

DOES TEACHER CERTIFICATION IN MATHEMATICS
IMPROVE HIGH SCHOOL SPECIAL EDUCATION STUDENTS' PERFORMANCE
ON THE HIGH SCHOOL PROFICIENCY ASSESSMENT?:

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ABSTRACT

This pilot investigation examined the impact of teacher mathematics certification on high school special education students' scores on the High School Proficiency Assessment (HSPA) in an urban public school setting. The sample included 76 eleventh grade students classified as special education under IDEA. The student sample represented 70% of males and 30% of females from culturally and economically diverse backgrounds. Five teachers federally classified as highly qualified were included. Out of the teacher sample, four held state certifications in mathematics and one was not certified. Research questions and hypotheses were examined using inferential statistical tests (2-sample t-tests) and effect sizes. Results suggested that special education students who were taught by High Qualified Teachers (HQTs) certified in mathematics scored significantly better on the Mathematics section of the HSPA than special education students who were taught by a non-certified HQTs mathematics teacher. Effect sizes suggested small practical and meaningful differences. Study limitations and directions for future research are outlined.

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CHAPTER I

Policy and Legal Background

The No Child Left Behind Act (NCLB) that was signed into law in January 2002 increases accountability of results of students' scores on high-stake tests by placing an emphasis on teacher qualification. The bill proposes many goals regarding education policy, but one area of particular interest to the education community is the requirement that every state ensures that all teachers are highly qualified and are receiving high-quality professional development (Gelman, Pullen, & Kauffman, 2004). According to NCLB, all students, including students with special needs, must demonstrate proficiency in Language Arts and Math by the year 2014. Therefore, the responsibility of student achievement does not solely fall upon the skills of the student, but also the skills of the teacher.

The basic principles of NCLB date back to *Brown v. Board of Education* (1954) when the U.S. Supreme Court outlawed racial segregation in public schools (U.S. Department of Education, 2004). This landmark case instituted the decision that all students have the right to an equal education. In 1965, the Elementary and Secondary Education Act (ESEA) became law. The ESEA was designed to send federal assistance to poor schools and low achieving students. In 1968, the National Institute for Advanced Study in Teaching Disadvantaged Youth published *Teachers for the Real World* (B.O. Smith, 1969). It was developed to enhance teacher preparation programs by having education professionals in public schools, universities, and communities collaborate (Gelman et al., 2004). However, due to lack of funding and follow through, this proposal failed.

In 1983, The National Commission on Excellence in Education published a report, *A Nation at Risk*. This report documented the shortcomings of public schools and provided detailed recommendations that covered four important aspects of the educational process: (1) content; (2) expectations; (3) time; and (4) teaching (Jorgensen & Hoffmann, 2003).

- School **content** focused on improving curriculum in the areas of English, mathematics, science, social studies, and computer science.
- **Expectations** were defined in terms of the skills graduates should possess. Schools should “adopt more rigorous and measureable standards, and higher expectations, for academic performance using challenging materials to support learning” (Jorgensen & Hoffmann, p. 3, 2003).
- **Time** was described as schools making the school day more meaningful in terms of quantity (making the school day longer or the school year longer) and quality (assigning students more homework and assisting them in developing study skills).
- The field of **teaching** needed to be improved by making teaching preparation programs more challenging and making the field of teaching more attractive to academically able students (Jorgensen & Hoffmann, 2003).

A Nation at Risk became the movement for change and the evolution in implementing high-stakes achievement testing began (Jorgensen & Hoffmann, 2003). The goals set forth in that report were vast and it led to the reauthorization of ESEA (1965). ESEA allowed the federal government to assume a larger role in financing public school

education. The goal of this law was to implement a high standard for all children; not just students who were disadvantaged and at risk for school failure (Jorgensen & Hoffmann, 2003). The ESEA required all states to have content and performance standards, implement standardized assessments aligned with those standards, and accountability of schools to meet expectations (Jorgensen & Hoffmann, 2003). These movements led to the authorization of No Child Left Behind Act (NCLB); which places a definite emphasis on accountability by increasing the expectations of both teachers and students.

Definition of Teacher Certifications

One of the criticisms of NCLB is the vague and sometimes confusing definition of the credentials that a teacher must obtain in order to meet the requirements of a Highly Qualified Teacher (HQT). The term “highly qualified teacher” was developed as part of NCLB and is now mandated by the federal government. To be deemed highly qualified, teachers must have: (1.) a bachelor's degree, (2.) full state certification or licensure, and (3.) the demonstration of competency in each subject they teach.

Alternately, certifications come from the state department, and teachers in different states can have different credentials in order to be certified in a particular subject area(s). In the state of New Jersey, a teacher who is certified in a particular subject area also meets the requirement of a HQT. However, not all HQTs hold certifications in the particular subject area(s) that they teach. In the state of New Jersey, in addition to teachers meeting the requirements of HQT, teachers must also have an advanced degree, hold 30 credits in the subject area in addition to taking advanced courses in a particular subject area along with passing the state praxis which assesses content knowledge in that particular subject area.

The goal of NCLB is to increase the depth and breadth of content knowledge that a teacher has in a particular subject area(s). One of the goals of NCLB and the federal

government is to streamline credentials so that all teachers have the same credentials. This is in an effort to provide all children with the same educational opportunities across the country, regardless of what state they reside in.

Although the premise of NCLB has good intentions, it is currently having a significant negative impact on special education teachers in secondary public schools. Historically, in the state of New Jersey, special education teachers typically completed their schooling with a degree that allowed them to teach students with special needs in grades K - 12. They were not certified in a particular subject area, instead their expertise focused on understanding the individual learning styles of students with disabilities and modifying instruction in order to assist them in understanding the subject matter at hand.

When NCLB was passed, and a HQT was mandated in each classroom, special education teachers did not have the credentials to demonstrate that they had subject specific competence. In order to minimize the shortage of special education teachers in classrooms, the federal government instituted the HOUSSE Matrix (NJ High Objective Uniform State Standard of Evaluation). The HOUSSE Matrix allowed veteran special education teachers the ability to meet the requirements of HQT if they had certain credentials and experiences such as professional development and a certain number of years of teaching experience. It was a “back door” effort to allow veteran special education teachers the ability to become a HQT in order to circumvent what would be a devastating shortage of special education teachers in our classrooms. The HOUSSE Matrix expired on June 30, 2007. However, it was reinstated and veteran special education teachers may use the HOUSSE Matrix to achieve highly qualified status until it expires on June 30, 2012. Under this policy, special education teachers who use the HOUSSE Matrix to become highly qualified are highly qualified to teach only special education students in the area for which the HOUSSE Matrix was successfully employed.

In November 2004, Congress passed H.R. 1350, the Individual with Disabilities Improvement Act (IDEA 04) in order to align with the requirements of NCLB.

Specifically, it mandated that special education teachers meet the requirement of HQT (Hardman, Rosenberg, & Sindelar, 2005). Therefore, special education teachers were not only accountable by NCLB requirements, but also IDEA 04 standards.

Secondary special education teachers were especially affected by NCLB because many students in secondary schools must be taught instruction in different core content areas by a special education teacher, in accordance with students' Individual Education Plans (IEP). Since many special education teachers instruct students in different core academic subjects, special education teachers must be a HQT in a variety of subject areas. Quigley (2009) proposes that the requirements to meet HQT become expanded so that special education teachers can become HQT by meeting different indicators of subject competence of core content area(s). Quigley (2009) is in support of the retention of the HOUSSE Matrix and also in favor of providing different teacher preparation alternatives for meeting HQT.

Teacher Accountability and Student Performance

In the recent past, attempts have been made to improve public schools and teacher preparation. However, education reform plans have not had a great deal of focus and follow through and due to lack of resources; these attempts have failed (Gelman et al., 2004). The goal of NCLB is to improve public schools. Reports have indicated that students in public schools are not meeting expectations, especially in the areas of Mathematics, Language Arts, and Science. Although high school graduation rates are increasing, students are not graduating with the skills necessary to compete in the knowledge-based job market (U.S. Department of Education, 2004). Schools, students,

and teachers are under scrutiny and teachers are being blamed for students' shortcomings (Gelman et al., 2004).

The goals of NCLB include the improvement of students' performance on high-stakes, standardized assessments by increasing teachers' preparation and content knowledge. There is data in the literature to support the relationship between teacher preparation and student performance on standardized tests. Students who had certified teachers performed better on standardized tests in reading, language arts, and math, than their counterparts who had uncertified teachers (Laczko-Kerr & Berlinger, 2002).

Teaching Mathematics

It is important to have HQTs in all core academic areas. However, competence in mathematics is the gateway to higher education as well as technological advances (Gimbert, Bol, & Wallace, 2007). Teaching mathematics "requires teachers who have considerable expertise in a wide range of subject matter, instructional strategies, and methods of assessment for students to make significant academic gains" (Gimbert et al., 2007, p. 93). "There is growing evidence that being assigned to a teacher with deeper content knowledge is related to greater academic growth, and the evidence is more persuasive in mathematics" (Nield, et. al., 2009, p. 738). Furthermore, teaching mathematics, specifically at the secondary level, requires teachers to have a wide variety of skill sets that enables them to teach students increasingly difficult instructional material to students with varying degrees of background knowledge in mathematics.

Teaching in Urban Settings

The goal of NCLB is to implement regulations that require teachers to receive more education and to display content knowledge in a specific area(s). This has resulted in teacher shortages, especially in secondary schools that are in urban areas (Gimbert et al., 2007). Teachers who work in urban areas not only face the challenges of meeting the

demands of teaching the curriculum, but they also have to instruct students who are not prepared to learn because they are affected by poverty, teenage pregnancy, illness, and high incidences of violence and school drop out rates (Gimbert et al., 2007). Therefore, urban secondary schools are often understaffed and students are being underserved.

Special Education Teaching

Special education teachers are also feeling the pressures of the mandates placed upon them by NCLB. NCLB states that all special education teachers must also be highly qualified in the content area(s) that they teach. Although this appears to be a suitable goal, special education teachers often teach students more than one academic subject area. Therefore, special education teachers face even more challenges than general education teachers and teacher shortages in special education are a reality. In fact, “during the 1999-2000 school year, more than 12,000 special education positions were filled by unqualified personnel or remained vacant (Gimbert et al., 2007). This places students with special needs in even a more vulnerable position than their general education counterparts.

NCLB Benchmarks and Student Achievement

Under NCLB, by the year 2014, 100% of students must be proficient in Language Arts and Math and schools have the burden of meeting Adequately Yearly Progress (AYP) (Darling-Hammond, 2007). Adequately yearly progress is a benchmark that has been set by each state. Every three years, the benchmark must be raised and by the year 2014, all students must be proficient in Language Arts and Math. NCLB provides opportunities for schools to develop action plans, however, if certain benchmarks are not achieved, the state can restructure the school. This can include reopening the school as a charter school, replacing all school staff or turning over the school to the state or to a private company.

Due to the benchmarks set by NCLB, education reform undoubtedly includes the implementation of standardized assessments to determine proficiency in core academic areas, especially in Language Arts and Math. At the present time, student achievement is measured by their performance on standardized tests. Factors that affect students' performance on standardized tests have been investigated throughout the literature. Evidence suggests that the better students perform on standardized tests, the better their outcome to continue their education and gain meaningful employment.

The implementation of more rigorous standards for becoming a teacher is highly controversial. With the recent implementation of NCLB, this topic is becoming of high interest and there is great debate among education professionals as to the value of teacher credentials. However, there is literature to support the notion that student performance on achievement tests is impacted by a teachers' level of preparedness and their certification status.

Teacher Certification and Student Outcomes

Greenberg, Rhodes, Ye and Stancavage (2004) examined the relationship between teacher qualifications and student achievement. They used data from the National Assessment of Educational Progress (NAEP) Grade 8 Mathematics assessment that was administered in spring 2008 to students enrolled in public schools. The NAEP mathematics assessment provides information regarding student knowledge and skills in the area of mathematics. It also asked students, teachers, and school administrators to provide background questionnaires to measure student background, teacher qualifications, and school characteristics (Greenberg, et al., 2004). Their study examined four specific teacher qualifications: teacher certification, academic major or minor, highest postsecondary degree, and years of teaching experience. Teachers were categorized as either certified teachers or non certified teachers. Certified teachers were teachers who

held an advanced professional certificate in the area they taught and non certified teachers were teachers who held emergency, temporary, or provisional certificates and who did not meet the necessary standards for certification in the state that they taught in. Mathematics teachers were defined as having a major or minor if they reported that they had an undergraduate or graduate major or minor in mathematics or mathematics education. Since all teachers hold a bachelor's degree, teachers were categorized into two groups: as either having a bachelor's degree or having an advanced degree such as a master's degree or higher. Teachers were also categorized into two groups in terms of teaching experience: those who had five or more years of teaching experience in mathematics (Greenberg et al., 2004).

Results indicated that eighth-grade students whose teachers were certified in mathematics had significantly higher average scores on the mathematics assessment than students whose teachers were not certified. Results were also statistically significant for teachers who held an academic major or minor in mathematics and for teachers who had more than five years of experience teaching mathematics. Having a teacher with a master's degree or higher did not yield statistically significant results.

Greenberg et al. (2004) also examined factors that are associated with at-risk students. Results indicated that economically disadvantaged students and students who were grouped into low ability math classes were less likely to be taught mathematics by a teacher with a major or minor in mathematics. Economically disadvantaged students were less likely to be taught mathematics by a certified math teacher and students in low-ability classes were less likely to be taught by a teacher with more than five years of teaching experience (Greenberg et al., 2004). Furthermore, results indicated that Black and Hispanic students were less likely to be taught by a certified teacher or a teacher with a major or minor in mathematics. These results raise concerns regarding the impact of

teacher certification on student achievement and the consequences that economically disadvantaged students and minority students have.

The relevance of state-mandated testing becomes increasingly more important as students transition from middle school to high school and can even affect students' graduation status. Neild, Farely-Ripple, & Byrnes (2009) examined the relationship between the qualifications of middle school teachers (grades 5 through 8) and student academic growth in mathematics and science. The purpose of their investigation was to demonstrate the importance of middle school education and that mastering basic skills is a bridge to acquiring more advanced logical and reasoning skills that are required in high school academic courses. This study used a data set from a large urban district where there were a large proportion of low-income students and 85% of students are from a minority group (Neild et al., 2009). The authors investigated the effects of teacher certification on student achievement on the Terra Nova Comprehensive Test of Basic Skills (CTBS). This test is administered to students in grades five through eight in Fall 2002 and Spring 2003 in math and science. Teachers were assigned to one of five groups: (a) secondary certified in math, (b) elementary certified, c) certified in special education, (d) certified in a field other than secondary math, elementary education or special education, or (e) not certified in any field. Contextual factors such as poverty level were controlled for. Results indicated that students with secondary-certified teachers in mathematics performed better on the Terra Nova than those who had teachers who were elementary-certified. Of importance to note is that the effect size was small and results were not statistically significant. However, students with elementary-certified teachers in mathematics performed statistically better than students who were certified in special education or who were not certified at all (Neild et al., 2009). Results for science yielded

statistically significant results where students with secondary science-certified teachers outperformed students who had any other type of teacher.

The literature suggests that teacher certification can indeed impact student performance on standardized tests and the acquisition of academic skills. Gass (2008) investigated the relationship between teacher certification and student performance on the Grade Eight Proficiency Assessment (GEPA). The GEPA is a standardized assessment tool administered to students in April or May to all eighth grade students in the state of New Jersey. The GEPA assesses proficiency in Language Arts, Math, and Science. Data was collected via the New Jersey Department of Education website. In addition to the 2005 NJGEPA scores, the following variables were collected: gender, ethnicity, economics), District Factor Group (DFG); (DFG is an index of a town's socioeconomic status derived from the Census), and the percentage of highly qualified teachers in core academic subjects (Gass, 2008). Results indicated that students who had highly qualified teachers performed better on the GEPA, particularly in low performing schools (Gass, 2008). In addition, ethnic differences and socioeconomic differences were found. Results indicated that African American and White students performed better on the GEPA than students of other ethnic backgrounds. Gass (2008) also found that DFG was a predictor of student performance on the GEPA.

Goldhaber and Brewer (2000) also compared teacher certification and student performance on standardized test scores in mathematics and science. The purpose of this study was to examine if teacher certification is associated with student test score gains. Specifically, the authors investigated the impact of teachers with probationary certification, emergency certification, private school certification, and non certified teachers in the subject area they taught in comparison with teachers with certification in the subject area they taught (Goldhaber & Brewer, 2000). The data used in this study was

collected by the National Educational Longitudinal Study of 1988 (NELS: 88). This is a national survey of 8th grade students that was conducted in spring, 1988. A subset of students were resurveyed in the spring of the 10th grade (1990) and 12th grades (1992) (Goldhaber & Brewer, 2000). The NELS: 88 surveyed students, their parents, and teachers. The survey provided information about student demographics and student test scores. Teachers were asked to provide information related to the subject(s) that they taught, degree level, experience, and certification.

Similarly to Greenberg et al. (2004), results indicated that students of certified math teachers performed statistically significantly better on tests than students of teachers who are either not certified in their subject area or hold a private school certification. Interestingly, they found that students of teachers who hold an emergency certification in mathematics do no worse than students who have teachers with standard certification (Goldhaber & Brewer, 2000). The authors propose a number of possible reasons for this finding. First, they suggest that teachers who apply for emergency certification are a heterogeneous group. Second, they suggest that teachers who are emergency certified, may undergo a more intense screening process when they are being hired by school districts. In essence, the authors question the integrity of teacher credentials and certification.

These findings bring to light the controversial topic of teacher certification. It raises questions regarding the more rigorous standards that are being employed for becoming a teacher and if teacher certification improves student achievement. Darling-Hammond, Berry, and Thoreson (2001) challenged Goldhaber and Brewer's (2000) findings. Darling-Hammond et al. (2001) questioned the validity of the NELS: 88 and the methodological practices that were utilized. In addition, the findings that students of emergency certified teachers of students do no worse than certified teachers on

standardized was challenged. Darling-Hammond et al. (2001) reported that it appeared that this sample of teachers does not take into account the fact that many of the teachers that were emergency certified were in fact experienced teachers, they had the same credentials as certified teachers, and they were from out of state and were in the process of becoming certified.

Goldhaber and Brewer (2001) then offered a rebuttal against the Darling-Hammond et al. (2001) article. Goldhaber and Brewer (2001) reported that their study on the effectiveness of teacher certification was one of the first in the field. In addition, they reported that their findings were credible and that Darling-Hammond et al. (2001) misrepresented their work. Goldhaber and Brewer (2001) reported that further empirical research must be conducted to determine the relationship between teacher certification and student achievement.

It is evident that teacher certification and its impact on student achievement is a provocative topic, one worthy of further investigation in order to either support or refute the relevance of teacher certifications. Although there is research to support the notion that teacher certifications impact student performance on standardized tests, the topic of teacher preparedness and the impact that it has on student achievement is highly controversial. Gimbert et al. (2007) examined the influence of instructional delivery methods used by beginning teachers on student achievement in Algebra I classrooms with regard to national standards in mathematics. The two groups of teachers were traditional teachers who received their bachelor's or master's degree in education and a major in secondary mathematics from a four or five year college or university and teachers who received their training in the alternative or nontraditional teacher preparation program (Gimbert et al., 2007). Participants came from middle schools and high schools in an urban public school system that met the criteria of having an Algebra I teacher who was a

1st-year teacher. Students came from an economically disadvantaged area and more than half the population was of a minority group. The Algebra I assessment was developed by teachers and the mathematics coordinator and was modeled after the state mathematics, the Standards of Learning End-of-Year Assessment (SOL). The Algebra I assessment was administered quarterly within the district.

Results indicated that students whose teachers were alternatively trained had a slightly higher overall mean score than students who were in classrooms with teachers with traditional training on the SOL. Results indicated that students performed significantly better on the SOL when taught by traditionally trained teachers only in the area of statistics. Findings also indicated that teacher training had a significant influence on Algebra I achievement prior to the final administration of the district quarterly tests, but there was no significant influence on students' Algebra I scores on the final district quarterly test (Gimbert et al., 2007).

The findings by Goldhaber and Brewer (2000) and Gimbert et al. (2007) question the validity of teacher certifications and the relevance of NCLB and the implementation of teachers meeting certain guidelines in order to enter the field of teaching. At the present time, policy makers, stakeholders, and educators are making decisions in regard to how public schools are funded and in the recruitment of teachers and other staff members. Superintendents, administrators, and stakeholders are burdened with hiring teachers who not only present with skills that would make them good teachers, but who are also certified in the content area(s) that they teach. In urban areas where teacher shortages are the norm, this can be an arduous task. This is especially true for teachers of students with disabilities. In addition, it is important to note the significance of students' achievement scores and the impact scores have on the community. State and federal funding of schools is affected by students' achievement test scores and the

determination if schools are demonstrating adequate yearly progress or if they are failing to progress. In addition, students' achievement scores are made public and are utilized to make decisions that affect the entire community such as property taxes and the allotment of monies at the municipal level. It is imperative that stakeholders in public education continue to gather information so that decisions regarding how to educate children and who to hire to educate children can be made.

Present Investigation

Further investigation on the impact of teacher certification on student academic outcomes is warranted. At the present time, the research on teacher certification and the relationship it has on student performance on state-wide standardized assessments is inconclusive. Furthermore, the research on teacher certification in math and the impact that it has on high school special education students' performance on high-stakes tests is lacking in urban public school settings. Since special education students are already at a disadvantage simply because they are not performing as well as their peers, understanding the relevance of teachers' credentials and the relationship it has on special education students' standardized test performance is worthy of further investigation. In addition, an urban setting provides a unique context for teaching. The present study provides the first pilot investigation on the impact of teacher math certification on public high school special education students' performance on a state-wide assessment in an urban setting. The purpose of this study is to examine whether teacher certification improves high school special education students' performance on the math and language arts sections of the High School Proficiency Assessment (HSPA).

Statement of Specific Hypothesis and Predictions

Primary Research Question

1. Do eleventh grade special education students taught by HQTs certified in mathematics yield higher math scores on the HSPA than eleventh grade special education students taught by HQTs not certified in mathematics?

Specific Hypothesis

Hypothesis 1a. – Eleventh grade special education students who were taught by HQTs certified in mathematics will have statistically significant ($p < .05$) higher standard scores on the HSPA math section than eleventh grade special education students who were taught by HQTs not certified in mathematics.

Hypothesis 1b. – Eleventh grade special education students who were taught by HQTs certified in mathematics will have practically different (as measured by between group effect sizes) standard scores on the HSPA math section than eleventh grade special education students who were taught by HQTs not certified in mathematics.

Secondary Research Question

2. Do eleventh grade special education students taught by HQTs certified in mathematics yield higher language art scores on the HSPA language arts section than eleventh grade special education students taught by HQTs not certified in mathematics?

Specific Hypothesis

Hypothesis 2a. – Eleventh grade special education students who were taught by HQTs certified in mathematics will have similar ($p > .05$) standard scores on the HSPA language arts section than eleventh grade special education students who were taught by HQTs not certified in mathematics.

Hypothesis 2b. – Eleventh grade special education students who were taught by HQTs certified in mathematics will have similar standard scores (i.e. minimal or small

group effect sizes) on the HSPA language arts section than eleventh grade special education students who were taught by HQTs non certified in mathematics.

CHAPTER II

Student Sample

The sample included 76 eleventh grade students classified as special education under IDEA. The students came from an urban public high school in New Jersey. The district consists of six elementary schools and one high school. There are approximately 2,500 students in the high school. Approximately 15% (375 students) are classified as special education under IDEA.

Of the 76 eleventh grade students, 47% of the special education students who participated in the HSPA were taught math by a teacher who was a HQT and non-certified in math ($n = 36$). Fifty three percent of the special education students who participated in the HSPA were taught by math teachers who were HQTs and certified in math ($n = 40$). The student sample represented 70% of males ($n = 53$) and 30% of females ($n = 23$) from culturally and economically diverse backgrounds. Forty nine percent of students were 17 years old ($n = 37$), 32% were 16 years old ($n = 24$), 18% were 17 years old ($n = 14$), and one student was 20 years old at time of testing. Eighty two percent of students are Hispanic ($n = 62$), 16% are White ($n = 12$), and the remaining sample consisted of students whose ethnicity is Black ($n = 1$) and Asian ($n = 1$). Seventy five percent of students were classified under the federal category of Specific Learning Disability ($n = 57$), 14% were classified under the category of Other Health Impaired ($n = 11$), 5% were classified as Cognitively Impaired Moderate Range ($n = 4$) and the remaining sample consisted of students classified as Emotionally Disturbed ($n = 2$), Multiply Disabled ($n = 1$), and Orthopedically Impaired ($n = 1$). Fifty five percent of students come from

families that are not classified as economically disadvantaged ($n = 42$) and 45% of students are classified economically disadvantaged ($n = 34$). Students who are classified as economically disadvantaged qualify for free or reduced lunch based on their household income. Table 1 presents the student demographics in the sample group.

Table 1
Student demographics

Gender		N	Percentage
	Male	53	70%
	Female	23	30%
<hr/>			
Ethnicity			
	Hispanic	62	82%
	White	12	16%
	Black	1	<1%
	Asian	1	<1%
<hr/>			
Special Education Classification			
	Specific Learning Disability	57	75%
	Other Health Impaired	11	14%
	Cognitively Impaired	4	5%
	Moderate Range		
	Emotionally Disturbed	2	3%
	Multiply Disabled	1	<1%
	Orthopedically Impaired	1	<1%
<hr/>			
Economically Disadvantaged			
	Yes	42	55%
	No	34	45%

Teacher Sample

Five teachers federally classified as highly qualified were included. The highly qualified teacher (HQT) had the following credentials: (1.) a bachelor's degree, (2.) full state certification or licensure, and (3.) the demonstration of competency in each subject they teach. Out of the teacher sample, four held state certifications in math (HQT math-certified group) and one was not certified (HQT non-math certified group).

In the state of New Jersey, a certified math teacher must have the following credentials in addition to meeting the requirements of HQT: teachers must also have an advanced degree, hold 30 credits in the subject of mathematics in addition to taking advanced courses in mathematics along with passing the state praxis which assesses content knowledge in that particular subject area.

Data was collected during two academic school years. During the first year, the HQT non-math certified group ($n = 1$) taught thirty-six students. This teacher was a special education teacher. During the second academic school year, the HQT math certified group ($n = 4$) taught forty students. These teachers were regular education teachers. In the HQT math certified group, a special education teacher was also available as a resource to assist the students and to assist the teacher in implementing modifications to accommodate students' varied learning styles, per each student's IEP. The shift in model from using HQT non-math certified teachers to HQT math certified teachers was due to the school district attempting to increase the performance of special education students' scores on the High School Proficiency Assessment (HSPA). It was the belief of the administrators that utilizing HQT math certified teachers to teach special education students in math classes would improve these students' scores on the HSPA due to the certified math teachers having demonstrated depth and breadth of knowledge in the area of mathematics.

Each teacher taught math, five days per week, for forty-two minutes per day utilizing the same textbooks as their general education counterparts. Approximate class size varied, with no more than 16 students in one particular classroom. Four teachers are female, one is male, four teachers are White, one is Hispanic, and four teachers had achieved tenure status in the school district and one teacher was non-tenured. Table 2 presents the teacher demographics in the sample group.

Table 2
Teacher demographics

Gender		N	Percentage
	Male	1	20%
	Female	4	80%
Ethnicity			
	Hispanic	4	80%
	White	1	20%
Tenure Status			
	Tenured	4	80%
	Non-tenured	1	20%
Certifications			
	HQT Math-Certified	4	80%
	HQT Non-math Certified	1	20%

Instrumentation

The High School Proficiency Assessment (HSPA) is a New Jersey state-wide assessment given to first-time 11th graders in March of each school year. Participants included all eleventh grade special education students who took the HSPA for the first

time. Archival data was collected from an urban school districts' computer database. The superintendent of schools granted permission for the data to be used in this study.

Special education students took the HSPA with setting accommodations and modifications that included small group, unlimited time, and test questions could be read to them (excluding reading passages on the Language Arts section).

The HSPA measures student proficiency of eleventh-grade knowledge and skills in the areas of in Mathematics and in Language Arts Literacy (LAL) as described in the New Jersey Core Curriculum Content Standards (NJCCCS). Students are assigned to one of three proficiency levels separately for Math and for LAL. A level of "Proficient" indicates that a student meets the requirements for graduation. "Partially Proficient" indicates that a student does not meet the minimum level of achievement set for graduation. "Advanced Proficient" indicates a high level of mastery against the NJCCCS.

"Partially Proficient" indicates that a student does not meet the minimum level of achievement set for graduation (0 – 199).

"Proficient" indicates that a student meets the requirements for graduation (200 – 249).

"Advanced Proficient" indicates a high level of mastery against the NJCCCS. The state of New Jersey also reports HSPA results by major demographic group. (250 - 300).

The Mathematics section requires students to utilize their problem solving skills to solve math problems of basic mathematics, algebra, and geometry. Questions are either multiple choice or open-ended where students are required to explain their answer. Open-ended questions are scored by highly trained raters. Students are provided with a reference sheet that contains a ruler, geometric shapes, formulas, and other information that may be useful as he/she takes the test. The student is also provided with a calculator.

The Mathematics section measures student knowledge of the following skills:

- Number and Numerical Operations
- Geometry and Measurement
- Patterns and Algebra
- Data Analysis, Probability, Statistics, and Discrete Mathematics

The Language Arts section requires students to read passages and answer multiple choice questions and open-ended questions that assess students' literal and inferential comprehension. Open-ended questions are scored by highly trained raters. The written component requires students to provide a written response to two writing prompts. It measures students' ability to construct meaning in a written response.

The HSPA was developed and reviewed by state-level committees for Mathematics and Language Arts. Proficiency levels were established from the March 2002 test administration. Committees of experienced educators recommended proficiency levels for each test section. With the committees' recommendations, the State Board of Education, in consultation with the Commissioner of Education, adopted the standards which established the proficiency levels. Statistical equating is used to make sure that all future HSPA tests are at the same level of difficulty as the March 2002 test.

Multiple choice questions are machine-scored by a company hired by the New Jersey Department of Education. Each correct response counts as one point and students' raw scores are based on each correct response. Raw scores are then converted into scaled scores. Open-ended questions are scored on a scale that ranges from 0 to 4 in Language Arts Literacy and 0 to 3 in Math. Essays are scored on a scale from 1 to 6. Two independent readers score the open-ended questions and the essays and scores are averaged.

In order for students to demonstrate proficiency, they must obtain a passing score of 200 on each section. If students do not meet the benchmark, they are able to take the test again in the twelfth grade. If students do not pass at that time, they can become eligible for the Special Review Assessment (SRA) process. Students classified as special education students may be exempt from taking the HSPA, per their IEP.

Data Analysis

Three data analytic techniques were used to address the proposed research questions and hypotheses. First, descriptive statistics were computed to describe the student and teacher samples and HSPA score distributions. Second, two-sample t-tests were computed to assess the statistical significant differences between teacher groups. Third, between group effect sizes were computed to determine the practical and clinically meaningful differences between the teacher group.

Glass' (1977) effect size for between-subject effect designs was computed using the following formula:

$$ES_{\text{between}} = \frac{\text{Group 1} - \text{Group 2 control}}{SD_{\text{control}}}$$

Cohen's (1988) effect size of .20 or smaller represent small group differences, .50 medium group difference, and .80 or larger represent large group differences.

CHAPTER III

Results

Table 3 presents the two-sample t-tests for HSPA scale scores between teacher group. Results indicated that special education students who were taught by HQTs certified in mathematics scored significantly better on the Mathematics section of the HSPA than special education students who were taught by HQTs non-certified math teachers [$t(2,74) = .105, p < .05$].

Results indicated that special education students who were taught by HQTs certified in mathematics did not score significantly better on the Language Arts section of the HSPA than special education students who were taught by HQTs non-certified in math [$t(2, 74) = .249, p > .05$].

Table 3
Results of t-tests

Scale	HQTs Non-Certified in Mathematics N=36		HQTs Certified in Mathematics N=40		<i>t</i>
	M	SD	M	SD	
HSPA Sections					
Math	168.44	18.11	175.50	19.22	0.105*
Language Arts	189.28	29.00	196.33	23.77	0.249

Note. * $p < .05$ for 1-tailed test

Effect sizes (ES) were computed using Cohen's *d* (Cohen, 1988). A small ES was found for the special education students' Mathematics scores on the HSPA who were

taught by HQTs certified in mathematics (ES = .38). A small ES was also found for the special education students' Language Arts scores on the HSPA who were taught by HQTs certified in mathematics (ES = .26).

CHAPTER IV

Discussion

This pilot investigation examined the impact of teacher mathematics certification on high school special education students' scores on the High School Proficiency Assessment (HSPA) in an urban public school setting. Results suggested that special education students who were taught by HQTs certified in mathematics scored significantly better on the mathematics section of the HSPA than special education students who were taught by HQTs non-certified mathematics teachers. Although results for the HQTs certified in mathematics group did not yield significant results for student scores on the Language Arts section of the HSPA, a small positive ES value was found which indicates that there is some modest practical difference between the teacher certification groups on students' performance on state-wide testing.

Results of the present study are commensurate with results from previous studies. Greenberg et al. (2004) found that eighth-grade students whose teachers were certified in mathematics had significantly higher scores on the mathematics assessment than students who had non-certified math teachers. Furthermore, Greenberg et al. (2004) found that teachers who held an academic major or minor in mathematics, and who had more than five years of experience teaching mathematics resulted in higher average scores on the state-wide assessment in mathematics. Holding a major or minor in mathematics and years of teaching experience are factors that affect certifications. In the state of New Jersey, teachers certified in mathematics have demonstrated breadth and depth of

knowledge as evidenced by having an advanced degree in mathematics and passing the state praxis in mathematics. The greater the knowledge and experience that teachers have in a particular subject area, the greater the likelihood that they will have the ability to maximize student learning, therefore improving student performance on standardized assessments. The findings of the present study provide some preliminary support for the implementation of teacher certifications and the impact that it has on student performance on state-mandated assessments.

Gass (2008) found that 8th grade students who had highly qualified teachers performed better on the GEPA than students who had teachers that were not highly qualified. Results indicated that students who had highly qualified teachers performed better on the grade eight state-wide assessment, particularly in low performing schools. Findings also revealed ethnic differences and socioeconomic differences. Results indicated that African American and White students performed better on the GEPA than students of other ethnic backgrounds. Results from Gass (2008) are commensurate with results from the present study and support the notion that teacher certifications do indeed have an impact on student performance on standardized assessments.

Goldhaber and Brewer (2000) investigated teacher certification and student performance on standardized test scores in both mathematics and science. Their results indicated that students of certified math teachers performed significantly better on tests than students of teachers who were not certified in the subject area they taught or who held private school certification. The present investigation yielded similar results to the Goldhaber and Brewer's findings and supports the notion that teacher certifications impact student achievement on standard assessments. However, Goldhaber and Brewer (2000)

also found that students of teachers who hold an emergency certification¹ in mathematics do no worse on standardized assessments than students who have teachers with standard certification. Goldhaber and Brewer postulated that these findings may be attributed to the heterogeneity of the teacher group and that teachers who apply for teaching positions undergo a more intense screening process by school districts. Neild et al. (2009) investigated the effects of middle school teacher certification on student performance on standardized tests in math and science. Results suggested that students with secondary-certified teachers in mathematics performed better in mathematics on middle school state-wide testing than students who had teachers who were elementary certified. However, these results were not significant and the effect size was small. Alternatively, students with elementary-certified teachers in mathematics performed statistically better than students who had teachers who were certified in special education or who were not certified at all. Previous studies underscore the complexity of the impact of teacher certification on student performance on standardized tests. The present investigation provides some preliminary evidence for the significance of teacher certification in math and the impact that it has on special education students' performance on the math section of a standardized assessment. Further examination of the influence of teacher certification, training, and teaching experience on student outcomes is needed.

Limitations

The present investigation includes several limitations. First, this investigation included a small sample size. The student sample included 76 eleventh grade special education students from one urban public high school in New Jersey. Likewise, the teacher sample was small, including a total of five teachers. Second, the student and

¹ According to Goldhaber and Brewer (2000) emergency certification indicates that the teacher requires additional coursework before regular certification can be obtained.

teacher groups were homogeneous. Approximately 70% of the student sample was male and 82% of the sample was Hispanic. Males and minorities were over represented in this sample. The teacher group was predominantly female and White. Third, there was an imbalance between the teacher groups. The HQT non-math certified group consisted of one teacher while the HQT certified math group included four teachers. Fourth, the instructional context between the two teacher groups over the two academic years differed. The delivery of instruction was not investigated and teacher lesson plans were not collected. Taken together, these methodological limitations significantly impede the generalizability of the present investigation's findings.

Future Research Directions

Despite these limitations, findings in this preliminary investigation offer new directions for research. First, future research should include a larger and more diverse sample of students and teachers to allow for greater statistical power and generalizability of findings to other school populations. Second, research that examines the impact of teacher certification on both special education and regular education students' performance on standardized assessments is needed. Third, this line of research can be extended to examine the longitudinal effect of teacher certification on student performance on state-wide mandated testing. Fourth, the instructional context should be investigated. This includes collecting information on the characteristics of the teachers, the students, the quality of the delivery of instructional lessons, and teacher classroom management techniques.

Final Thoughts

Since the inception of NCLB, the utilization of standardized assessments as a tool to determine student achievement appears to be a method that will continue to be employed. Teachers are increasingly being held accountable for student performance on

these assessments, particularly in the areas of Mathematics and Language Arts. Therefore, it is imperative that teachers have the necessary qualifications and certifications in their areas of instruction. In addition, it is important that teacher certifications are aligned with both the breadth and depth of content of the subject matter they instruct and the areas that are assessed on student standardized tests.

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