14
North Carolina	9,333	9,452	9,679	12,356	13,621	13,047	12,908	12,277	32	-5
North Dakota	645	506	506	630	697	693	489	539	-16	10
Northern Mariana Islands	—	—	—	—	—	70	29	28	—	-3
Ohio	7,256	10,483	7,493	8,857	9,045	11,199	9,534	8,880	22	-7
Oklahoma	2,942	1,765	2,091	6,069	6,846	5,154	5,435	4,596	56	-15
Oregon*	1,724	2,611	3,388	2,352	2,253	3,990	3,800	2,743	59	-28
Palau	—	—	—	—	—	—	—	—	—	—
Pennsylvania	11,311	12,376	12,608	12,036	12,260	15,959	14,318	14,192	25	-1
Puerto Rico	3,136	3,447	3,017	3,538	3,740	4,296	4,020	2,943	-6	-27
Rhode Island	1,805	1,498	1,308	1,582	1,263	1,103	1,206	1,267	-30	5
South Carolina	3,017	2,007	2,049	2,159	2,063	1,881	2,534	2,296	-24	-9
South Dakota	652	940	943	957	1,057	1,165	1,263	967	48	-23
Tennessee	6,448	8,913	5,747	5,553	5,908	6,158	6,648	7,052	9	6
Texas	16,601	17,920	24,726	22,715	26,393	27,993	29,644	30,257	82	2
Utah	2,139	2,193	2,830	2,582	3,204	3,311	3,145	2,920	37	-7
Vermont	746	702	702	720	1,069	970	984	867	16	-12
Virgin Islands	90	39	60	24	18	20	70	73	-19	4
Virginia	10,777	11,003	9,304	10,582	10,832	10,969	9,219	10,179	-6	10
Washington	4,538	5,939	4,959	4,953	5,932	5,033	3,702	3,792	-16	2
West Virginia	1,352	1,369	1,505	1,581	1,786	1,801	1,778	1,690	25	-5
Wisconsin	4,445	4,617	4,699	5,080	3,975	3,886	4,092	4,055	-9	-1
Wyoming	573	652	569	740	638	657	751	795	39	6
Total	282,112	309,817	315,423	313,201	307,332	329,074	325,556	310,097	10	-5

—Data not available.

\*Data for AY 2000-01 and AY 2001-02 are incomplete for out-of-state program completers.

**NOTE:**For purposes of this table, the term "state" refers to any of the states of the United States, as well as the Commonwealth of Puerto Rico, the District of Columbia, Guam, American Samoa, the United States Virgin Islands, the Commonwealth of the Northern Mariana Islands and the Freely Associated States (the Republic of the Marshall Islands, the Federated States of Micronesia and the Republic of Palau). Federated States of Micronesia did not submit a state Title II report in 2007. Republic of the Marshall Islands did not submit a state Title II report in 2009. Data presented in this report for previous years may not be consistent with data published in earlier reports because states are able to revise their data.

**SOURCE:**U.S. Department of Education, Office of Postsecondary Education. (2011). Higher Education Act Title II Reporting System.



**Table 3**

*States Requiring Testing for Initial Certification of Elementary and Secondary Teacher, by Skills or knowledge Assessment and State: 2010 and 2011*

knowledge assessment and state: 2010 and 2011								
State	Assessment for certification, 2010				Assessment for certification, 2011			
	Basic skills exam	Subject-matter exam	Knowledge of teaching exam	Assessment of teaching performance	Basic skills exam	Subject-matter exam	Knowledge of teaching exam	Assessment of teaching performance
1	2	3	4	5	6	7	8	9
Alabama	X	X	X	X	X	X	X	X
Alaska	X				X			
Arizona		X	X			X	X	
Arkansas	X	X	X	X	X	X	X	X
California	X	---		X	X	---		X
Colorado		X				X		
Connecticut	X	X	X	X	X	X	X	X
Delaware	X	X			X	X		
District of Columbia	X	X	---	---	X	X	X	
Florida	X			X				X
Georgia	X	X			X	X		
Hawaii	X	X	X	---	X	X	X	---
Idaho		X	X	X		X		X
Illinois	X	X	X		X	X	X	
Indiana	X	X		X	X	X		X
Iowa	---		---	---				
Kansas		X	X			X	X	
Kentucky	X	X	X	X	X	X	X	X
Louisiana	X	X	X	X	X	X	X	X
Maine	---	---	---	---	---	---	---	---
Maryland	X	X	X	X	X	X	X	X
Massachusetts	X	X		X	X	X	X	X
Michigan	X	X		X	X	X	X	X
Minnesota	X	X	X		X	X	X	
Mississippi	---	---	---	---	---	---	---	---
Missouri	X	X		X	X	X		X
Montana								
Nebraska	X				X			
Nevada	---	X	---	---		X	---	---
New Hampshire	X	X			X	X		
New Jersey	---	---	---	---	---	---	---	---
New Mexico	X	X	X	X	X	X	X	X
New York		X	X			X	X	
North Carolina	---	---	---	---	---	---	---	---
North Dakota	---	X	---	---	---	X	---	---
Ohio		X	X	X		X	X	X
Oklahoma	---	---	---	---	---	---	---	---
Oregon	X	X	---	---	X	X		X
Pennsylvania	X	X	X	X	X	X	X	X
Rhode Island			X	X			X	X
South Carolina		X	X			X	X	
South Dakota	X	X	X	X	X	X	X	X
Tennessee	X	X	X		X	X	X	
Texas	---	---	---	---	---	---	---	---
Utah		X		X		X		X
Vermont	X	X			X	X		
Virginia	X	X	X		X	X	X	
Washington	X	X		X	X	X		X
West Virginia	X	X	X	X	X	X	X	X
Wisconsin	X	X			X	X		
Wyoming	---		---	---	---		---	---

---Not available.  
 X Denotes that the state requires testing. A blank denotes that the state does not require testing.  
 SOURCE: National Association of State Directors of Teacher Education and Certification, NASDTEC Knowledgebase, retrieved June 23, 2011, from <https://www.nasdtc.info/>. (This table was prepared June 2011.)

## CHAPTER FOUR

### FINDINGS

#### Introduction

The purpose of this study was to examine, at the school system level, the relationship between the percentage of classes taught by highly qualified teachers (HQT) and students' academic achievement as measured by students' passing rates on Maryland's standardized test, High School Assessment (HSA), and graduation rates for three academic school years (2011, 2012 and 2013) in the State of Maryland. The highly qualified teacher data, and the data for academic achievement rates, and graduation rates were obtained from Maryland's Annual Report Cards, published by Maryland State Department of Education for all 24 school systems in the state of Maryland during three consecutive academic school years (2011, 2012 and 2013). The passing scores for Maryland's high school assessments (HSA) in Math (Algebra/data analysis), Biology and English are (412, 400 and 396 respectively)<sup>1</sup>. Students' scores on these high school assessments are reported as scale scores which range from 240 to 650. Maryland uses a scale score to provide a more precise measurement of a student's achievement and to assure that tests given at different times are comparable (Maryland Department of Education, 2013).

This chapter provides the data analysis procedures and results for each of the research questions. The chapter contains four major sections which include a descriptive summary of the

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<sup>1</sup> For graduation purposes, students must pass all three HSA tests Math (Algebra/data Analysis), Biology and English by earning a combined score on the three tests of 1208 or higher, or complete the required Bridge Plan projects (available to students who have failed an HSA twice and have met the eligibility criteria would complete one or more projects in the HSA content area) (Maryland Department of Education, 2013).

school systems used in this study, a discussion of the data analysis procedures, the results for both research questions and a summary of the research findings.

### **Questions and Hypotheses**

The research questions guiding this study are follows:

- 1) Are there statistically significant relationships between the percentage of classes taught by highly qualified teachers and students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012 and 2013)?
- 2) Are there statistically significant relationships between the percentage of highly qualified teachers and students' graduation rates, over a three year period (2011, 2012 and 2013)?

Because the data were collected across time, the data for the percentage of highly qualified teachers were decomposed into between-county and within-county variables.

The following null hypotheses were designed to address the research questions in this study:

- 1) The between-county (differences between counties) percentage of highly qualified teachers was not significantly related to students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012, and 2013).
- 2) The within-county (differences between school years) percentage of highly qualified teachers was not significantly related to students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012, and 2013).

- 3) The between-county (differences between counties) percentage of highly qualified teachers was not significantly related to students' graduation rates, over a three year period (2011, 2012 and 2013).
- 4) The within-county (differences between school years) percentage of highly qualified teachers was not significantly related to students' graduation rates, over a three year period (2011, 2012 and 2013).

### **Descriptive Data**

The data analysis results for this study were based on 24 public school systems within the state of Maryland. The school systems were examined across three consecutive school years (2011, 2012 and 2013) with the independent variable of interest being the percent of classes taught by highly qualified teachers and the dependent variables being student academic achievement and student graduation rates.

In order to determine the percentage of classes taught by highly qualified teachers, the percentage of students passing Maryland's High School Assessment (HSA) in Math, Biology and English, and students' graduation rates, archival school report data were obtained from Maryland's Annual Report Card. The summary of the percentage of classes taught by highly qualified teachers, the percentage of students passing Maryland's HSA in Math, Biology and English, and students' graduation rates are presented in Table 4. The results indicated the following:

- 1) Across the state, 95% of teachers at the secondary level were "Highly Qualified," over three consecutive school years (2011, 2012 and 2013) with a mean (M) = 94.76 and Standard Deviation (SD) = 4.56.

- 2) Across the state, 86% of students met the state passing score rate on the Math<sup>2</sup> 10 HSA, over three consecutive school years (2011, 2012 and 2013) with a mean (M) = 85.54, and Standard Deviation (SD) = 10.27.
- 3) Across the state, 84% of students met the state passing score rate on the Biology<sup>3</sup> 10 HSA, over three consecutive school years (2011, 2012, 2013) with a mean (M) = 83.92, and Standard Deviation (SD) = 9.73.
- 4) Across the state, 78% of students met the state passing score rate on the English<sup>4</sup> 10 HSA, over three consecutive school years (2011, 2012, 2013) with a mean (M) = 77.52, and Standard Deviation (SD) = 9.80.
- 5) Across the state, 89% of students met the state passing score rate on the Math 11 HSA, over three consecutive school years (2011, 2012, 2013) with a mean (M) = 88.54, and Standard Deviation (SD) = 8.54.
- 6) Across the state, 87% of students met the state passing score rate on the Biology 11 HSA, over three consecutive school years (2011, 2012, 2013) with a mean (M) = 86.77, and Standard Deviation (SD) = 8.55.
- 7) Across the state, 84% of students met the state passing score rate on the English 11 HSA, over three consecutive school years (2011, 2012, 2013) with a mean (M) = 84.44, and Standard Deviation (SD) = 8.18.

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<sup>2</sup> **Students' scores on HSA's are reported as scale scores (from 240 – 650).** Maryland uses a scale score to provide a more precise measurement of a student's achievement and to assure that tests given at different times are comparable (Maryland Department of Education, 2013). Passing score for Math is 412.

<sup>3</sup> Passing score for Biology is 400 regardless of the grade level (i.e. 10<sup>th</sup>, 11<sup>th</sup> or 12<sup>th</sup>) in which the assessment was taken.

<sup>4</sup> Passing score for English is 396 regardless of the grade level (i.e. 10<sup>th</sup>, 11<sup>th</sup> or 12<sup>th</sup>) in which the assessment was taken.

- 8) Across the state, 89% of students met the state passing score rate on the Math 12 HSA, over three consecutive school years (2011, 2012, 2013) with a mean (M) = 88.90, and Standard Deviation (SD) = 7.99.
- 9) Across the state, 86% of students met the state passing score rate on the Biology 12 HSA, over three consecutive school years (2011, 2012, 2013) with a mean (M) = 86.21, and Standard Deviation (SD) = 8.85.
- 10) Across the state, 85% of students met the state passing score rate on the English 12 HSA, over three consecutive school years (2011, 2012, 2013) with a mean (M) = 85.41, and Standard Deviation (SD) = 7.62.
- 11) Across the state, the average among students' graduation rates over three consecutive years (2011, 2012 and 2013) was (M) = 86.36, and Standard Deviation (SD) = 6.64.

Table 4. Descriptive Statistics for the Percentage of Highly Qualified Teachers (HQT), Percentage of Students Passing Maryland’s High School Assessment (HSA) in Math, Biology and English, and Students’ Graduation Rates Over a Three Year Period (2011, 2012 and 2013)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
HQ_Teachers	72	72.90	99.20	94.77	4.57
Math 10	72	53.60	95.00	85.54	10.27
Biology 10	72	55.80	95.00	83.92	9.73
English 10	72	48.80	92.30	77.52	9.80
Math 11	72	60.70	95.00	88.54	8.54
Biology 11	72	59.70	95.00	86.77	8.55
English 11	72	60.90	95.00	84.44	8.18
Math 12	72	62.70	95.00	88.9	7.99
Biology 12	72	59.60	95.00	86.21	8.85
English 12	72	64.20	95.00	85.41	7.62
GradRate	72	65.80	95.00	86.36	6.64

### Data Analysis

All of the system level performance data were analyzed in a descriptive fashion in order to show the percent of students passing each of the Maryland High School Assessments (HSA) in Math, Biology and English, and the percent of students graduating from high school. The descriptive data table reflected aggregate student outcomes for all 24 school systems combined. In addition to the descriptive statistics, Hierarchical Linear Modeling analyses were conducted in

order to determine if (1) students performed better on High School Assessments (HSA) in counties having more highly qualified teachers (noted on tables 4 - 12 as Between Counties) and (2) if students performed better in years when there were more highly qualified teachers (HQT) in a county, than in those years when there were fewer highly qualified teachers (noted on tables 4 - 12 as Between Years). To be statistically significant an alpha of .05 was used with all inferential procedures, since it is customary set for behavioral science (Hinkle, Wiersma, & Jurs, 1998).

## Results

Before predicting the dependent variables (students' passing rates on the state standardized assessments), we first decomposed the percentage of highly qualified teachers variable into within-county (between-years) and between-county components. Following Curran and Bauer (2011), the within-county effect was represented by the residual obtained from regressing percentage of highly qualified teachers, onto year centered on the middle year (2012). This process is also named "detrending" (p. 609). Between-county effects were represented by each county's year 2012 percentage of qualified teachers intercept (as obtained from the regression described above); this intercept is equivalent to the average percentage of highly qualified teachers, in a county, across the three years examined. By operationalizing the effects of the percentage of highly qualified teachers in this way, the within-county and between-county effects were disaggregated into the two different levels in the Hierarchical Linear Model (HLM, Raudenbush & Bryk, 2002), which is specified below.

### Level-1 Model

High School Assessment<sub>ij</sub> =  $\beta_0_j + \beta_1_j$  \*(Within-county (between-year) percentage of highly qualified teachers<sub>ij</sub>) +  $r_{ij}$



## Level-2 Model

$$\beta_{0j} = \gamma_{00} + \gamma_{01} * (\text{Between-county percentage of highly qualified teachers}_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + u_{1j}$$

### *Null Hypothesis One and Two*

The between-county (differences between counties) percentage of highly qualified teachers was not significantly related to students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012, and 2013).

The within-county (differences between school years) percentage of highly qualified teachers was not significantly related to students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012, and 2013).

### **Highly Qualified Teachers (HQT) and Biology 10**

The results of the analysis examining the between-county and within-county percentage of HQT's and student achievement on the Biology 10 assessment are depicted in Table 5. The intercept from this analysis indicated that the state average passing percentage for the Maryland High School Assessment (HSA) in Biology 10 over three consecutive years (2011, 2012 and 2013) was 83.92%. The average percentage (across three years) of highly qualified teachers (HQT) in a county was significantly related to the percentage of students who achieved proficiency on the Biology 10 HSA ( $\gamma_{01} = 144.24$ ,  $t = 8.86$ ,  $p = <0.001$ ) over three academic school years (2011, 2012 and 2013). Consequently, in counties where there were more highly

qualified teachers (HQT), a higher proportion of students passed the Biology 10 HSA than in counties where there were fewer highly qualified teachers (HQT). *Null hypothesis 1* was rejected for this research question and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had increased academic achievement, as measured by student passing rates on the state standardized assessment in Biology 10 HSA, over three consecutive academic school years (2011, 2012 and 2013).

The greater the percentage of highly qualified teaches (HQT) within a county in a particular school year the greater the percentage of students who achieved proficiency on the Biology 10 HSA in that year ( $\gamma_{10} = 133.11$ ,  $t = 2.10$ ,  $p = 0.047$ ). *Null hypothesis 2* was rejected for this research question and it was concluded that in years when a county had a higher percentage of highly qualified teachers (compared to other years), in that year students' had increased academic achievement, as measured by student passing rates on the state standardized assessment in Biology 10 HSA.

Table 5. HQT and Biology 10

	Coefficient	SE	<i>t</i>	df	p
State Average	83.92	1.42	59.17	22	<0.001
Between Counties, $\gamma_{01}$	144.20	16.27	8.86	22	<0.001
Within-Counties (Between Years), $\gamma_{10}$	133.11	63.42	2.10	23	0.047

## Highly Qualified Teachers (HQT) and English 10

The results of the analyses examining the between-county and within-county percentage of HQT's and student achievement on the English 10 assessment are depicted in Table 6. The intercept from this analysis indicated that the state average passing percentage for the Maryland High School Assessment (HSA) in English 10 over three consecutive years (2011, 2012 and 2013) was 77.52%. The average percentage (across three years) of highly qualified teachers (HQT) in a county was significantly related to the percentage of students who achieved proficiency on the English 10 HSA ( $\gamma_{01} = 144.90$ ,  $t = 8.46$ ,  $p = <0.001$ ) over three academic school years (2011, 2012 and 2013). Consequently, in counties where there were more highly qualified teachers (HQT), a higher proportion of students passed the English 10 HSA than in counties where there were fewer highly qualified teachers (HQT). *Null hypothesis 1* was rejected for this research question and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had increased academic achievement, as measured by student passing rates on the state standardized assessment in English 10 HSA, over three consecutive academic school years (2011, 2012 and 2013).

There was no significant relationship between the percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students who achieved proficiency on the English 10 HSA in that year ( $\gamma_{10} = 151.26$ ,  $t = 2.02$ ,  $p = 0.056$ ). *Null hypothesis 2* was accepted for this research question and it was concluded that there was no relationship between years when a county had a higher percentage of highly qualified teachers (compared to other years), students' academic achievement (in that year), as measured by student passing rates on the state standardized assessment in English 10 HSA.

Table 6. HQT and English 10

	Coefficient	SE	<i>t</i>	df	p
State Average	77.52	1.46	53.20	22	<0.001
Between Counties, $\gamma_{01}$	144.90	17.14	8.46	22	<0.001
Within-Counties (Between Years), $\gamma_{10}$	151.26	75.07	2.02	23	0.056

### Highly Qualified Teachers (HQT) and Math 10

The results of the analyses examining the between-county and within-county percentage of HQT's and student achievement on the Math 10 assessment are depicted in Table 7. The intercept from this analysis indicated that the state average passing percentage for the Maryland High School Assessment (HSA) in Math 10 over three consecutive years (2011, 2012 ad 2013) was 85.54%. The average percentage (across three years) of highly qualified teachers (HQT) in a county was significantly related to the percentage of students who achieved proficiency on the Math 10 HSA ( $\gamma_{01} = 167.58$ ,  $t = 9.21$ ,  $p = <0.001$ ) over three academic school years (2011, 2012 and 2013). Consequently, in counties where there were more highly qualified teachers (HQT), a higher proportion of students passed the Math 10 HSA than in counties where there were fewer highly qualified teachers (HQT). *Null hypothesis 1* was rejected for this research question and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had increased academic achievement, as measured by student passing rates on the state standardized assessment in Math 10 HSA, over three consecutive academic school years (2011, 2012 and 2013).

There was no significant relationship between the percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students who achieved proficiency on the Math 10 HSA in that year ( $\gamma_{10} = 50.49$ ,  $t = 0.91$ ,  $p = 0.375$ ). *Null hypothesis 2* was accepted for this research question and it was concluded that there was no relationship between years when a county had a higher percentage of highly qualified teachers (compared to other years), students' academic achievement (in that year), as measured by student passing rates on the state standardized assessment in Math 10 HSA.

Table 7. HQT and Math 10

	Coefficient	SE	<i>t</i>	df	p
State Average	85.54	1.42	60.10	22	<0.001
Between Counties, $\gamma_{01}$	167.58	18.19	9.21	22	<0.001
Within-Counties (Between Years), $\gamma_{10}$	50.49	55.82	0.91	23	0.375

### Highly Qualified Teachers (HQT) and Biology 11

The results of the analysis examining the between-county and within-county percentage of HQT's and student achievement on the Biology 11 assessment are depicted in Table 8. The intercept from this analysis indicated that the state average passing percentage for the Maryland High School Assessment (HSA) in Biology 11 over three consecutive years (2011, 2012 and 2013) was 86.77%. The average percentage (across three years) of highly qualified teachers (HQT) in a county was significantly related to the percentage of students who achieved proficiency on the Biology 11 HSA ( $\gamma_{01} = 136.01$ ,  $t = 9.55$ ,  $p = <0.001$ ) over three academic

school years (2011, 2012 and 2013). Consequently, in counties where there were more highly qualified teachers (HQT), a higher proportion of students passed the Biology 11 HSA than in counties where there were fewer highly qualified teachers (HQT). *Null hypothesis 1* was rejected for this research question and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had increased academic achievement, as measured by student passing rates on the state standardized assessment in Biology 11 HSA, over three consecutive academic school years (2011, 2012 and 2013).

There was no significant relationship between the percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students who achieved proficiency on the Biology 11 HSA in that year ( $\gamma_{10} = -29.98$ ,  $t = -1.24$ ,  $p = 0.229$ ). *Null hypothesis 2* was accepted for this research question and it was concluded that there was no relationship between years when a county had a higher percentage of highly qualified teachers (compared to other years), students' academic achievement (in that year), as measured by student passing rates on the state standardized assessment in Biology 11 HSA.

Table 8. HQT and Biology 11

	Coefficient	SE	<i>t</i>	df	p
State Average	86.77	1.17	74.39	22	<0.001
Between Counties, $\gamma_{01}$	136.01	14.25	9.55	22	<0.001
Within-Counties (Between Years), $\gamma_{10}$	-29.98	24.25	-1.24	23	0.229

## Highly Qualified Teachers (HQT) and English 11

The results of the analyses examining the between-county and within-county percentage of HQT's and student achievement on the English 11 assessment are depicted in Table 9. The intercept from this analysis indicated that the state average passing percentage for the Maryland High School Assessment (HSA) in English 11 over three consecutive years (2011, 2012 and 2013) was 84.44%. The average percentage (across three years) of highly qualified teachers (HQT) in a county was significantly related to the percentage of students who achieved proficiency on the English 11 HSA ( $\gamma_{01} = 113.98$ ,  $t = 6.86$ ,  $p = <0.001$ ) over three academic school years (2011, 2012 and 2013). Consequently, in counties where there were more highly qualified teachers (HQT), a higher proportion of students passed the English 11 HSA than in counties where there were fewer highly qualified teachers (HQT). *Null hypothesis 1* was rejected for this research question and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had increased academic achievement, as measured by student passing rates on the state standardized assessment in English 11 HSA, over three consecutive academic school years (2011, 2012 and 2013).

There was no significant relationship between the percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students who achieved proficiency on the English 11 HSA in that year ( $\gamma_{10} = 25.08$ ,  $t = 1.93$ ,  $p = 0.067$ ). *Null hypothesis 2* was accepted for this research question and it was concluded that there was no relationship between years when a county had a higher percentage of highly qualified teachers (compared to other years), students' academic achievement (in that year), as measured by student passing rates on the state standardized assessment in English 11 HSA.

Table 9. HQT and English 11

	Coefficient	SE	<i>t</i>	df	p
State Average	84.44	1.26	66.98	22	<0.001
Between Counties, $\gamma_{01}$	113.98	16.62	6.86	22	<0.001
Within-Counties (Between Years), $\gamma_{10}$	25.08	13.03	1.93	23	0.067

### Highly Qualified Teachers (HQT) and Math 11

The results of the analyses examining the between-county and within-county percentage of HQT's and student achievement on the Math 11 assessment are depicted in Table 10. The intercept from this analysis indicated that the state average passing percentage for the Maryland High School Assessment (HSA) in Math 11 over three consecutive years (2011, 2012 and 2013) was 88.54%. The average percentage (across three years) of highly qualified teachers (HQT) in a county was significantly related to the percentage of students who achieved proficiency on the Math 11 HSA ( $\gamma_{01} = 142.06$ ,  $t = 14.92$ ,  $p = <0.001$ ) over three academic school years (2011, 2012 and 2013). Consequently, in counties where there were more highly qualified teachers (HQT), a higher proportion of students passed the Math 11 HSA than in counties where there were fewer highly qualified teachers (HQT). *Null hypothesis 1* was rejected for this research question and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had increased academic achievement, as measured by student passing rates on the state standardized assessment in Math 11 HSA, over three consecutive academic school years (2011, 2012 and 2013).



The greater the percentage of highly qualified teachers (HQT) within a county in a particular school year the greater the percentage of students who achieved proficiency on the Math 11 HSA in that year ( $\gamma_{10} = 48.19$ ,  $t = 2.46$ ,  $p = 0.022$ ). *Null hypothesis 2* was rejected for this research question and it was concluded that in years when a county had a higher percentage of highly qualified teachers (compared to other years), in that year students' had greater academic achievement, as measured by student passing rates on the state standardized assessment in Math 11 HSA.

Table 10. HQT and Math 11

	Coefficient	SE	<i>t</i>	df	p
State Average	88.54	1.16	76.49	22	<0.001
Between Counties, $\gamma_{01}$	142.06	9.52	14.92	22	<0.001
Within-Counties (Between Years), $\gamma_{10}$	48.19	19.61	2.46	23	0.022

### Highly Qualified Teachers (HQT) and Biology 12

The results of the analysis examining the between-county and within-county percentage of HQT's and student achievement on the Biology 12 assessment are depicted in Table 11. The intercept from this analysis indicated that the state average passing percentage for the Maryland High School Assessment (HSA) in Biology 12 over three consecutive years (2011, 2012 and 2013) was 86.21%. The average percentage (across three years) of highly qualified teachers (HQT) in a county was significantly related to the percentage of students who achieved proficiency on the Biology 12 HSA ( $\gamma_{01} = 142.87$ ,  $t = 9.14$ ,  $p = <0.001$ ) over three academic school years (2011, 2012 and 2013). Consequently, in counties where there were more highly

qualified teachers (HQT), a higher proportion of students passed the Biology 12 HSA than in counties where there were fewer highly qualified teachers (HQT). *Null hypothesis 1* was rejected for this research question and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had increased academic achievement, as measured by student passing rates on the state standardized assessment in Biology 12 HSA, over three consecutive academic school years (2011, 2012 and 2013).

There was no significant relationship between the percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students who achieved proficiency on the Biology 12 HSA in that year ( $\gamma_{10} = 5.53$ ,  $t = 0.12$ ,  $p = 0.905$ ). *Null hypothesis 2* was accepted for this research question and it was concluded that there was no relationship between years when a county had a higher percentage of highly qualified teachers (compared to other years), students' academic achievement (in that year), as measured by student passing rates on the state standardized assessment in Biology 12 HSA.

Table 11. HQT and Biology 12

	Coefficient	SE	<i>t</i>	df	<i>p</i>
State Average	86.21	1.19	72.46	22	<0.001
Between Counties, $\gamma_{01}$	142.87	15.63	9.14	22	<0.001
Within-Counties (Between Years), $\gamma_{10}$	5.53	45.81	0.12	23	0.905

## Highly Qualified Teachers (HQT) and English 12

The results of the analyses examining the between-county and within-county percentage of HQT's and student achievement on the English 12 assessment are depicted in Table 12. The intercept from this analysis indicated that the state average passing percentage for the Maryland High School Assessment (HSA) in English 12 over three consecutive years (2011, 2012 and 2013) was 85.41%. The average percentage (across three years) of highly qualified teachers (HQT) in a county was significantly related to the percentage of students who achieved proficiency on the English 12 HSA ( $\gamma_{01} = 101.62$ ,  $t = 8.45$ ,  $p = <0.001$ ) over three academic school years (2011, 2012 and 2013). Consequently, in counties where there were more highly qualified teachers (HQT), a higher proportion of students passed the English 12 HSA than in counties where there were fewer highly qualified teachers (HQT). *Null hypothesis 1* was rejected for this research question and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had increased academic achievement, as measured by student passing rates on the state standardized assessment in English 12 HSA, over three consecutive academic school years (2011, 2012 and 2013).

The greater the percentage of highly qualified teachers (HQT) within a county in a particular school year the greater the percentage of students who achieved proficiency on the English 12 HSA in that year ( $\gamma_{10} = 67.02$ ,  $t = 2.14$ ,  $p = 0.043$ ). *Null hypothesis 2* was rejected for this research question and it was concluded that in years when a county had a higher percentage of highly qualified teachers (compared to other years), in that year students' had higher academic achievement, as measured by student passing rates on the state standardized assessment in English 12 HSA.

Table 12. HQT and English12

	Coefficient	SE	<i>t</i>	df	p
State Average	85.41	1.16	73.65	22	<0.001
Between Counties, $\gamma_{01}$	101.62	12.03	8.45	22	<0.001
Within-Counties (Between Years), $\gamma_{10}$	67.02	31.33	2.14	23	0.043

### Highly Qualified Teachers (HQT) and Math 12

The results of the analyses examining the between-county and within-county percentage of HQT's and student achievement on the Math 12 assessment are depicted in Table 13. The intercept from this analysis indicated that the state average passing percentage for the Maryland High School Assessment (HSA) in Math 12 over three consecutive years (2011, 2012 and 2013) was 88.90%. The average percentage (across three years) of highly qualified teachers (HQT) in a county was significantly related to the percentage of students who achieved proficiency on the Math 12 HSA ( $\gamma_{01} = 140.14$ ,  $t = 11.12$ ,  $p = <0.001$ ) over three academic school years (2011, 2012 and 2013). Consequently, in counties where there were more highly qualified teachers (HQT), a higher proportion of students passed the Math 12 HSA than in counties where there were fewer highly qualified teachers (HQT). *Null hypothesis 1* was rejected for this research question and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had increased academic achievement, as measured by student passing rates on the state standardized assessment in Math 12 HSA, over three consecutive academic school years (2011, 2012 and 2013).

There was no significant relationship between the percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students who achieved proficiency on the Math 12 HSA in that year ( $\gamma_{10} = 36.31$ ,  $t = 1.88$ ,  $p = 0.073$ ). *Null hypothesis 2* was accepted for this research question and it was concluded that there was no relationship between years when a county had a higher percentage of highly qualified teachers (compared to other years), students' academic achievement (in that year), as measured by student passing rates on the state standardized assessment in Math 12 HSA.

Table 13. HQT and Math 12

	Coefficient	SE	<i>t</i>	df	p
State Average	88.90	1.09	81.78	22	<0.001
Between Counties, $\gamma_{01}$	140.14	12.60	11.12	22	<0.001
Within-Counties (Between Years), $\gamma_{10}$	36.31	19.32	1.88	23	0.073

*Null Hypothesis Three and Four*

The between-county (differences between counties) percentage of highly qualified teachers was not significantly related to students' graduation rates, over a three year period (2011, 2012 and 2013).

The within-county (differences between school years) percentage of highly qualified teachers was not significantly related to students' graduation rates, over a three year period (2011, 2012 and 2013).

Statistical Analysis Software was used to conduct a Hierarchical Linear Modeling analyses to determine if there was: 1) a relationship between the percentage of students who graduated in counties having more highly qualified teachers or fewer (noted on table 14 as Between Counties) and 2) a relationship between the percentage of students who graduated during years when there were more highly qualified teachers (HQT) than in those years when there were fewer highly qualified teachers (noted on table 14 as Between Years). The significance level was set at 0.05.

### **Highly Qualified Teachers (HQT) and Graduation Rates**

The results of the analyses examining the between-county and within-county percentage of HQT's and students' graduation rates are depicted in Table 14. The intercept from this analysis indicated that the state average graduation rates over three consecutive years (2011, 2012 and 2013) was 86.36%. The average percentage (across three years) of highly qualified teachers (HQT) in a county was significantly related to the percentage of students who graduated ( $\gamma_{01} = 114.77$ ,  $t = 14.32$ ,  $p = <0.001$ ) over three academic school years (2011, 2012 and 2013). Consequently, in counties where there were more highly qualified teachers (HQT), a higher proportion of students graduated than in counties where there were fewer highly qualified teachers (HQT). *Null hypothesis 3* was rejected for this research question and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had increased in graduation rates, over three consecutive academic school years (2011, 2012 and 2013).

There was no significant relationship between the percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students graduating in

that year ( $\gamma_{10} = -30.50$ ,  $t = -0.70$ ,  $p = 0.494$ ). *Null hypothesis 4* was accepted for this research question and it was concluded that there was no relationship between years when a county had a higher percentage of highly qualified teachers (compared to other years), and students' graduation rates over three consecutive academic school years (2011, 2012 and 2013).

Table 14. Graduation Rates

	Coefficient	SE	<i>t</i>	df	p
State Average	86.36	0.85	101.54	22	<0.001
Between Counties, $\gamma_{01}$	114.77	8.01	14.32	22	<0.001
Within-Counties (Between Years), $\gamma_{10}$	-30.51	43.93	-0.70	23	0.494

### Summary

This study was designed to determine if there was a relationship between the percentage of classes taught by highly qualified teachers (HQT) and students' academic achievement as measured by students' passing rates on Maryland's standardized test, High School Assessment (HSA), and graduation rates for three academic school years (2011, 2012 and 2013) in the State of Maryland. The results of the statistical testing, using archival data obtained from Maryland's Annual Report Card, led to the following conclusions:

1) Between-counties findings were very consistent. Between-county or counties with more highly qualified teachers (HQT) than counties with fewer highly qualified teachers had a higher percentage of students who passed the Biology 10, 11 and 12, English 10, 11 and 12, and Math 10, 11, and 12 High School Assessments (HSA), over three consecutive academic school

years (2011, 2012 and 2013). *Null hypothesis 1* was rejected and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had an increase in academic achievement, as measured by student passing rates on the state standardized assessments in Math, Biology and English HSA, over three consecutive academic school years (2011, 2012 and 2013).

2) The within-counties findings were less consistent than the between-county findings, within-counties, between-years or years when there were more highly qualified teachers (HQT) in a county compared to years when there were fewer (HQT) teachers, there was no significant relationships between the percentage of highly qualified teachers and students passing rates on the Biology 11 and 12, the Math 10 and 12, and the English 10 and 11 High School Assessments (HSA). However, for English 10, English 11 and Math 12 the  $p$  values for the within-counties analyses were all  $< .05$ . For Biology 10, Math 11 and English 12 there was a significant relationship between the percentage of HQT in a county in a year, and the percentage of students passing the test that year. Therefore, *Null hypothesis 2* was accepted for some academic subjects and years but reject for other academic subjects and years.

3) Counties where there were more highly qualified teachers (HQT), a higher proportion of students graduated than in counties where there were fewer highly qualified teachers (HQT), over three academic school years (2011, 2012 and 2013). *Null hypothesis 3* was rejected and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had an increase in graduation rates, over three consecutive academic school years (2011, 2012 and 2013).



4) There was no relationship between the percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students graduating in that year. *Null hypothesis 4* was accepted and it was concluded that in years when a county had a higher percentage of highly qualified teachers (compared to other years) there was no relationship with that year's students' graduation rates.

## **CHAPTER FIVE**

### **CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS**

#### **Introduction**

The purpose of this study was to examine the relationship between the percentage of classes taught by highly qualified teachers (HQT) and students' academic achievement, as measured by students' passing rates on Maryland's standardized test, High School Assessment (HSA), and graduation rates among secondary students within twenty four public school systems for three academic school years (2011, 2012 and 2013) in the State of Maryland. This chapter provides a comprehensive overview of this quantitative study. The independent variable in this study included the percentage of classes taught by highly qualified teachers (HQT), and the dependent variable was students' academic achievement, as measured by students' passing rates on Maryland's standardized test, High School Assessment (HSA), and graduation rates. Quantitative data was gathered for both variables then compared and analyzed to explain the significance of the relationship between the variables. Chapter 5 provides a summary of the study and findings, limitations of the study, conclusions drawn, implications and recommendations for future research and practice

#### **Summary of the Study**

This study obtained highly qualified teacher data, and the data for academic achievement and graduation rates from Maryland's Annual Report Cards, published by Maryland State Department of Education for all 24 school systems in the State of Maryland during three consecutive academic school years (2011, 2012 and 2013). Data for Maryland's high school

assessment (HSA) focused on Math, Biology and English. Government HSA scores were not included in this study because of its reinstatement in 2011 as a requirement for seniors graduating in 2014 – 2015 and beyond.

The research revealed that there exists a relationship between the percentage of classes taught by highly qualified teachers (HQT) and the pass rates of students on Maryland's High School Assessments in Math, Biology and English, over three consecutive academic school years (2011, 2012 and 2013). Between-county findings were very consistent. Counties with more highly qualified teachers (HQT) than counties with fewer highly qualified teachers had a higher percentage of students who passed the Biology 10, 11, 12, English 10, 11, and 12, and Math 10, 11, and 12 High School Assessments (HSA), over three consecutive academic school years (2011, 2012 and 2013). Specifically, when counties had a higher percentage of highly qualified teachers (compared to other counties) students had an increase in academic achievement, as measured by students' passing rates on the state standardized assessments in Math, Biology and English HSA, over three consecutive academic school years (2011, 2012 and 2013). These findings support research conducted by Ferguson (1999) who stated that highly qualified teachers had an increasing effect on students' performance. He further contends that the more experience a teacher had, the higher the scores were among students who took core courses such as reading and mathematics (Ferguson, 1999). The within-counties findings were less consistent than the between-county findings. Within-counties, there was no significant relationships between the percentage of highly qualified teachers and students passing rates on the Biology 11 and 12, the Math 10 and 12, and the English 10 and 11 High School Assessments (HSA). The results here support Hargreaves and Ingersoll's study (2004) which contends that improving academic achievement remains a complex issue. Further, his study reveals that school officials

must continue to examine the issues which impact academic achievement attain within school systems, and consider the quality of educators who teach within school counties. The fact that there were some inconsistencies in the data “within-counties,” suggests that possibly more attention and studies need to be done to further look at the qualifications of teachers, along with teacher preparation and course delivery when addressing student academic achievement in core subject areas. Conversely, when considering the findings for English 10, English 11 and Math 12 the  $p$  values for the within-counties analyses were all  $< .05$ . The HSA’s taken in these subject areas, i.e. Biology 10, Math 11 and English 12, indicated that there was a significant relationship between the percentage of HQT in a county in a year, and the percentage of students passing the test that year. These finding are in accordance with the study by Arnette (2009) who contends that highly qualified teachers are still an important element to secure increased academic achievement from students.

Further, statistical analysis of quantitative data was used to show the relationship existing between the percentage of classes taught by highly qualified teachers (HQT) and students’ graduation rates for three academic school years (2011, 2012 and 2013). Counties where there were more highly qualified teachers (HQT), a higher proportion of students graduated than in counties where there were fewer highly qualified teachers (HQT), over three academic school years (2011, 2012 and 2013). When counties had a higher percentage of highly qualified teachers (compared to other counties) students had an increase in graduation rates, over three consecutive academic school years (2011, 2012 and 2013). Conversely, there was no relationship between the percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students graduating in that year. In other words, in

years when a county had a higher percentage of highly qualified teachers (compared to other years) there was no relationship with that year's students' graduation rates.

### **Limitations to the Study**

In the course of this inquiry of the relationship between the percent of classes taught by highly qualified teachers and students' academic achievement in the state of Maryland, there were three main limitations that arose that should be presented before discussing any of the findings of this study. Limitations of a study can be viewed as a particular part in a study that the researcher knows may possibly sway the research findings or generalization of results, but which the researcher has no control (Fraenkel & Wallen, 2003). Researchers interested in pursuing similar studies should take these limitations into consideration.

- 1) The study examined students' academic achievement as measured by students' passing rates on Maryland's standardized test, High School Assessment (HSA), and graduation rates for school years 2011, 2012 and 2013 only.
- 2) The study did not examine all differences between schools and other variables that might have also affected achievement.
- 3) This study examined the highly qualified teacher (HQT) data for the school years 2011, 2012 and 2013 only in the state of Maryland.

### **Summary of Findings and Conclusions**

This section provides explanation and detailed analysis of the independent and dependent variables associated with this research study. This quantitative study was guided by two research questions. Through inferential statistical analysis, the significance level for the relationship

between the independent and dependent variable for each research question posed in this study was determined.

### *Research Question One*

Are there statistically significant relationships between the percentage of classes taught by highly qualified teachers and students' academic achievement, as measured by student passing rates on state standardized assessments in Math, Biology and English, over a three year period (2011, 2012 and 2013)?

Maryland State Board of Education ruled that, starting with the graduating class of 2009, all Maryland students had to pass the High School Assessments (HSA) in Math, Biology and English, before receiving their diploma. The Maryland High School Assessments measured school and student progress toward Maryland's High School Core Learning Goals. Each HSA required students to learn a multiplicity of skills and competencies. The passing scores for Maryland's high school assessments (HSA) in Math (Algebra/data analysis), Biology and English are (412, 400 and 396 respectively). Students' scores on these high school assessments are reported as scale scores which range from 240 to 650. Maryland uses a scale score to provide a more precise measurement of a student's achievement and to assure that tests given at different times are comparable (Maryland Department of Education, 2013). If students were unsuccessful in passing the HSA during the first attempt, they could schedule to retake either of the assessments in January, May or during the summer. An option for students with disabilities who had difficulties in passing either of the four HSA would be to take the Modified HSA for that particular assessment. The findings in this study support a growing body of research that has shown that teacher qualifications are one of the key factors associated with student performance (Darling-Hammond, 2000; Ferguson, 1991; Goldhaber & Brewer, 2000; Laczko-Kerr & Berliner, 2002; Monk, 1994; Sanders & Rivers, 1996).

Equally important to this study was the percentage of classes being taught by highly qualified teachers, specifically in Math, Biology and English, for three consecutive academic school years (2011, 2012 and 2013). The state of Maryland follows the mandate crafted by the No Child Left Behind (NCLB) Act when defining a highly qualified teacher. Highly qualified teachers are teachers who had full state certification, demonstrated content mastery or competency in each core academic subject they had taught, and at a minimum had a bachelor degree (NCLB, 2003). According to NCLB, every classroom teacher of core academic subjects (i.e. English, Reading or Language Arts, Mathematics, Science, Foreign Languages, Civics and Government, Economics, Arts, History and Geography) had to be highly qualified by the end of the 2005-2006 academic year and beyond ([www.nea.org](http://www.nea.org)). In the state of Maryland, during school years 2011, 2012 and 2013 the number of core classes taught by highly qualified teacher were [(101,367), (99,835), and (99,835)] respectively. The fact that 97% of high school math, English, and science courses in Maryland are taught by highly qualified teachers (HQT) highlights the positive correlation many researchers have found between teacher quality and student achievement. Evidence from this study, support the research finding of other investigators that the quality of the teachers teaching in a classroom was the single, most influential determinant of increased student academic achievement (Amrein-Beardsley, 2006; Darling-Hammond, Berry, & Thoreson, 2001; Ferguson & Womack, 1993; Fuller, 1999; Hawk, Coble, & Swanson, 1985; Monk, 1994; Monk & King, 1999; Rowan, Chiang, & Miller, 1997; Strauss & Sawyer, 1986).

Data from the twenty four counties combine revealed significant and non-significant results. These findings were based on between-counties and within-counties data of the percentage of classes taught by highly qualified teachers (HQT) and their impact on students'

academic achievement in Math, Biology and English High School Assessments (HSA) during three consecutive academic school years (2011, 2012 and 2013) in the State of Maryland. The Hierarchical Linear Modeling analyses were conducted in order to determine if 1) students performed better on High School Assessments (HSA) (between-counties) in counties having more highly qualified teachers than in counties having fewer highly qualified teachers; and 2) if students performed better (within-counties) in years when there were more highly qualified teachers (HQT) in a school district, than in those years when there were fewer highly qualified teachers.

Descriptive and inferential data analysis of the percentage of classes taught by highly qualified teachers (HQT) and student achievement, as measured by Maryland's High School Assessment (HSA) in Math, Biology and English, indicated the following results:

1) Between-counties findings were very consistent. Between-county or counties with more highly qualified teachers (HQT) than counties with fewer highly qualified teachers had a higher percentage of students who passed the Biology 10, 11 and 12, English 10, 11 and 12, and Math 10, 11, and 12 High School Assessments (HSA), over three consecutive academic school years (2011, 2012 and 2013). *Null hypothesis 1* was rejected and it was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had an increase in academic achievement, as measured by student passing rates on the state standardized assessments in Math, Biology and English HSA, over three consecutive academic school years (2011, 2012 and 2013). These findings support research conducted by Ferguson (1999) who stated that highly qualified teachers had an increasing effect on students' performance. He further contends that the more experience a teacher had, the higher the scores were among students who took core courses such as reading and mathematics (Ferguson, 1999).



2) The within-counties findings were less consistent than the between-county findings. Within-counties, between-years or years when there were more highly qualified teachers (HQT) in a county compared to years when there were fewer (HQT) teachers, there was no significant relationships between the percentage of highly qualified teachers and students passing rates on the Biology 11 and 12, the Math 10 and 12, and the English 10 and 11 High School Assessments (HSA). However, for English 10, English 11 and Math 12 the  $p$  values for the within-counties analyses were all  $< .05$ . For Biology 10, Math 11 and English 12 there was a significant relationship between the percentage of HQT in a county in a year, and the percentage of students passing the test that year. Therefore, *Null hypothesis 2* was accepted for some academic subjects and years but reject for other academic subjects and years. The results here support Hargreaves and Ingersoll's study (2004) which contends that improving academic achievement remains a complex issue. Specifically, the results in this study were reflective of other researchers' findings that indicated that differences in teacher quality had large effects on student performance measured by test scores (Aronon et al., 2007; Hanushek et al., 2005; Koedel, 2007; Nye et al., 2004; Rivken et al., 2005; and Rockof, 2004).

### *Research Question Two*

Are there statistically significant relationships between the percentage of highly qualified teachers and students' graduation rates, over a three year period (2011, 2012 and 2013)?

3) Counties where there were more highly qualified teachers (HQT), a higher proportion of students graduated than in counties where there were fewer highly qualified teachers (HQT), over three academic school years (2011, 2012 and 2013). *Null hypothesis 3* was rejected and it

was concluded that when counties had a higher percentage of highly qualified teachers (compared to other counties) students' had an increase in graduation rates, over three consecutive academic school years (2011, 2012 and 2013). The findings in this study support a growing body of research that has shown that teacher qualifications are one of the key factors associated with student performance (Darling-Hammond, 2000; Ferguson, 1991; Goldhaber & Brewer, 2000; Laczko-Kerr & Berliner, 2002; Monk, 1994; Sanders & Rivers, 1996).

4) There was no relationship between the percentage of highly qualified teachers (HQT) within a county in a particular school year and the percentage of students graduating in that year. *Null hypothesis 4* was accepted and it was concluded that in years when a county had a higher percentage of highly qualified teachers (compared to other years) there was no relationship with that year's students' graduation rates. The results in this study were reflective of other researchers' findings that indicated that differences in teacher quality had large effects on student performance measured by test scores (Aaronson et al., 2007; Hanushek et al., 2005; Koedel, 2007; Nye et al., 2004; Rivken et al., 2005; and Rockoff, 2004). The results here support Hargreaves and Ingersoll's study (2004) which contends that improving academic achievement remains a complex issue.

## **Conclusion**

The current findings of this study suggested that there was a relationship between the percentages of classes taught by highly qualified teachers and students' academic achievement, as measured by the High School Assessments (HSA) in Math, Biology and English for three

consecutive academic school years (2011, 2012 and 2013) in the state of Maryland. Counties with more highly qualified teachers (HQT) than counties with fewer highly qualified teachers had a higher percentage of students who passed the Biology 10, 11 and 12, English 10, 11 and 12, and Math 10, 11, and 12 High School Assessments (HSA), over three consecutive academic school years (2011, 2012 and 2013). This implies that students in courses taught by highly qualified teachers will have higher levels of academic achievement than students in courses with teachers who are not highly qualified. These findings support research conducted by Ferguson (1999) who stated that highly qualified teachers had an increasing effect on students' performance. He further contends that the more experience a teacher had, the higher the scores were among students who took core courses, such as reading and mathematics (Ferguson, 1999).

Within-counties, between-years or years when there were more highly qualified teachers (HQT) in a county compared to years when there were fewer (HQT) teachers, there was no significant relationships between the percentage of highly qualified teachers and students passing rates on the Biology 11 and 12, the Math 10 and 12, and the English 10 and 11 High School Assessments (HSA). This implied that between years when there were more highly qualified teachers in a county compared to years when there were fewer highly qualified teachers, student's academic performance did not show any significant change in the Math, Biology and English HSA, except for Biology 10, Math 11, and English 12 with a reported  $p$  value of  $< .05$ . The inconsistencies of the results "within-counties" support Hargreaves and Ingersoll's study (2004) which contends that improving academic achievement remains a complex issue. The part of this study that showed significant change, is in accordance with the study conducted by Arnette (2009) which revealed that highly qualified teachers are still an important element to secure increased academic achievement from students.

## **Implications**

This study was conducted to examine, at the school system level, the relationship between the percentage of classes taught by highly qualified teachers (HQT) and students' academic achievement, as measured by students' passing rates on Maryland's standardized test, High School Assessment (HSA), and graduation rates for three consecutive academic school years (2011, 2012 and 2013).

An essential component posed by the No Child Left Behind (NCLB) Act was the requirement that all teachers of core academic subject areas be highly qualified by 2006 and beyond. This study adds to a growing body of research that has found statistically significant relationships between highly qualified teachers and students' academic achievement. Thus, the findings of this study have implications for policies related to highly qualified teachers and student achievement in secondary schools.

When a county had a higher percentage of highly qualified teachers (compared to other counties that had fewer highly qualified teachers) there was a higher percentage of students who passed the Biology 10, 11 and 12, English 10, 11 and 12, and Math 10, 11, and 12 High School Assessments (HSA), over three consecutive academic school years (2011, 2012 and 2013). The findings of this study would be particularly helpful to guide policies that would recruit and allocate highly qualified teachers across schools and districts, particularly in those schools which are underperforming in the core academic areas. Further, these findings would be helpful to plan policies that would provide adequate support and professional development to novice teachers, to encourage the attainment of the highly qualified teacher status.

When a county had a higher percentage of highly qualified teachers in that year compared to years when there were fewer highly qualified teachers, there was no significant relationships between the percentage of highly qualified teachers and students passing rates on the Biology 11 and 12, the Math 10 and 12, and the English 10 and 11 High School Assessments (HSA). For Biology 10, Math 11 and English 12 there was a significant relationship between the percentage of HQT in a county in a year, and the percentage of students passing the test that year. Part of the findings suggests that possibly more attention and studies need to be done to further look at the qualifications of teachers, along with teacher preparation and course delivery when addressing student academic achievement in core subject areas. Further, this study reveals that school officials must continue to examine the issues which impact academic achievement within school systems, and consider the quality of educators who teach within school counties. These results would help school county leaders form policies that not only address the “highly qualified” status of teachers but ensure that every (HQT) teacher have continuous training in their core area, and professional development that would link their skills as educators to better academic performance of students in every academic school year.

Completing a high school education is essential in order for students to advance to the next academic growth level, or even attend post-secondary training. This study demonstrated that there was a relationship between the percentage of classes taught by highly qualified teachers and graduation rates. In counties where there were more highly qualified teachers (HQT), a higher proportion of students graduated than in counties where there were fewer highly qualified teachers (HQT), over three academic school years (2011, 2012 and 2013). This implied that counties in Maryland with highly qualified teachers in core academic areas experienced higher graduation rates than counties with fewer highly qualified teachers. These findings would

help guide policies that would implement systemic changes in teacher preparation programs, to ensure continued success rates of students completing their high school education. Certainly, support from district and state leaders in crafting policies would ensure full state certification and continuous evaluation of teachers' content mastery or competency, in order to increase the number of students graduating between all districts within the state. State leaders working collaboratively with school administrators in writing policies would play a leading role in bringing about changes in teacher quality systemically, which would ultimately affect student graduation rates.

When a county had a higher percentage of highly qualified teachers (compared to other years) there was no relationship with that year's students' graduation rates. This implied that when comparing years where there were more highly qualified teachers than years when there were less, school districts experienced no significant change in the number of students graduating. Further implication is that districts need to consider the measurement of other variables, such as curriculum and school environment which may play a greater role on student achievement than highly qualified teachers, when determining the impact on student's graduation rates between years. Perhaps developing professional learning communities, as supported by Richardson's (2011) research would develop a culture in a school (school environment) and county where there would be shared ownership of student learning and academic achievement, thus increasing student buy-in that would lead to increase graduation rates.

### **Recommendations**

The purpose of this study was to examine the relationship between the percentage of classes taught by highly qualified teachers (HQT) and students' academic achievement, as

measured by students' passing rates on Maryland's standardized test, High School Assessment (HSA), and graduation rates for three consecutive academic school years (2011, 2012 and 2013).

The research was guided by two research questions. The ultimate goal of this study was to determine whether or not the independent variable (the percentage of courses taught by highly qualified teachers) has a statistically significant impact on the dependent variable (students' academic achievement and graduation rates). Thus, the current study has provided opportunities for future research in the following areas:

### **Recommendations for Future Research**

The following are recommendations for future research based on the findings in this study.

- 1) This study used quantitative data to examine the impact of highly qualified teachers on students' academic achievement. Because of what teachers learn and what they actually implement in their instructional practice, a qualitative approach may be useful in order to obtain a deeper understanding of teachers' classroom practices, and how their preparation and qualification impact academic achievement.
- 2) This study examined students' academic achievement as measured by student's passing rates on the High School Assessment (HSA). Future research, using qualitative data, could be utilized to better understand student's perceptions of the importance of taking standardized assessments and the possible relevance and connection to the real world. This data may provide a better understanding of why students perform better on some standardized assessments and not on others. Also,

- this approach may provide insight to possible barriers that may hinder students' performance on these high-stake assessments.
- 3) This study relied on the collection and analysis of archival data or secondary data to determine if a relationship exists between the percentage of courses taught by highly qualified teachers and students' academic achievement. Future research should consider a range of methods in data collection and analysis so that the information obtained would be richer and in-depth, in terms of the complexities surrounding the independent and dependent variables. For example, these methods for data collection and analysis may take the form of: survey questionnaires, interviews, focus groups (with teachers, students, school administrators and parents), classroom observations, teachers' examinations and students' learning outcomes.
  - 4) This study used quantitative data that was aggregated when examining the impact of highly qualified teachers on students' academic achievement. Future research should consider disaggregating the data to determine if there are some disparities among various student groups; thus, providing insight on possible approaches to addressing the achievement divide on the High School Assessments.

### **Recommendations for Future Practice**

The following are recommendations for future practice based on the findings in this study.

- 1) Administrators must collaborate with education stakeholders to provide appropriate staff development for teachers based on student achievement levels, as part of retaining highly qualified teacher.



- 2) School districts should continue to have discussions with institutions of higher education regarding appropriate teacher training programs that produce highly qualified teachers; licensing processes that are rigorous; methods that would increase the number of students entering in the teaching profession with expertise in core academic fields.
- 3) In support of the teacher quality provision of the NCLB Act, school leaders, in collaboration with district school executives, need to strategize on how to reach 100% in hiring highly qualified teachers. This effort to recruit and retain highly qualified teachers must be an ongoing effort that would not only impact the passing of state assessments but improve graduation rates.

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