The Relationship Between Selected Attributes of Algebra I Teachers and Student Achievement on the Algebra I SOL Test in Grades 9-12

by

Bernardine Goode Miles

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Travis W. Twiford, Chair
Virgie Binford
Carol S. Cash
Richard G. Salmon

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ABSTRACT

This study of the relationship between teacher attributes and student scores on the SOL Algebra I Test in Grades 9-12 focused on three prominent teacher attributes: certification, specialization in math, and years of experience teaching math. The study also assessed two additional relationships: 1) the relationship between student socioeconomic status, as reflected in the percentage of students who receive free or reduced fee lunch, and the SOL test score; and 2) the association between teacher perceptions of Stronge's (2002) domains of effective teaching and achievement on the SOL Algebra test. Teachers who taught high school Algebra I in the Commonwealth of Virginia voluntarily completed a questionnaire about their experiences and educational preparation, and their perceptions of teacher attributes that contribute to student achievement in Algebra.

The study found no significant relationships between the teacher attributes and student achievement on the Algebra I SOL test. Only two of Stronge's domains of effective teaching, *Teacher as a Person* and *Monitoring Student Progress and Potential*, were statistically significant. These findings affirm recent reports that traditional measures of teacher quality such as seniority or certification, or established views of effective teaching may not be related to student achievement. The study found that the students' socioeconomic status had a statistically significant association with student achievement on the Algebra I SOL test.

Although the study findings are limited because of the small sample size and the homogenous sample of Virginia teachers, the findings are consistent with recent reports on effective teaching, and widespread educational reform. Studies that are specifically focused on the teaching of subjects such as Algebra could help to identify the characteristics of great math teachers and the unique teaching strategies these teachers use to help students successfully learn math. New research that utilizes qualitative research methods has the potential to identify additional classroom strategies and approaches used by great teachers.

In 2009, No Child Left Behind requires that all schools find, hire, and retain highly qualified teachers for core subject areas. The findings of this study suggest that traditional measures for hiring and rewarding teachers may need to be expanded to include new perspectives on selecting effective teachers.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I
INTRODUCTION

A good teacher…is kind, is generous, listens to you, encourages you, has faith in you, keeps confidences, likes teaching children, likes teaching their subject, takes time to explain things, helps you when you're stuck, tells you how you are doing, allows you to have your say, doesn't give up on you, cares for our opinion, makes you feel clever, treats people equally, stands up for you, makes allowances, tells the truth, is forgiving. (McBer, 2000, p. n.p.)

Context of the Study

In his 1999 State-of-the-Union address, President Clinton proposed the Education Accountability Act, which would require school districts that receive federal financial assistance to improve teacher quality (Clinton, 1999). That same year, Richard Riley, the U. S. Secretary of Education, introduced President Clinton's vision which would require states to institute three steps in the certification of teachers (Wenglinsky, 2000). First, teachers would be required to pass a written exam in their major subject. Second, the professional licensure of teachers would be based on classroom observations by peers. Third, teachers would be evaluated later in their careers for advanced licenses such as those measured by the National Board for Professional Teaching Standards (NBPTS) (Wenglinsky, 2000). In addition, the legislation proposed establishing a national job bank to recruit teachers, national conferences on teacher quality; and a national commission that would target the teaching of math and science (Wenglinsky, 2000). The legislation failed to pass in Congress.

After President Clinton left office without succeeding with this legislation, then President Bush proposed a $2.9 billion incentive to recruit, hire, and train teachers; provide teachers with tax deductions for school supplies and other school-related, out-of-pocket expenses; and fund the Troops-to-Teachers Program (Wenglinsky, 2000). Although this legislation was designed to improve teacher quality and student academic performance, the approach was based on little empirical evidence about the association between improvement in teacher inputs and improvement in student outputs. The proposals also ignored classroom practices (Wenglinsky).

In 2001, Sullivan predicted that, in the next decade, American school districts would face the great challenge of hiring sufficient numbers of effective teachers. During 2001-2011 decade, the American educational system was expected to lose almost half of the classroom teachers because of retirement; approximately 50 percent of new teachers were also expected to resign their positions within seven years and begin new careers. Furthermore, more teachers would be needed in response to the demand for smaller class sizes and the increase of 1.7 million or 13% in student enrollment. With the projected decrease in the teaching workforce within 10 years, schools were under enormous pressure to hire and retain highly qualified teachers as mandated by No Child Left Behind (NCLB) (Sullivan, 2001).

Statistics from the 2006-2007 U.S. Department of Labor's Bureau of Labor Statistics (2006) reaffirmed Sullivan's predictions that the prospects for teaching positions would be good in the next decade because of the high number of retirements expected between 2006-2014. School districts have experienced difficulty hiring highly qualified teachers. This shortage of highly qualified teachers is particularly acute in the areas of mathematics, science, bilingual education, and foreign languages. The anticipated shortages of teachers in some parts of the US and the loss of teachers to retirement have prompted many states to implement policies that encourage students to consider teaching as a career (Commonwealth of Virginia, 2004b, 2005b).

The NCLB Act (2002) mandated that schools must employ highly qualified teachers by the school year 2005-2006 (PL 107 110, Title I, Part A §1119a.2). The Commonwealth of Virginia complied with this mandate and defined a highly qualified teacher as one whom:

1. Obtained full state certification (licensure) as a teacher (including certification obtained through alternative routes to certification) or passed the state teacher-licensing examination; holds a license to teach in the state; and does not have certification or licensure requirements waived on an emergency, temporary, or provisional basis.
2. Holds a minimum of a bachelor's degree.
3. Has demonstrated subject matter competency in each of the academic subjects in which the teacher teaches in a manner determined by the state

and in compliance with Section 9101(23) of ESEA (Commonwealth of Virginia, 2004a, p. 54).

Teacher preparation and certification champions advocated for such qualifications for all teachers by suggesting that teachers complete a five to six-year college program. During such a program, the first four years would focus on broad-based knowledge in a specific field of interest, and the last two would be an extended internship in which novice teachers could learn best practices and practice teaching strategies (Sullivan, 2001). In 1994, Monk had proposed that the National Board for Professional Teaching Standards (NBPTS) establish such criteria for teachers of mathematics that require courses beyond the minimal state requirements.

Finding highly qualified teachers has been challenging in some states. Coble (2004) and the Education Commission of the States tracked the progress of the 50 states and their success in hiring highly qualified teachers based on the 'Highly Qualified Definition'. The definition of 'highly qualified' is different in some states, but all of the definitions meet the mandates of NCLB. Twenty-one states, in 2004, including Virginia, made progress. Thomas Elliott, State Assistant Superintendent for Teacher Education and Professional Licensure (Commonwealth of Virginia, 2004a), reported to the Commonwealth of Virginia Board of Education the progressive actions of the Virginia Department of Education in applying the 'Highly Qualified' definition when hiring new teachers.

Historical Perspective

A Nation at Risk (1983) was the landmark publication that influenced modern educational reform and accountability. This report stressed the need for America to take ownership of the educational requirements of students and teachers. Colleges, universities, and public and private schools were challenged to raise the expectations for student achievement in English, physical sciences, mathematics, and technology. The report identified teacher accountability as a key factor in improving student achievement.

Documentation of the relationship between the attributes of teachers and student achievement began with the Coleman Report in 1966 (Wenglinsky, 2000). Coleman et al. (1966) conducted a two-year national survey that investigated the access to

educational opportunities for people of six ethnic groups, national origin, and color. The identified groups were “Negroes, American Indians, Oriental Americans, Puerto Ricans, Mexican Americans, with Whites often called the ‘*majority*’” (p. iii). Although this report provided crucial information in 1966, by today’s standards, its statistical findings are of little significance. However, this report stimulated pioneering research that linked teaching attributes, or teacher inputs, to student achievement, or student outputs through standardized test scores.

The survey findings showed that there was a stronger correlation between teacher quality and student achievement in the secondary grades than the lower elementary grades, and that effective teachers were more important to the achievement of minority students than to students in the majority group (Coleman et al., 1966). The teacher attributes addressed in the survey-- education, number of years teaching, salary level, verbal ability, and attitudinal indicators-- were considered less tangible (Coleman et al., 1966). The report also compared students from families that supported education with students from deprived backgrounds. The academic achievement of the first set of students was not as significant as the second set of students who came from deprived backgrounds and were placed in school environments that offered privileged opportunities (Coleman et al., 1966).

Research on teacher attributes can be traced back to the 1800s when Kratz (1896) asked students to describe the teachers from whom they learned the most. The students learned best from demanding teachers, teachers who were skilled in teaching, teachers who were knowledgeable about their subject matter and teachers who were disciplinarians. In 1930, Barr and Emans based their perception of teacher attributes on student achievement. In 1958, Barr developed a comprehensive list of teacher behaviors that characterized good teachers. Behaviors such as resourcefulness, considerateness, intelligence, refinement, reliability, and objectivity were similar to the characteristics of good teachers later reported by McBer in 2000.

Ryans (1960) found that personal characteristics such as “superior intellectual abilities, above average school achievement, good emotional adjustment, generosity in the appraisal of behavior and motives of other persons, early experiences in caring for children, and a history of teaching in the family” were prominent characteristics that

applied to good teachers (p. 366). Later research on teacher attributes began to focus on other attributes such as years of experience and the amount of education (McEwan, 2002).

Defining the teacher attributes that affect student achievement became a source of disagreement among researchers, who have defined and described such attributes in various ways. (Ornstein & Lasley, 2000) Hill, Rowan, and Ball (2005) suggested that the number of courses taken by the teacher, number of degrees earned, or the results of basic skill tests are good attributes of math teachers. Another view includes assessing the effects of these factors on student test results (Hill, Rowan & Ball).

Hill, Rowan, and Ball (2005) studied how the knowledge of math teachers affected the mathematics achievement of first and third graders. The study concentrated on subject-matter knowledge that defined a teacher's ability to teach math by using "proxy variables such as courses taken, degrees attained, or results of basic skills tests" (Hill, Rowan & Ball, p. 372). The researchers found that teachers educated in the delivery of math instruction and math comprehension had a significant impact on student achievement, and that the most important factor was the quality of the math training. Hill, Rowan, and Ball also found that the teacher's verbal ability could predict the student outcome on achievement tests.

In 1985, Hawk, Coble, and Swanson had commented on certification and teacher effectiveness by stating that, "A person cannot be a good teacher without first knowing the subject areas and that the process of certification is designed to guarantee that teachers have such basic knowledge" (p. 13). Hawk, Coble, and Swanson assessed the correlation between selected attributes of teachers and student achievement by specifically targeting research to the quality of teachers placed in schools based on certification and their effectiveness. Research at that time was limited and had not identified a relationship between the two variables. However, Hawk, Coble, and Swanson documented that teachers with increased coursework in their area of certification influenced student achievement.

Ironically, Wenglinsky's research noted that in the late 1990s and early 2000s, empirical research was too limited to support the federal government's incentives to improve teacher quality and student academic performance. Begle and Geeslin (1972)

had acknowledged that, for years, the correlation between students' academic behavior and teacher characteristics had been a topic of study, and that the area was usually denoted as "teacher effectiveness" (p.1). Nevertheless, educators had differing beliefs about teachers' ability to produce a change in student behavior (Begle & Geeslin, 1972). Bedwell, Touzel, and Wiseman (1991), Darling-Hammond, Holtzman, Gatlin, and Heilig (2005), and Darling-Hammond and Young (2002) reiterated this sentiment and emphasized that the importance of understanding the instructional material to be taught is essential to good teaching.

Ornstein (1990b) summarized the controversy about teacher effectiveness by stating:

> Researchers disagree on how to categorize which teacher attributes affect student achievement. In addition, they give a variety of names to what they are trying to describe, such as teacher traits, teacher personality, teacher performance, teacher outcomes. (p.48)

Goldhaber and Brewer (1996) and Monk (1994) explored the topic further by studying teacher attributes, teacher knowledge, or teacher preparation in the math and teacher certification of public school teachers. The research concluded that teachers who had prior background knowledge in their subject area and were certified in the subject they taught had higher student achievement rates than teachers who were not proficient in their assigned subject or certified to teach that subject. The issue of teacher preparation in Manouchehri's 1997 research focused on the preparation of math teachers for teaching mathematics. Manouchehri's research suggested that:

> The recommendations of the current reform for school mathematics focus attention on teaching. They require that teacher education programs play an integral role in familiarizing teachers with current recommendations and preparing them with the professional knowledge base for realizing those visions (p. 197).

Research by McBer (2000) affirmed that the practice of teaching is demanding and to see success in students, teachers need to be committed to meeting the needs of all students assigned to their classrooms.

In 2002, Stronge listed six teacher attributes that are highly recognized in good teachers: recognition of the teacher as a person, efficient classroom management skills, organizational skills, instructional capabilities, monitoring student progress and potential, and teacher preparedness. Each of these qualities was described by sub-qualities that clarified the characteristics in greater depth.

With these factors as a basis for further research, Stronge (2002) studied the relationships among teacher preparation and valuable teaching, certification and teaching, teaching experience and success with impact on student achievement, teacher personality traits, teacher/student academic interaction, teacher attitude toward teaching, classroom management skills, organizational skills, and use of instructional and planning time. This work was similar to other research by Fetler (2001), Goldhaber and Anthony (2003a, 2003b), Monk (1994), Ornstein (1990b), and Sanders and Horn (1998). Stronge (2002) defined teacher attributes as a hypothetical concept in terms of student achievement or high performance job ratings. Initial studies of teaching focused primarily on the "views of prominent thinkers rather than on research" (Kauchek & Eggen, 1989, p. 3).

In 2003, U. S. Secretary of Education Paige acknowledged the importance of highly qualified teachers in his Third Annual Report on Teacher Quality:

> We know that being a highly qualified teacher matters because the academic achievement levels of students who are taught by good teachers increase at greater rates than the levels of those who are taught by other teachers. In fact, highly qualified teachers are able to raise the academic achievement levels of all students to high levels—not just the students who are already performing well (due to the diligent work of prior teachers, strong parental involvement, or innate aptitude). (p. 13)

Hunter (2004) found that teachers apply meaningful material to illustrate valid information. Hunter presented four techniques used by effective teachers to make instruction significant. The first was using a student's past experiences to illustrate a point. The second was providing experiences associated with tangible relationships that came from the learner's past. Third, the teacher provided a function or rationale for

learning the material, while allowing for authenticity. The fourth was the use of mnemonics, which relate artificial meanings to the presented information.

Hunter (2004) also noted that teachers taught procedural and problem solving strategies through well-guided practice. By preparing well-designed lectures and lessons, effective teachers met a learner's needs through visualization and auditory experience. Effective teachers were capable of modifying their delivery of instruction by observing the students' body language and other nonverbal behavior, listening to verbal responses, and acknowledging understanding. A teacher was capable of communicating instruction by organizing basic information, presenting the information in a simple and clear format, and modeling the concepts.

Tucker and Stronge's (2005) list of prominent teacher qualities included (a) formal teacher preparation training, (b) teaching certification, and certification within their field(s), (c) teaching experience of at least three years, (d) caring, fair, and respectful qualities, and (e) holding high expectations for themselves and their students. Certification types included standard, alternative, or provisional. According to Tucker and Stronge, students taught by teachers with certification within their field of study had higher achievement rates than students taught by teachers teaching outside their area of certification.

Most recently, Arnove (2009) captured the essence of great teachers in his book that describes the ability of great teachers to diagnose the needs of their students, access their academic strengths and needs of improvement, and plan interventions to set goals of high expectations. Arnove's philosophy suggests that great teachers personalize student instruction and encourage students by setting high expectations.

The fact that researchers had not made a definitive connection between a teacher's intellectual aptitude and student achievement had been noted years before by Ornstein, who commented in 1990 that studies often disregarded external factors that could affect the study's outcome. In 1978, Gage had made a similar observation. Such factors included the time of day, time of the school year observations take place, content, the combination of earlier observations, and the location of the observations. Consideration of these variables can result in varied interpretations of the findings as

found in later studies by Goldhaber and Anthony (2003b), Monk (1994), and Ornstein (1990b).

In conclusion, educational researchers have concluded that teacher attributes influence student achievement. The current study investigated four of these attributes: teacher certification, years of teaching experience, degree earned, and the socioeconomic status of students.

Problem Statement

Algebra 1 teachers expect high student achievement as reflected in test scores. In the review of literature, the commonly studied attributes of teachers were certification, years of experience, and degrees earned in the academic arena. Stronge (2002) defined successful teachers as those who believed that each student brings with them an abundance of ideas and experiences from inside and outside the classroom. Theoretically, certified teachers with years of experience and advanced degrees in math should have a positive impact on student achievement. Because no consensus exists about the most critical teacher attributes that influence student achievement, more research is needed.

Purpose of the Study

This study sought to identify the teacher attributes with the greatest impact on student achievement in SOL Algebra I test scores across high schools in the Commonwealth of Virginia. The study targeted selected teacher attributes identified in research by Goldhaber and Brewer (1999, 2000), Sanders and Horn (1998), and Bedwell, Hunt, Touzel, and Wiseman (1991). Ornstein (1990b) said that “The kind of teacher effectiveness studies that involve the mainstream of educational research considers relationships between variables” (p. 82). In prior research, the relationship between certification, years of experience, and degree earned was linked to student achievement.

American students, as compared to their international peers, achieve lower scores on standardized math tests (Koency & Swanson, 2000). Algebra I was chosen as a focus in this study rather than language arts, social studies, or science because in 2000, the Commonwealth of Virginia changed the graduation requirements for freshmen

graduating in 2004 and beyond. New requirements stipulated that high school students must earn at least two verified credits in mathematics as part of the requirements for an Advanced Studies, Standard, or Modified Standard Diploma. One of the allowed math credits was Algebra I (Commonwealth of Virginia, 2003). The content of the Mathematics Standards of Learning (SOL) supported five process goals for students: becoming mathematical problem solvers, communicating mathematically, reasoning mathematically, making mathematical connections, and using mathematical representations to model and interpret practical situations (Commonwealth of Virginia, 2002). Each topic in the Algebra I curriculum was developed in response to the SOL. The statewide SOL test results in Virginia indicated that the percentage of students who passed the Algebra I test in 2002-2003 was 78 percent; in 2003-2004, the percentage increased to 83 percent; and in 2004-2005, the percentage was 84 percent (Commonwealth of Virginia, 2005b). In response to this improvement in test scores, this study sought to identify which attributes of the Algebra I teachers contributed to this success, and what staff development opportunities would be most appropriate for school divisions. The variables in this study included teacher attributes--teacher certification, number of years teaching math, and specialization in math-- the socio-economic status (SES) of students, and the association of these variables to student achievement in Algebra I.

Research Questions

The overarching research question was: *How are selected attributes of Algebra I mathematics teachers related to school pass rates of students on the Standards of Learning Algebra I tests in Virginia?* Sub-questions were:

1. What is the relationship between teacher certification and student achievement in Algebra I?
2. What is the relationship between the level of specialization in math and student achievement in Algebra I?
3. What is the relationship between the number of years of teaching math at any level and student achievement in Algebra I?
4. What is the relationship between SES and student achievement in Algebra I?

5. What are teacher perceptions in the relationship between the six teacher characteristics identified by Stronge (2002) and student achievement in Algebra I?

Conceptual Framework

The premise of this study is that teachers make a difference in student achievement by using a variety of skills that promote learning, comprehension, interaction, and thought. Based on previous research, the study also assumes that the socioeconomic status of students affects student achievement in Algebra. As described below, Figure 1 conceptualizes the three teacher attributes that can affect student achievement in Algebra 1, as well and the socioeconomic status of the students:

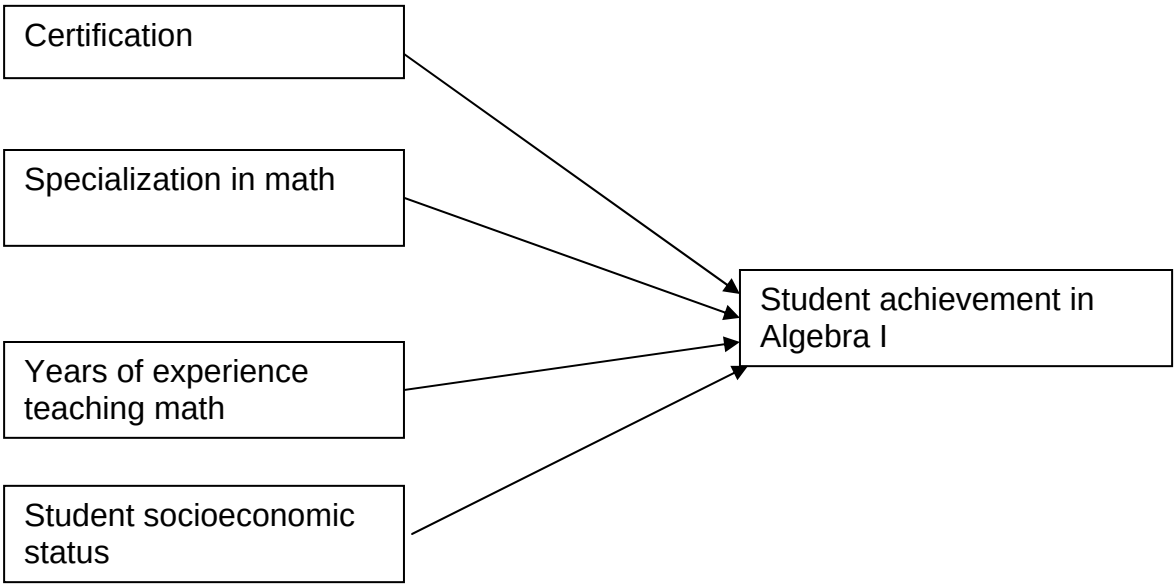

Figure 1. Relationship model - student achievement in Algebra I.

Certification and Student Achievement in Algebra I

In the Commonwealth of Virginia, teachers must be certified to teach in a public school. In 2002, NCLB stated that highly qualified teachers were considered certified if they have attained one of three criteria, (a) had full state certification, (b) held a minimum of a bachelors degree or (c) has demonstrated subject matter competency in each of the academic subjects in which the teachers teaches—if the subject was a core

academic subject. In 2004, Virginia was one of 21 states successful at recruiting highly qualified teachers (Coble 2004).

Specialization in Math and Student Achievement in Algebra I

The Holmes Group (1995) noted that ineffective teaching and learning took place when a teacher understood a subject, but failed to effectively deliver the material. Effective teaching and high student achievement were associated when teachers were knowledgeable in their subject area (Goldhaber & Brewer, 2000; Hill, Rowan, & Ball, 2005). Monk (1994) had studied the number of semester and quarter hours teachers completed in math courses before graduating from a university with a bachelors or masters degree. Results showed that students who received instruction from teachers with a math degree or with multiple math courses credited to their degree had higher achievement in math. Koency and Swanson (2000) also noted the association between teachers with high content knowledge in math and greater student achievement on math tests.

Years of Experience Teaching in Math and Student Achievement in Algebra I

Specific studies of the association between years of teaching and student achievement in math were not available. However, Goldhaber and Anthony (2003b), Hill, Rowan, and Ball (2005), and Monk (1994) concluded that career teachers with years of experience, participation in professional development on instructional strategies, and coursework related to the subject matter taught had greater influence on student achievement than teachers who have not furthered their teaching skills through professional development.

Student Socioeconomic Status and Student Achievement in Algebra I

In 1966, Coleman indicated that the socioeconomic status of a student's family influenced student achievement. In 1999, Munoz, Clavjo, and Koven studied students who received free and reduced priced lunches and their test performance on the Comprehensive Test of Basic Skills (CTBS). The data strongly indicated that students who received free/reduced priced lunch did not perform as well as those who did not receive free/reduced priced lunch. Students from financially disadvantaged homes have

not performed well on standardized tests, and some educators blame the family and its economic circumstances for poor student achievement (Kaplan & Owings, 2002). Kaplan and Owings (2002) suggested that socioeconomic status could affect student achievement, but it was not the exclusive cause of poor student achievement. Other research suggested that demographic factors such as poverty level, language, ethnicity, and family background were no longer the sole enablers of poor achievement (Corbett & Wilson, 2002; Dolezal, Welsh, Pressley, & Vincent, 2003), and that the teaching skills of highly qualified teachers could produce made substantial academic gains (Kaplan & Owings, 2002).

Definitions of Terms

The following terms are relevant to this study:

1. Teacher certification: A document issued by the Virginia Department of Education indicating a person has completed the requirements to teach Algebra I (Commonwealth of Virginia, 2004).
2. Degrees earned: The degrees a teacher has earned (Commonwealth of Virginia, 2005a).
3. Years of experience: The number of years a person has taught math at the high school level (Commonwealth of Virginia, 2004).
4. Majors of earned degrees: Majors for all degrees earned with a degree in math or major in math (Commonwealth of Virginia, 2004).

Organization of the Study

This study is presented in five chapters. The first chapter includes the introduction, context of the study, historical perspective, problem statement, purpose, research questions, conceptual framework, definition of terms, and the organization of the study. Chapter 2 includes the literature review and commentaries from the 1990s to the present. Chapter 3 explains the methodology of the study, and Chapter 4 reports the study results. The final chapter, Chapter V, describes the findings of the study, limitations and implications of the study and recommendations for education practice and future research.

CHAPTER II
REVIEW OF LITERATURE

This chapter includes a review of the literature on teacher attributes and its influence on student achievement. Studies selected for review include at least one for each of the four variables: teacher certification (or teacher licensure), number of years in teaching, highest teaching degree earned, and the SES of students.

Goldhaber and Brewer (1996, 1999) concentrated their studies on teachers and their impact on student achievement in the four core subject areas: English, mathematics, science, and social studies. One study focused on three teacher attributes: teacher certification, years of experience, and degrees earned. The research reviewed in this chapter identified a relationship between an attribute and student achievement in math. Several studies included more than one attribute and the four core subjects. The research indicated that the teacher attributes were catalysts for increasing student achievement on standardized tests. However, the focal point of this research was the student achievement in math. There were no studies that concentrated on one or more of the three attributes and Algebra I math.

Teacher Certification and Student Achievement

According to Sullivan (2001), 12% of new teachers in the US who taught for three years or less were not fully certified. In some high poverty school districts, the number of non-certified teachers was higher than the national norm. Teachers who were *uncertified*, *not fully certified*, or *emergency certified* were viewed as not being prepared to teach the needed subject areas. However, the meaning of *uncertified* varied from state to state; this included failure to pass state exams, failure to complete teacher education programs, or lack of a degree.

In the 1980s, Hawk et al. (1985) studied the effectiveness of certified and non-certified middle school and high school math teachers and their impact on student achievement. The research premise suggested that teachers could not be effective without knowing the subject area taught and that certification was “designed to guarantee that teachers have such basic knowledge” (p.14). The researchers studied 36 teachers; 18 were certified in math and 18 were not. The two sets of teachers taught

the same math course to 826 students. The Stanford Achievement Test for general math and algebra assessed student learning. Results indicated that students achieved higher test scores on the general math and algebra tests when taught by teachers who were certified in mathematics. The researchers concluded that certified teachers employed more effective teaching strategies than teachers who were not certified in the subject area they taught.

Studies by Begle and Geeslin (1972), Goldhaber and Brewer (1999), and Tucker and Stronge (2005) focused on attributes of teachers in the subject of math and general characteristics of teachers. Goldhaber and Brewer (1996, 1999) conducted studies on attributes of teachers and teacher certification of public school teachers. The studies indicated that teachers certified in the subject they taught had higher student achievement rates than teachers who were not proficient in their assigned subject or were not certified to teach that subject.

The 1996 Goldhaber and Brewer study focused on multiple attributes of teachers, some of which are included in this study. The researchers used the National Educational Longitudinal Study of 1988 (NELS: 88) as the source of student achievement data for 24,000 tenth grade students, of which 5,113 were tested in math. Different variables were included for the student, school, and teacher participants. The teacher variables were sex, race/ethnicity, years of experience at the secondary level, certification, and degree earned. The results indicated that teachers certified in math influenced student standardized test scores more than teachers who were not certified.

In 1999, Goldhaber and Brewer arrived at similar conclusions after using the NELS: 88 to assess teacher certification and degrees earned by a teacher. The researchers concluded that teachers with emergency certification had the same influence on students' improvement in standardized test scores as teachers with a standard certification.

In 2000, Goldhaber and Brewer conducted an empirical study that explained teacher certification as "licensure is designed to guarantee a basic level of quality or skill of teachers in schools" (p. 130). The team consistently used the NELS: 88 as its primary data source. This national survey represented approximately 24,000 eighth grade students in the four core subject areas. The study included four categories of

variables, (a) individual and family background, (b) school, (c) teacher, and (d) class. There were 3,786 math students and 2,098 math teachers who completed the survey on the NELS: 88. Of the total number of teachers, 86% of the teachers were certified in math (Goldhaber & Brewer, 2000).

Goldhaber and Brewer (2000) compared the academic performance of students taught by teachers with regular certification with students taught by teachers with probationary, emergency, or private school certification. In addition, the researchers assessed the effects on student achievement of specific state-by-state differences in teacher certification requirements. There was a difference in the student test scores of math teachers who held standard certification in their subject area. The test scores were seven to ten points higher than students who were taught by teachers with probationary, emergency, or no subject certifications. The researchers added that "teachers with standard and private school certification in math were more likely to be White and taught in schools with a low percentage of students on free and reduced lunch" (Goldhaber & Brewer, 2000, p.136). The teachers with emergency certification had less experience and were more likely to teach in high poverty schools.

By using the NELS database, Goldhaber and Brewer detected the similarities between twelfth graders' performance in math and science and teacher characteristics. Results were consistent with the 1996 study that showed teachers of math with subject-specific training, such as a math degree or certification, outperformed teachers without subject-matter preparation (Goldhaber & Brewer, 2000).

Darling-Hammond et al. (2005) studied teacher certification by using the student data bank from the Houston Independent School District (HISD) that linked student achievement to teachers with certification, experience, and degree levels from 1995-2002. Candidates from Teach for America (TFA) and non-TFA teachers within the HISD were the study participants. This study replicated an earlier study by The Center for Research on Educational Outcomes (CREDO), Hoover Institute, and Stanford University. The original study analyzed the effect of TFA teachers on student achievement in reading and math from grades 3-8 between the years of 1996-2000. The CREDO study compared TFA candidates who had two-year assignments in school districts that were difficult to staff to other teachers who were certified through other

programs. The study showed that teachers who were uncertified or held a substandard certification had negative influence on student achievement in mathematics.

Darling-Hammond et al. (2005) looked at a wider range of achievement over a greater number of years with additional controls. The study included the HISD student and teacher data, but expanded the data set to include grades 3 and higher from the 1995-1996 to the 2001-2002 school years. Over 271,000 students and over 15,000 teachers participated in the study. The researchers analyzed test scores from math teachers, and considered years of teaching experience, highest degree completed, certification information, and TFA participation as variables.

The measurement of student achievement in math included scores from the Texas Assessment of Academic Skills (TAAS), the Stanford Achievement Test, ninth Edition (SAT-9), and the Aprenda. The TAAS is the criterion reference test administered statewide every spring to grades 3-8 and 10 in the state of Texas. The variables in this study were expanded to include: a. teacher degree levels, b. proxy for class size, c. student prior achievement, d. student demographic characteristics, and e. teacher years of experience with highest degree completed (Darling-Hammond et al., 2005).

Teacher certification was classified as: a. *Standard*, b. *Alternative*, c. *Emergency/temporary*, d. *Certified out-of-field*, e. *Certified no-test*, f. *Uncertified*, and g. *Certification unknown* (Darling-Hammond et al). The TFA cohort was categorized as uncertified alternatively certified, and standard certified in the various stages of the teaching career.

A descriptive analysis included student and teacher characteristics and the type of certified teachers assigned to different groups of students. The dependent variables of the regression analysis were individual student level, prior year test scores, student ethnicity, socioeconomic status (SES), language spoken by the student, teacher years of experience, the teaching degree level earned, class size, and class average of the previous year's test score and overall school demographics which included the student ethnicity, and SES (Darling-Hammond et al.). The independent variables were teacher certification status and the TFA status.

Teachers with less than two years experience comprised the majority of the teachers in the study. Teachers not involved with TFA and with six years or more of

teaching decreased over a six-year period from 64 to 57%. Many of the teachers held a bachelors degree, with the percentage increasing from 68 to 75% over the 1996-2002 period. Teachers with master's degrees declined at the same rate as the increase of the bachelor degrees.

In comparison, one-third to one-half of the TFA teachers assigned to grades four and five did not have standard certification. From 1999 to 2001, TFA teachers held fewer standard certifications than non-TFA teachers.

In addition to the differences between the TFA and non-TFA teachers, the percentage of standard certified teachers rose significantly during this period of the study. During the 1996-1997 school year, teachers with standard certification taught 56% of the African American and 57% of the White students. In comparison to the 2001-2002 school year, the percentage of White students taught by standard certified teachers increased to 76%, whereas the increase for African American students was only 61% (Darling-Hammond et al.).

During the 1996-1997 academic year, teachers taught 54% of the low SES students with standard certification compared to the 57% of the non-SES students taught by the teachers with the same certification. The same categories of students were reviewed in the 2001-2002 period. Data showed that 61% of the low SES students were taught by teachers with standard certification, compared to 72% of the non-SES students taught by teachers with the same certification.

The TFA teachers negatively influenced student math achievement on the SAT-9 and on the Aprenda. The TFA teachers also had a negative impact on student achievement in the reading and math subtests of TAAS. During the six years of the study, the TFA experience increased the number of teachers who became fully certified.

Non-TFA teachers without standard certification or who had failed to pass the state certification test given by Texas were found to negatively affect student achievement on all tests. Alternatively, certified teachers also had a negative impact on student achievement on five tests, with three of them at the level of significance (Darling-Hammond et al.).

Teachers with emergency or temporary certificates negatively affected student test scores in five of the six tests. Fully certified teachers who were teaching outside

their academic field had positive effects on reading test scores of the TAAS and the Aprenda, but negative effects on the math subtests of the SAT-9 and Aprenda.

This study concluded that fully certified teachers produce the best student achievement scores on standardized tests. The limitations of the TFA resulted in difficulties retaining and producing effective teachers because many left the program before becoming fully certified or shortly after obtaining full certification. This exodus did not allow for the opportunity to positively influence test scores or for honing the skills that would develop in a more mature teaching career.

Goldhaber and Brewer (1999) indicated that “little research evidence exists on the effectiveness of the teacher licensure system in terms of how well teachers subsequently teach and what works to promote positive student outcomes” (p. 84). The premise by Goldhaber and Brewer in 1999 was that students would do worse on standardized tests if taught by teachers with no certification/license or emergency certification/license. Using the NELS survey of 24,000 eighth grade students, Goldhaber and Brewer (1999) studied a comprehensive database of 3611 math students who took a standardized test in math or another core subject area.

The teacher sample of 2,101 was divided into five independent variables: (1) certification in the subject area taught; (2) private school certification; (3) probationary certification in the subject area taught; (4) an emergency certificate in the subject area taught; and (5) no certification in the subject area taught. The research question asked whether the type of certification held by the teacher influenced student test scores.

Results indicated that “Teachers with standard certification in mathematics are more likely to be White, and more likely to teach in schools with a high percentage of White students and a lower percentage of low income students” (Goldhaber & Brewer, 1999, p.90). In addition, teachers in this category were highly experienced, veteran teachers. Teachers with other types of certification were new to education and held probationary certification in the area of math. Teachers with emergency certifications averaged seven years in teaching and were less likely to have a masters and education specialist degree.

Goldhaber and Brewer (1999) noted that (1) Certified teachers in math had the most impact on student achievement in math; (2) Teachers issued an emergency

certification in math had similar impact on student test scores as those of students who did not receive instruction from a certified teacher; (3) Teachers with probationary certification also produced similar test results in students as those who had received instruction from a certified teacher in math.

Specialization in Math and Student Achievement

Goldhaber and Brewer (1996) studied the influence of a teaching degree on student achievement in the four core subject areas of mathematics, science, English, and history. The NELS: 88 was the source of student achievement data for 24,000 tenth grade students; 5,113 were tested in math. All teacher participants had a bachelor's degree in education, although the total sample size was not provided. However, Goldhaber and Brewer reported that 68-76% of the teachers had at least a bachelor's degree in their subject area. As a group, teachers of math had fewer bachelor's degrees in math than their colleagues in the other three subject areas. Approximately half the teachers had earned a masters degree, although less than 25% had an advanced degree in their subject area.

Sets of explanatory variables were identified in the hypothesis that associated the variables with student achievement. The teacher variables included sex, race/ethnicity, years of experience at the secondary level, teacher certification, and the teacher's degree. The hypothesis suggested that teachers with bachelor's or master's degrees in math would have a significant impact on standardized math scores. The study results supported the hypothesis that teachers with either degree in math positively influenced student achievement in math (Goldhaber & Brewer, 1996).

In 1999, Goldhaber and Brewer used data from the NELS: 88 to study the relationship between three teachers' degrees, (bachelor's, master's, or doctoral) in math and student achievement in math. The findings indicated that twelfth grade students did not score higher on math tests when taught by teachers with doctoral degrees. Students taught by teachers with a bachelor's or master's degree in mathematics tested higher than students taught by teachers without these degrees. Students taught by teachers with certification/licensure in math and probationary certification in math had a significant increase in student test scores.

Goldhaber and colleagues conducted effective teacher research on multiple topics related to teacher effectiveness such as (a) effects of teacher degrees on student performance, (b) teacher certification, (c) school compensation policies, and (d) academic skills of the teacher workforce (Goldhaber & Anthony, 2003a). Goldhaber and Anthony (2003a) concluded that teachers with advanced degrees in specific subjects could influence student learning. Earlier studies by Goldhaber and Brewer (1996) were inconclusive about the influence of teacher degrees on student achievement. The researchers concluded that the subject focus of the degree was more important than the type of degree.

In an early study of student outcomes and teacher preparation of middle school eighth grade math and science teachers, Chaney (1995) also used the NELS database as the primary resource. With 24,599 grade eight students, the researchers investigated the importance of professional teacher preparation in math and science. The variables included student test scores and data from students, teachers, parents, and principals. Using a multiple regression analysis, the researchers found that:

(a) Students earned higher scores in math if their teachers had majored in mathematics as an undergraduate or graduate student.
(b) Students' math scores were higher if their math teachers incorporated math topics and skills within the lesson.
(c) Teachers' pedagogical skills were helpful only if the teacher had received training in the subject area as well (Chaney, 1995).

Further examination of the teachers' characteristics found that teachers who had taken courses in math for certification were considered stronger teachers than their colleagues who had taken fewer or no courses for certification in the math curricula. Certified teachers who had taken advanced math course training viewed the subject of algebra as a significant topic for instruction.

Goldhaber and Brewer (1996) researched certification of public school teachers and stated that "Virtually all teachers in public schools have at least an undergraduate degree" (p. 202). The researchers found that fewer teachers had earned degrees specific to their subject area, and that 68-76% of the teacher sample in the study had a bachelor's degree in their subject area. Teachers in the areas of math and science had

fewer bachelor's degrees in these subjects than in English and history, and less than 25% of the teachers had master's degrees in their subject area**.**

The study explored the influence of a teacher's advanced degree on student achievement in math, science, English, and history. Goldhaber and Brewer (1996) used the NELS: 88 database that included approximately 24,000 eighth grade students in 1988. In 1990, 18,000 of the 24,000 students in the survey attended tenth grade.

The research team decided that the NELS database best represented a national panorama of educational variables that linked students to teachers and subject areas. In addition to the comprehensive database, the NELS: 88 allowed the researchers to study other factors related to student achievement such as subject-specific teacher degrees. The NELS sample included 5,113 math students, 4,357 science students, 6,196 English students, and 2,943 history students. The variables included (a) the achievement of students and family background variables, (b) some measure of prior ability or achievement and (c) school resources that do not vary from student to student. The resources included data on the school, teachers, and class specific variables.

The dependent variable in this study was tenth grade student achievement on standardized tests in the subjects of math, science, English, and history. The independent variables included the general teacher characteristics such as degree level of subject area. The study assessed whether general teacher characteristics affected the student outcomes.

The study results included four sets of explanatory variables: (a) individual and family background, (b) school-level, (c) teacher, and (d) class variables. The individual and family background variables included sex, race/ethnicity, parental education, family structure, family income, and eighth grade test scores. The school variables included "urbanicity, regional dummies [*not explained*], school size, the percentage of students at the school who were White, the percentage of students from single parent families, and the percentage of teachers at the school with at least a master's degree" (Goldhaber & Brewer, 1996, p. 202). The teacher variables consisted of "sex, race/ethnicity, years of experience at the secondary level of education, teacher certification and teacher's degree level" (p. 203).

The analysis of subject-specific teacher characteristics distinguished between teachers who were teaching with a BA or MA, teaching in their certified area, or teaching outside of their trained subject area. The study found that (a) math and science teachers with specific subject content training had a significant impact on student achievement; (b) teachers with a BA in math or a MA in math had a positive impact on student achievement vs. teachers with non-math subjects or advanced degrees; and (c) teachers with BA degrees in science had positive outcomes in relation to those who taught science without a degree in science. The study found no evidence that subject-specific degrees or certification had any effect on student achievement in English or history.

Goldhaber and Brewer (1996) concluded, “Years of teaching experience is not statistically significant in any subject area, nor is it statistically significant whether the teacher has a master’s degree. Teachers with master’s degrees are no more (or less) effective than those without an advanced degree” (p. 205).

Goldhaber and Brewer noted that many traditional educational production function studies used crude teacher characteristics. Use of the NELS database produced more resourceful and more refined studies. The results suggested that teachers certified in math and those who have earned a BA or MA in math or science have a positive influence on student achievement. However, the same degrees did not influence student outcomes in English and history. This led to the conclusion that subject-specific training, rather than teacher ability, improved student outcomes.

In 1996, Goldhaber and Brewer noted that the National Commission on Teaching found “newly hired teachers are unqualified for the job” (p.199). Their report contained statistics from 1994 which showed that “40% of teachers have at least a master’s degree and more than 25% have at least 20 years full-time teaching experience” (p. 200). These findings were similar to the statistics cited by the 1999 National Center for Education Statistics.

The findings of Wenglinsky (2000) support Goldhaber and Anthony’s (2003b) research about teacher effectiveness and advanced degrees. Goldhaber and Anthony (2003b) cited studies that found that a teacher’s advanced degree was not necessarily associated with student learning. Wenglinsky (2000) cited studies that show that the

correlation between teacher inputs and student outputs rarely considers the instructional practices that enhances student learning. Such studies typically integrate variables such as teaching degrees in the equation of the teacher effectiveness and student achievement. Goldhaber and Anthony (2003b) used the NELS: 88 database to determine if teachers with advanced degrees in English, history, science or math had a positive impact on student achievement in these subject areas. Results showed that there was a positive effect on student achievement in science and math, although the same effect was not evident in English and history. In summary, three attributes of effective teachers - certification, years of experience, and degree earned – have been shown to be qualifications of effective teachers.

Years of Teacher Experience and Student Achievement

The data on the relationship between years of teacher experience and student achievement are not consistent. According to Tucker and Stronge (2005), teachers with more experience in the classroom tend to produce students with higher achievement results than teachers who had taught three or less years Tucker and Stronge expanded the qualities of effective teachers to include (a) formal teacher preparation training, (b) teaching certification and certification within their field(s), (c) teaching experience of at least three years, (d) personal attributes such as being caring, fair, and respectful, and (e) high expectations for themselves and their students.

Goldhaber and Brewer (1996) used years of experience at the secondary level as one of the variables in their study of student achievement in mathematics, English, science, and history. The data indicated that the influence of teaching experience on student test scores was not as significant as the certification and degree of the teacher. Goldhaber and Anthony (2003a) stated:

> Teacher experience may predict teacher effectiveness, but there is very little evidence of this beyond the first couple of years of teaching. Though measures of teachers' academic proficiency are less commonly used to predict teacher effectiveness, we believe the existing body of research points to these as better predictors of teacher quality (p. 4).

Student Socioeconomic Status and Student Achievement

Historically, poor student achievement has been attributed to family and economic variables. The Coleman Report (1966) and *A Nation at Risk* (1983) acknowledged that these variables could impair student achievement, but focused the challenge on educators. In 2000, Dossett and Munoz confirmed that students from low-income environments were not as successful academically as their peers from higher income environments. The research involved 133 schools (88 elementary, 24 middle and 21 high schools) in a Kentucky school system. The independent variables included school level enrollment, expenditure-per-pupil for instruction, percentage of students receiving free/reduced lunch, student- teacher ratios, and percentage of Black students enrolled (Dossett & Munoz, 2000). Relative to the current study, the variable of importance was the percentage of students who qualified for free and reduced lunch according to federal guidelines.

The dependent variable in the study was the KIRIS total academic index, a "statewide testing/assessment program composed of several content area tests given to different grade levels" (Dossett & Munoz, 2000, p. 9). The data were taken from the 1995-1996 to 1998-1999 school profile documents. The correlation between the independent variables and student achievement on the KIRIS was positive except for one variable - free or reduced lunch, which was correlated negatively with the KIRIS results from the 1995-1996, 1996-1997, 1997-1998, and 1998-1999 school years. Dossett and Munoz (2000) concluded that schools could change the achievement levels of students with low SES by recognizing other factors such as families and communities.

Begle and Geeslin (1972) studied the achievement of teachers in the area of mathematics by using the 1972 National Longitudinal Study of Mathematical Abilities (NLSMA). The study's three objectives were, (a) identifying the good teacher, (b) measuring change in student achievement, and (c) identifying characteristics of teachers that distinguish them from teachers who were not successful in improving the achievement of students with low SES.

The study identified good teachers through surveys, observations, and ratings by key stakeholders in the school setting (Begle & Geeslin, 1972). The second objective

measured student achievement with regression techniques that allowed expected scores to be compared to actual scores. The difference between the scores determined if the teacher was successful or not successful in influencing student achievement (Begle & Geeslin, 1972). One limitation of the study was the failure to account for other teacher variables which were not identified in the study and which may have influenced student achievement.

The third objective, identifying the characteristics of teachers, included student test scores and other student factors such as orderliness and problem solving ability. However, these particular attributes were not measured in the NLSMA. Begle and Geeslin (1972) did not identify the characteristics and behaviors of distinguished teachers, although they identified a favorable correlation between good teachers and student test scores.

In 2001, Fetler conducted a study in California that analyzed teacher quality, teacher supply, and student outcomes in math achievement. The study assessed the poverty factor in the California high schools and its correlation to student math achievement by teachers with degrees, certification, and years of experience. During the 1998-99 school year, California employed over 280,000 teachers in its public schools (Fetler, 2001), and experienced a shortage of qualified math teachers at the high school level. A total of 13.3% of the teachers did not meet state requirements for teaching licenses and obtained employment based on a waiver or emergency permit. California recognizes teaching as a “goal of preparation, usually a credential only requires an academic degree and coursework” (p.152). Subsequently, the majority of public schools had teachers with bachelor’s degrees or some advanced degree for teaching (Fetler, 2001; Goldhaber & Brewer 1996).

The study included 795 California high schools. In 1998, there were 56,571 full-time equivalent teachers, with 14.1% teaching math (Fetler, 2001). The Professional Assignment Information Form (PAIF) provided verification of teachers with teaching assignments in math. The teachers were coded by the degree earned, i.e. 1-doctorate, 2-master’s degree plus 30 or more semester hours, 3- master’s degree, 4- bachelor’s degree plus 30 or more semester hours; 5- bachelor’s degree and 6-Less than bachelor’s degree. The teachers’ years of experience included number of years in

current district, other states, and countries. This number did not include time spent in substitute teaching.

The standardized tests used in California included the Standardized Testing and Reporting (STAR), and the Stanford Achievement Test Series, 9th Edition (Stanford 9). All students in grades 2 through 11 take the Stanford 9. The poverty factor, as defined by Aid to Families with Dependent Children (AFDC), was a control variable in this study, which correlated poverty with student achievement (Fetler, 2001).

Analysis of the California Basic Educational Data System (CBEDS) revealed that 10.5% of the math teachers in regular high schools had emergency permits to teach math. Some of the teachers in this category had advanced degrees, and 85.9% had a baccalaureate degree or less. In contrast, 41.3% of the same category of teachers had a master's degree or higher (Fetler 2001). The regression analysis, with the AFDC data as the control variable, showed the significant correlation of student poverty and test score results ($p<.001$) (Fetler, 2001). The results identified a positive relationship between student participation and test scores, and lower school participation in high poverty schools. High poverty schools employed teachers with less teaching experience than lower poverty schools. The analyses also indicated that students taught by teachers working under an emergency permit did poorly on the standardized tests. Teachers with years of teaching experience produced students who had higher math achievement scores. Students who were taught by teachers who were certified in math, or had a bachelor's degree or higher did better academically than students who were taught by teachers with lesser qualifications. In summary, the shortage of highly qualified math teachers with years of experience in high poverty schools affected student achievement negatively in math, and that poverty predicted student achievement.

Recent research by Haycock and Crawford (2008), Gorski (2008) and Payne (2008) supports the findings of their earlier colleagues that students in poverty achieve higher academically when taught by teachers who are led by strong administrators, are provided essential staff development that is relevant to improving instructional strategies, and are committed to the teaching this population.

Payne (2008) listed nine powerful practices that were instrumental in helping poor students achieve. In addition to the qualities of effective teachers mentioned by Tucker and Stronge (2005), Payne (2008) suggested that teachers who were effective in teaching poverty stricken students have built relationships of respect, made learning relational, teach students to use formal language, access student resources, monitor progress and plan interventions, translate concrete thinking into abstract thinking, and teach students how to ask questions when they do not understand.

Gates (2009) reiterated the point that teachers who want to be great teachers need the availability of good resources to measure their progress and improvement of their teaching. Both Gorski (2008) and Gates (2009) recognize that poverty is a culture, and that people in poverty have the same goals, dreams, and wishes as those who are not living in poverty. Hiatt (2009) published a recent article that described how Gates, the former CEO of the Microsoft Corporation and the Co-chair and Trustee of the Bill & Melinda Gates Foundation, would improve educational opportunities for students who lived in poverty.

In his 2009 annual letter about his foundation's work on educational reform and during a recent visit to Washington, DC (Hiatt, 2009), Gates called the under-achievement of children who are born into poverty and who attend terrible schools a national scandal. As noted in the literature review for this study, this reality was described more than 40 years ago in the Coleman Report (1966). As reported by Hiatt (2009), Gates identified two priorities for education in the United States today-helping promote successful programs such as the Knowledge is Power Program (KIPP), a program that serves minority and students in poverty who are eligible for the free/reduced lunch program, and improve teacher effectiveness. Gates (2009) has suggested that the traditional belief that effective teaching related to teacher certification should be re-assessed. Instead, he suggested that performance of teachers should be assessed on their impact on student learning and achievement, and not by the traditional certification status (Hiatt, 2009).

In summary of the literature review, studies exploring teacher certification and its effect on student achievement in the areas of math concluded that teachers with prior knowledge and certification in their subject area influenced higher student achievement

than teachers without. Studies exploring specialization in math indicated that students scored higher test scores when taught by teachers with degrees in math. The findings of years of experience and student achievement were not consistent. Teachers with more years of experience did produce higher student test scores (Tucker and Stronge, 2005); however, Goldhaber and Brewer (1996) showed that teaching experience was not as significant as certification or degree earned. The poverty factor of students and their academic achievement produced positive findings when taught by effective teachers who were knowledgeable, certified and degreed in their subject area.

CHAPTER III
METHODOLOGY

Research has shown that the attributes of teachers influence student achievement (Begle & Geeslin, 1972; Fetler, 2001; Goldhaber & Brewer, 2000; Goldhaber & Anthony, 2003b; Tucker & Stronge, 2005). The selected teacher attributes that affect student achievement in Algebra I, as revealed in the literature review, were teacher certification, number of years of teaching, and specialization in math. This study assessed the relationship between these attributes of math teachers, the socioeconomic status of students, and student achievement on the Algebra I SOL test.

Research Questions

The overarching research question of this study is: *How are selected attributes of Algebra I mathematics teachers related to school pass rates of students on the Standards of Learning Algebra I tests in Virginia?* The sub-questions are:

1. What is the relationship between teacher certification and student achievement in Algebra I?
2. What is the relationship between the level of specialization in math and student achievement in Algebra I?
3. What is the relationship between the number of years of teaching math at any level and student achievement in Algebra I?
4. What is the relationship between socioeconomic status (SES) and student achievement in Algebra I?
5. What are teacher perceptions in the relationship between the six teacher characteristics identified by Stronge (2002) and student achievement in Algebra I?

Independent and Dependent Variables

The independent variables in this study were three teacher attributes: teacher certification, level of specialization in math, and years of experience in teaching math, and the six teacher attributes as described by Stronge (2002). An additional independent variable was student socioeconomic status (SES). The dependent variable

was the school performance according to the state benchmark in Algebra I on the SOL test.

Population

There are 306 high schools in the Commonwealth of Virginia (Commonwealth of Virginia, 2005c). This study gathered information from a stratified random sample of Algebra I teachers who taught during the 2004-2005 school year in 30 Virginia high schools. The stratification was determined by the three categories of the SOL test score intervals. The highest Algebra I test score was 100% while the lowest was 29%. Five of the 306 high schools in Virginia were in the researcher's school division. These schools were not included in the sample, but were asked to validate the study instrument. The descriptive analyses included the number of questionnaires sent to prospective participants, number of questionnaires returned, and the number of school divisions that participated.

Data Collection

Data collection was conducted in two parts. In Part 1, individual school data on student achievement for the 2004-2005 Virginia Standards of Learning Algebra I tests were collected from the Virginia Department of Education (VADOE) website (Commonwealth of Virginia, 2005c). Appendix A provides the description and validity of the SOL Algebra I tests. The data included the percentage of students who passed the Algebra I SOL test. The scores were separated by individual high school in the school divisions that participated in the questionnaire. In Part 2, a questionnaire was developed to collect data on the attributes of the Algebra I teachers. Details on the development, testing, administration, and scoring of the questionnaire follow.

Instrumentation

This section describes the development, testing, and administration of the Algebra I Teacher Questionnaire. Details on scoring are also included.

Development of the Algebra I Teacher Questionnaire

The content of the questionnaire included the level of certification, years of teaching, highest degree earned, and specialization in math. These variables were

expected to account for variation in the schools' pass rates on the Algebra I SOL test for 2004-2005. In addition, 18 questions on Stronge's six attributes of effective teachers were related to the personal attributes of teaching and their contribution to the success of the SOL scores. Directions at the beginning of the questionnaire instructed participants not to continue with the questionnaire if the answer to question one (I taught Algebra I at this high school level during the 2004-2005 school year.) was "No." A copy of the trial questionnaire is in Appendix B. The final questionnaire distributed to the Algebra I teachers is found in Appendix C.

Trial Test of the Algebra I Teacher Questionnaire

To test the questionnaire, Algebra I teachers in one school division were requested to voluntarily participate in the assessment. The schools participating in the testing of the questionnaire were not being included in the primary study. A letter sent to the school division's superintendent (see Appendix D) requested permission for high school Algebra I teachers in the division to participate by completing the Algebra I Teacher Trial Questionnaire as it pertained to the 2004-2005 school year. After permission was received, a letter of introduction to the principal (see Appendix E) explained the study and asked the principal to distribute the teacher letter (see Appendix F) and the Algebra I Teacher Questionnaire to the Algebra I teachers. The trial questionnaire asked the teachers to evaluate the instrument for clarity. Changes were made accordingly to this feedback, and this process was continued until the items were found to be clear and the respondents had no difficulty in completing the questionnaire. Results of the trial are reported in Chapter IV.

Administration of the Algebra I Teacher Questionnaire

The Office for Human Research Protections (OHRP) and the Institutional Review Board (IRB) at Virginia Tech in Blacksburg, Virginia detailed the policies and procedures that pertained to the use of human subjects in experiments or research. Upon approval from these agencies, an e-mail letter was sent to the division superintendents that explained the intent of the research and the voluntary nature of participation. A letter explaining the study and requesting permission to distribute the questionnaire to Algebra I teachers was sent to the high school principals in the approved school

divisions. The principals received a postal package containing a principal letter, teacher letter, the final version of the revised questionnaire, and a self-addressed, stamped return envelope to be given to each Algebra I teacher in the school. All questionnaires were mailed through the U.S. Postal Service. Complete questionnaires were coded for data entry in the SPSS (Version 11.0). Additional questions with a Likert scale were added to the questionnaire which asked teachers about their perspectives on Stronge's (2002) six teacher attributes (recognizing the teacher as a person, efficient classroom management skills, organizational skills, instructional capabilities, monitoring student progress and potential, and teacher preparedness) and how these attributes might affect student achievement in Algebra I. Appendix G provides a correlation of questionnaire questions 6-23 and Stronge's six teacher attributes.

Scoring of the Algebra I Teacher Questionnaire

The teacher data were aggregated at the school level. Certification was the percentage of Algebra I teachers in a school that were fully certified or not fully certified at the time of the study. Years of experience was the percentage of Algebra I teachers in the following categories: three years or less, 4-7 years, 8-11 years, 12-16 years, and 17 or more years during the 2004-2005 school year. Highest degree earned was the percentage of Algebra I teachers in a school who had earned a bachelor's, master's, educational specialist, or doctorate. Specialization was the percentage of Algebra I teachers in a school with a bachelor's, master's, educational specialist, or doctorate in mathematics.

Collecting Data on School Performance on the Algebra I SOL Test

The criterion variable was the percentage of students who passed the SOL Algebra I test in the spring of 2005. The data were obtained from the Virginia Department of Education Website: http://www.pen.k12.va.us. To encourage a high percentage of responses to the questionnaire, the researcher followed these suggestions by Dillman (2000): "(1) a respondent-friendly questionnaire, (2) up to five contacts with the questionnaire recipient, (3) inclusion of stamped return envelopes, and (4) personalized correspondence" (p. 150).

Random Selection of Schools

As described in Appendix H, the Virginia Department of Education website listed all the high schools and SOL Algebra I test scores in alphabetical order by school division. The three ranges of the SOL test scores were determined by subtracting the lowest test score, 29.99, from the highest test score, 100. The difference in the two extremes was rounded to 70. The 70 was divided by three categories, which provided the three range percentage points of 23.33, rounded to 23 points for each categorical range of SOL test scores. Thus, category 1 range was 29.99-52.99%; the category 2 range was 53.00-76.99%, and category 3 was 77.00-100.00%.

Data Management

The participants returned the questionnaire data in a self-addressed stamped envelope. The data were entered into the SPSS, Version 11.0 manually and formatted for analysis.

Table I

Coding Strategy for Scoring Questionnaire

Operational definition	Question	Coding for SPSS
The level of certification as indicated by the certificate earned by the teacher.	1. Are you fully certified to teach Algebra I? If not, what is your certification status?	Fully certified to teach Algebra I ☐ 0= No ☐ 1= Yes If not what is your certification status? ☐ Provisional ☐ Other (Specify)
The degrees a teacher has earned.	All degrees a teacher has earned.	☐ 1= Bachelors ☐ 2= Masters ☐ 3= Ed.S. Certificate of Advanced Graduate Studies ☐ 4= Doctorate ☐ 5= Other (Specify)
The number of years a person has taught math at the high school level.	The number of years a person has taught math at the high school level, including the current year.	The actual number of years. ☐ 1= 0-3 years ☐ 2= 4-7 years ☐ 3= 8-11 years ☐ 4= 12-16 years ☐ 5= 17 + years

(Table Continued)

Table I (continued)

Coding Strategy for Scoring Questionnaire

Operational definition	Question	Coding for SPSS
Majors for all degrees earned with a degree in math or major in math.	The content major of all earned degrees. High specialization is those with both degrees and majors in math. Low specialization is degrees in other fields and not major in math.	Was the major or minor in math? Bachelors ☐ 0= Neither major or minor ☐ 1= Major ☐ 2= Minor Masters ☐ 0= Neither major or minor ☐ 1= Major ☐ 2= Minor Educational Specialist/CAGS ☐ 0= Neither major or minor ☐ 1= Major ☐ 2= Minor Doctorate ☐ 0= Neither major or minor ☐ 1= Major ☐ 2= Minor
School performance relative to state benchmark in Algebra I on the SOL test.	School meet or does not meet the state benchmark.	☐ 0= Does not meet benchmark ☐ 1= Meets benchmark

Data Analysis Techniques

The data were analyzed with descriptive and inferential statistics. The descriptive analyses included each of the teacher attributes: teacher certification, years of teaching, the highest degree earned, specialization in math, and percentages of students passing. The purpose of the descriptive analysis was to provide an overall profile of the schools and teachers in the study. The data were presented in frequencies and percentages for each variable.

A Chi-square test of association (Hinkle, Wiersma, & Jurs, 1998) was used to identify the relationships between the independent variables (teacher certification, years of teaching, the highest degree earned, and specialization in math) and dependent variable of the percentage of students passing the Algebra I SOL test in grades 9 through 12. The aggregation of data was at the individual high school level. The raw data were placed in contingency tables for analysis. A one-way ANOVA (Hinkle, Wiersma, & Jurs, 1998) of the six teacher attributes identified by Stronge, was conducted to see if there was a relationship between the six attributes and Algebra I test scores.

Limitations

The deciding factor in choosing Algebra I as the subject of this study was the Virginia Department of Education's decision to require Algebra 1 as one of the mandatory subjects required for a high school diploma. However, other core subjects could have been studied.

In 2005, Virginia had 308 high schools. This study sought the participation of 30 randomly selected schools; 28 responded. The selected high schools received coded questionnaires in quantities based on the number of Algebra I teachers in each school. The high school principal made the decision to distribute the questionnaire to the Algebra I teachers within the schools, and the number of participating teachers was small. The schools were divided into only three categories, with 10 schools in each category. If the sample was larger, the categories of schools would have been more diverse.

The questionnaire asked about the certification, type of degree, specification, and years of experience of each teacher participating. In addition, questions related to the six domains of effective teachers (Stronge 2002) were included. However, only three questions inquired about the teacher qualities for each domain. The questionnaire allowed only Likert-type responses and there were no qualitative data collected.

Summary

This chapter contained the description of the population and the methods of collecting, managing, and analyzing the data. The population included Algebra I teachers who taught in 30 of Virginia's public high schools during the 2004-2005 school year, and the percentage of high school students who passed the Algebra I SOL test that same school year. Data were collected from two sources: the Algebra I teachers and the student data from the Virginia Department of Education Website listing the SOL Algebra I test results for the 2004-2005 school year. The Chi-square test of association and a one-way ANOVA identified relationships between the variables.

CHAPTER IV
RESULTS

This study collected data on teacher attributes that affect student achievement in Algebra I. Algebra I teachers from 30 Virginia high schools that were randomly selected from the VADOE website were asked to participate by responding to a questionnaire. The first four research questions were addressed using a questionnaire that asked questions about certification, years of teaching experience, highest degree earned, and the specialization of the degree. Research question five addressed additional questions pertaining to Stronge's (2002) six attributes of effective teachers: 1. teaching as a person, 2. classroom management, 3. organization, organizing and orienting for daily instruction, 4. implementing instruction, 5. monitoring student progress and potential, and 6. teacher professionalism.

Validation of the Questionnaire

The researcher developed the questionnaire. In order to validate the instrument forty questionnaires were distributed in five high schools that were not involved in the study. The building principals affirmed that all Algebra I teachers received a questionnaire. Teaching Algebra during the 2004-2005 school year was not a requirement to participate in this validation process although it was a criteria in the final instrument. A total of 13 (32.5%) Algebra I teachers responded to the validation request for the questionnaire that was used in this study. (Appendix I) Two of the 13 teachers recommended changing question 10 from "*As an Algebra I teacher during the 04-05 school year, maintained a personal work area*" to "*As an Algebra I teacher during the 04-05 school year, I maintained a personal work area.*" This was the only change made to the final questionnaire that was used in the study.

Selection of Study Sample

Appendix H lists all Virginia high schools and their Algebra I test scores during the 2004-2005 school year. After the high schools were ranked from the highest SOL Algebra I passing rate to the lowest, the group of schools was divided into three categories based on the schools pass rate. To determine the categorical point spread,

the lowest test score, 29.99, was subtracted from the highest score, 100.00, and the difference, 70.01, divided by three. This resulted in an average categorical point range of 23.33. The first category grouping ranged from 29.99-52.99%; the second from 53.00-76.99%, and the third category from 77.00-100%**.** From each category, ten schools were randomly selected, for a total of 30 schools.

Of the 30 randomly selected high schools, 28 agreed to participate in the study. The remaining two high schools in Category 1 received permission to participate from their division superintendent, but chose not to participate. Five additional division superintendents with test scores from the first category were contacted via e-mail. Two of the superintendents expressed disinterest, and the remaining three superintendents did not respond to additional contacts by telephone and e-mail. Additional attempts via e-mail and phone calls were made to the superintendents of the two schools that did not wish to participate. No responses were received via e-mail or returned phone calls.

An initial e-mail was sent to each superintendent from the selected school divisions before the principals were contacted. After permission was granted, packets with a letter to the principal, a copy of the questionnaire for the principal, letters, and questionnaires for teachers were mailed to the school principal. A total of 141 questionnaires were distributed to the Algebra I teachers in the selected high schools.

Participation in the study was voluntary and the questionnaire (see Appendix C) included 23 questions. The first question eliminated respondents who did not teach Algebra I during the 04-05 school year. The next four questions, gathered information about four of the independent variables for this study, certification status, degrees earned, number of years teaching Algebra I, and specialization in math. These data are reported as descriptive data later in this chapter. An additional 18 statements with a Likert response scale corresponded to Stronge's (2002) six domains of effective teachers. Each attribute was correlated with three statements each within the questionnaire (see Appendix H). A Chi-square and one-way ANOVA were used to determine the relationship between the attributes of math teachers, the six teacher domains, and student achievement in the Algebra I SOL test.

Survey Response

Appendix J describes the survey responses from each high school in the study. This represents responses from 28 of 30 (93%) of the Virginia high schools selected for the study. Two high schools in category 1 chose not to participate.

A total of 140 questionnaires were mailed to the Algebra I teachers assigned to the 28 high schools; 39 were mailed to category 1 schools, 48 to category 2 schools, and 53 were mailed to category 3 schools. E-mails and telephone calls were used to encourage a high response rate from the schools. Of the 140 questionnaires, 79 were returned, for an overall response rate of 56.42%. When reported by category, the response rate was consistent among the three categories. The response rate for category 1 schools was 58.97% (n=23); for category 2, the rate was 54.16% (n= 26); and for category 3, the response rate was 56.60% (n=30). Of the 79 respondents, 53 (67.08%) taught Algebra I during the 2004-2005 school year and were included as participants in the study. The 53 participants included 13 (24.52%) from category 1 high schools; 20 (37.73%) from category 2; and 20 (37.73%) from category 3 schools.

The Free and Reduced Price Lunch Program Eligibility Report from the Virginia Department of Education (2005e) determined the SES. Appendix K describes the SES school percentages from the 53 teacher responses. Category 1 schools overall SES percentage was 28.56. Category 2 schools overall SES percentage 36.30, and category 3 schools SES percentage was 23.55.

Data Analysis

The categories of randomly selected schools were category 1for schools with a passing score of 29.99-52.99% on the SOL Algebra I test, category 2 for schools with passing scores between 53-76.99%, and category 3 for schools with a passing score between 77-100%. The coding system included alphabetical and numerical codes assigned to each school division and high school within the VADOE. The first numbers indicated the school division code assigned by the VADOE; the second indicated the VADOE high school code; and the final number indicated the number of questionnaires distributed to the individual school system. Therefore, to manage and organize the

returned questionnaires, the returns were coded accordingly as A-XXX-XXX-X. The school's identity in this study is anonymous and confidential.

A Chi-square test of association (Hinkle et al., 1998) compared the relationship between the independent variable of the teacher attributes and the means of the dependent variable of the SOL test results from Algebra I during the 2004-2005 school year. An analysis of variance (ANOVA), which measures the difference between the means of groups (Ramsey & Schafer, 2002), was used to analyze the mean responses to the 18 statements related to the six domains of effective teachers (Stronge, 2002).

Findings by Research Question

The following section describes the findings for each of the research questions.

Question 1 - What is the relationship between teacher certification and student achievement in Algebra I?

No Child Left Behind (2002) stated that a teacher is highly qualified if the following requirements are met: (a) full state certification, (b) achievement of a bachelor's degree or (c) demonstration of subject matter competency in each of the academic subjects in which he or she teaches—if the subject is a core academic subject. As depicted below, Table 2 describes the certification status of the 53 respondents who taught Algebra I during the 2004-2005 school year. Forty-three of the 53 respondents (81.13%) were certified to teach Algebra I during the 2004-2005 school year, while 10 (18.86%) were not. Category 2 schools had the highest number of teachers who were certified to teach Algebra I (90%), while teachers in category 3 schools had the lowest number of certified teachers (75%).

Table 2

Descriptive Analysis: Cross Tabulation of the solcat (SOL Category) and Certification

		Certification				
		No	Percent No	Yes	Percent Yes	Total
Solcat	1	3	21.42	10	76.92	13
	2	2	10.00	18	90.00	20
	3	5	25.00	15	75.00	20
Total		10	18.86	43	81.13	53

Table 3 indicates the categorical variables examined with the Chi-square test, which compared the significance of certification as the independent variable to the dependent variable, the SOL Algebra I test scores. There were no statistically significant differences among the SOL categories for the teachers' certification status.

Table 3

Chi-square Results

	Value	*df*	Significant Value
Chi-Square	1.479	2	.477
N of Valid Cases	53		

Question 2 - What is the relationship between the level of specialization in math and student achievement in Algebra I?

The descriptive analysis of the SOL categories and degrees earned by teachers is described in Table 4. A total of 37 (69.81%) had a bachelor's degree, while 16 (30%) had earned a master's degree. Teachers from the category 2 schools had the lowest number of teachers with a master's degree in mathematics, while teachers in category 3 (77-100% proficient student scores on the 2004-2005 Algebra I SOL test) had the highest percentage (45%) of teachers with master's degrees in mathematics.

Table 4

Descriptive Analysis: Cross Tabulation of the solcat (SOL Category) and Degrees

		Degrees			
		Bachelor's	Percent Bachelor's	Master's	Percent Master's
Solcat	1	9	69.23	4	30.76
	2	17	85.00	3	15.00
	3	11	55.00	9	45.00
Total		37	69.81	16	30.18

Table 5 represents the Chi-square results which showed that there were no statistically significant differences between SOL categories for either the bachelor's or master's degree status of the teachers.

Table 5

Chi-square results

	Value	*df*	Significant Value
Chi-Square	3.903	2	.142
N = Valid Cases	53		

Table 6 describes the degrees earned by the teachers in the area of mathematics. A total of 38 (71.69%) had bachelor's degrees in the area of math in 2004-2005, while 15 (28.30%) did not. Teachers in category 2 had the highest percentage of teachers with degrees in math (80%) while category 1 had the lowest percentage (61.53%).

Table 6

Descriptive Analysis: Cross Tabulation of solcat (SOL Category) and Specification

		Specification			
		Degree In Math	Percent with Degree In Math	No degree In Math	Percent with No Degree in Math
Solcat	1	8	61.53	5	38.46
	2	16	80.00	4	20.00
	3	14	70.00	6	30.00
Total		38	71.69	15	28.30

As described below in Table 7, there was no statistically significant difference between the SOL categories for teachers with and without a bachelor's degree in mathematics.

Table 7

Chi-square Results

	Value	*df*	Significant Value
Chi-Square	5.761	4	.218
N of Valid Cases	53		

Question 3 - What is the relationship between the number of years of teaching math at any level and student achievement in Algebra I?

Table 8 describes the relationship between years of teaching Algebra I during the 2004-2005 school year and the school category. In category 1 (n=13), five (38.46%) teachers had taught Algebra I for 0-3 years. Four (30.76%) had 4-7 years of experience, two (15.38%) had 8-11 years, zero had 12-16 years of experience, and two (15.38%) had experience teaching math during the reported period.

In category 2 (n=20), three (15%) had 0-3 years of experience, Half of the 20 (50%) had 4-7 years experience, while three (15%) 8-11 years, two (10%) had 12-16 years of experience and two (10%) had 17 plus years of teaching experience.

In category 3 (n= 20), three (15%) had 0-3 years of experience, while half (n=10, 50%) had 4-7 years of experience. Three (15%) had taught Algebra I for 8-11 years, zero taught 12-16 years and four (20%) who had more that 17 years experience.

Table 8

Descriptive Statistics: Cross Tabulation of solcat (SOL Category) and Years of Experience

		Years									
		0-3	%	4-7	%	8-11	%	12-16	%	17 plus	%
Solcat	1	5	38.46	4	30.76	2	15.38	0	0	2	15.38
	2	3	15.00	10	50.00	3	15.00	2	10.00	2	10.00
	3	3	15.00	10	50.00	3	15.00	0	0	4	20.00
Total		11	20.75	24	45.28	8	15.09	2	3.77	8	15.09

As described below in Table 9, there was no statistical significance between the SOL categories and years of experience teaching math.

Table 9

Chi-square results

	Value	*df*	Significant Value
Chi-Square	6.543	8	.587
N of Valid Cases	53		

Question 4 - What is the relationship between SES and student achievement in Algebra I?

Table 10 depicts the socioeconomic status percentages of the student body that received free/reduced lunches and attended the three school levels. Category 1 schools have an overall SES average of 28.56 percent. Category 2 schools have an overall SES average of 36.30 percent and Category 3 has an overall SES average of 23.55 percent. These percentages comprise the average of each of the participating schools. The combined average of the three categories is 29.47 percent.

Table 10

Descriptive Analysis: Cross Tabulation of solcat (SOL Category) and Socioeconomic Status (SES)

		Percentages Receiving Free or Reduced Priced Lunches	
	Solcat	No. of teacher participants	Average of High School F/R Lunch Averages
Solcat	1	13	28.56
	2	20	36.30
	3	20	23.55
		53 total	29.47 overall average

Table 11 depicts the Chi-square analysis of SOL category and SES. There was a statistically significant association between SOL and SES categories.

Table 11

Chi-square Results

	Value	*df*	Significant Value
Chi-Square	10.509	2	.005
N of Valid Cases	53		

ANOVA Analysis – Teacher Attributes

Question 5 - What are teacher perceptions in the relationship between the six teacher characteristics identified by Stronge (2002) and student achievement in Algebra I?

The study questionnaire contained 18 statements related to the characteristics of effective teachers. These statements corresponded to the six domains of effective teachers as described by Stronge (2002). Each domain consisted of three questions; each question used a Likert scale with a range from 1 to 4, with 4 representing “very much agree”, 3 representing “agree”, 2 representing “somewhat agree”, and 1 representing “do not agree”. The following section describes the ANOVA results for each domain.

Teacher as a Person

The first domain, *Teacher as a Person* (TAAP), asked questions about the teacher’s approach to teaching, the enjoyment from teaching, and the respect held for students (Stronge, 2002).

As described in Table 12, the teachers in category 1 schools had a mean score of 3.1282; the teachers in category 2 mean score was 3.4035, and category 3 schools had a mean score of 3.5833.

Table 12

Descriptive Analysis: Teacher as a Person (TAAP)

SOLCAT	Mean	N
1	3.1282	13
2	3.4035	20
3	3.5833	20
Total	3.3716	53

Table 13 depicts the analysis of the teacher response to questions related to the first domain, *Teacher as a Person.* The analysis was significant, F (2, 51) = 4.185, p.

<.05.(Whatley, 2007). The teachers in categories 2 and 3 believed that their joy in teaching, their respect for students, and a structured classroom were factors in student performance on the Algebra I SOL test. The teachers in category 1 scored below the mean.

Table 13

ANOVA: Teacher as a Person (TAAP)

Source	*df*	*F*	*sig.*
		Between Group	
SOLCAT	2	4.185	.021
		Within Group	
SOLCAT	51		

Classroom Management and Organization

The second domain, *Classroom Management and Organization (CMO),* ascertained teachers' views about organizing student desks to maximize student learning, maintaining a personal workspace, posting classroom rules, and student expectations (Stronge, 2002). As described below in Table 14, the total mean score was 2.9452. Teachers in category 1 had a mean score of 2.9487; teachers in category 2 had a mean score of 3.0702; and the category 3 teachers had a mean score of 2.8167.

Table 14

Descriptive Analysis: Classroom Management and Organization (CMO)

SOLCAT	Mean	N
1	2.9487	13
2	3.0702	20
3	2.8167	20
Total	2.9452	53

Table 15 describes the analysis of the teacher response to questions about classroom management and organization. The analysis showed no statistically significant differences, F (2, 51) = .744, p. =.481.

Table 15

ANOVA: Classroom Management and Organization

Source	*df*	*F*	*sig.*
		Between Group	
SOLCAT	2	.744	.481
		Within Group	
SOLCAT	51		

Organizing and Orienting for Daily Instruction

The third domain, *Organizing and Orienting for Daily Instruction (OODI),* included questions about the value of writing daily lesson plans, implementing differentiated instruction, and using manipulatives during instruction (Stronge, 2002). As shown below in Table 16, the total mean score for the three questions related to OODI was 2.9192 Teachers in category 1 schools had a mean score of 2.7436; teachers in category 2

schools had a mean score of 2.9474; and the teachers in category 3 schools had a mean score of 3.0667.

Table 16

Descriptive Analysis: Organizing and Orienting for Daily Instruction (OODI)

SOLCAT	Mean	N
1	2.7436	13
2	2.9474	20
3	3.0667	20
Total	2.9192	53

Table 17 describes the analysis of the teachers' responses to the questions asking about the writing of daily lesson plans, developing lesson plans that included differentiation of instruction for students at varied levels of algebra instruction, and the utilization of math manipulatives and supplemental materials during instruction. The analysis showed no statistically significant differences, F (2, 51) = 1.031, p. = .364.

Table 17

ANOVA: Organizing and Orienting for Daily Instruction

Source	*df*	*F*	*sig.*
		Between Group	
SOLCAT	2	1.031	.364
		Within Group	
SOLCAT	51		

Implementing Instruction (IIMP),

The fourth domain, *Implementing Instruction (IIMP),* included teacher responses to questions about the use of pre-assessment, planning of student-centered activities vs. teacher-centered activities, and establishing classroom routines (Stronge 2002). As described below in Table 18, the total mean score 2.5428. Teachers in category 1 schools had a mean score of 2.3846; and teachers in category 2 had a mean score of 2.5439, and category 3 had a mean score of 2.7000.

Table 18

Descriptive Analysis: Implementing Instruction (IIMP)

SOLCAT	Mean	N
1	2.3846	13
2	2.5439	20
3	2.7000	20
Total	2.5428	53

Table 19 depicts the analysis calculated on the teachers' responses to questions related to IIMP. The analysis showed no statistically significant differences, F (2, 51) = 1.440, p. = .247.

Table 19

ANOVA: Implementing Instruction (IIMP)

Source	*df*	*F*	*sig.*
		Between Group	
SOLCAT	2	1.440	.247
		Within Group	
SOLCAT	51		

Monitoring Student Progress and Potential (MSPP)

The fifth domain, *Monitoring Student Progress and Potential (MSPP),* assessed teacher perceptions of the importance of teacher communication of student progress to parents, and use of a variety of assessments and methods for providing written and verbal feedback to students (Stronge 2002). Table 20 shows the total mean score of 3.1029 for the three questions related to MSPP. Teachers in category 1 schools had a mean score of 2.6923, teachers in the category 2 had a mean score of 3.3333, and category 3 had a mean score of 3.2833, which was above the overall mean score.

Table 20

Descriptive Analysis: Monitoring Student Progress and Potential (MSPP)

SOLCAT	Mean	N
1	2.6923	13
2	3.3333	20
3	3.2833	20
Total	3.1029	53

Table 21 depicts the analysis of the teachers' responses to questions about MMSP. The analysis showed that there were statistically significant differences among the groups, F (2, 51) = 6.330, p. = <.05.

Table 21

ANOVA: Monitoring Student Progress and Potential (MSPP)

Source	*df*	*F*	*sig.*
		Between Group	
SOLCAT	2	6.330	.004
		Within Group	
SOLCAT	51		

Teacher Professionalism (TP)

The last of the six domains, *Teacher Professionalism (TP),* asked teachers about the value of sustaining their knowledge of current research in their content area, using best practices and literature to support their use of best practices, collaborating with colleagues and administrative staff, and attending grade level meetings to discuss the needs of students (Stronge 2002). Table 22 shows the total mean score of 2.8167 for the three questions pertaining to TP. Teachers in category 1 schools had a mean score of 2.6923, teachers in categories 2 and 3 had mean scores of 2.8246 and 2.9333 respectively.

Table 22

Descriptive Analysis: Teacher Professionalism (TP)

SOLCAT	Mean	N
1	2.6923	13
2	2.8246	20
3	2.9333	20
Total	2.8167	53

Table 23 describes the analysis of the teachers' responses to questions about TP. The analysis showed no statistically significant differences, F (2, 51) = .510, p. = .604.

Table 23

ANOVA: Teacher Professionalism (TP)

Source	*df*	*F*	*sig.*
		Between Group	
SOLCAT	2	.510	.604
		Within Group	
SOLCAT	51		

Summary

In summary, this chapter presented the results of data obtained from teacher questionnaires completed by 53 Algebra 1 teachers from randomly selected high schools across the Commonwealth Virginia. Schools were organized in categories that reflected achievement levels on the SOL Algebra 1 test. Teachers responded to questions about their certification, level of specialization, years of teaching experience

prior to the 2004-2005 school year, and the perceived value of the six domains of effective teachers as described by Stronge (2002). Chi-square and one-way ANOVAs were used to assess the relationship between student achievement in Algebra 1 and teacher certification, specialization in math, years of experience teaching math; the socioeconomic status of the students, as reflected in the number of students who received free or reduced lunch; and teacher perceptions of the importance of teacher attributes, as defined by Stronge (2002). In Chapter V, the results of the data collection are discussed, and implications and recommendations for further study are identified.

CHAPTER V

SUMMARY OF FINDINGS, IMPLICATIONS, AND RECOMMENDATIONS

This study assessed the correlation between selected teacher attributes and test scores on the SOL Algebra I test for students in grades 9-12. The study also evaluated the association between students' socioeconomic status (SES) and achievement on the test. The selected teacher attributes had been identified in the literature review as important factors in student achievement (Goldhaber & Brewer, 1993; Goldhaber & Anthony, 2003; Hawk, Coble & Swanson, 1985; Ornstein, 1990; Stronge, 2002; Wenglinski, 2000). The study also investigated teachers' perceptions of the six domains of an effective teacher, as defined by Stronge (2002).

The main research question that guided this study was:

How are selected attributes of Algebra I mathematics teachers related to pass rates of students on the Standards of Learning Algebra I tests in Virginia?

The sub-questions were:

1. What is the relationship between teacher certification and student achievement in Algebra I?
2. What is the relationship between the level of specialization in math and student achievement in Algebra I?
3. What is the relationship between the number of years of teaching math at any level and student achievement in Algebra I?
4. What is the relationship between SES and student achievement in Algebra I?
5. What are teacher perceptions in the relationship between the six teacher characteristics identified by Stronge (2002) and student achievement in Algebra I?

This chapter summarizes the study's findings, implications for practitioners, limitations, and recommendations for future research.

Summary of Findings

Teacher attributes

There were no significant relationships found between the teacher attribute of certification and student achievement on the Algebra I SOL test. As described previously, 43 (81.13%) of the high school teachers were certified to teach Algebra I during the 2004-2005 school year; 10 (18.86%) were not certified.

As indicated in Table 2, the larger percentages of certified Algebra I teachers were in the category 2 schools and the lowest percentage were found in the category 3 schools. However, category 1 schools had the lowest number of certified teachers and category 2 schools still had the highest number of certified teachers. Category 2 schools had the lowest number of non-certified teachers, followed increasingly by categories 1 and 3 respectively.

The data in Table 3 provided the Chi-square results. In this study, the non-significant relationship (p=.477) between teacher certification and student achievement on the Algebra I SOL test was not consistent with previous research (Begle & Geeslin, 1972; Goldhaber & Brewer, 1996, 1999; Hawk, Coble & Swanson, 1985; Tucker & Stronge, 2005), which concluded that students achieved higher test scores when taught by teachers who were certified in mathematics. The data in this study show that there was no statistically significant difference in the effect of certification on the level of student achievement.

There was no statistically significant difference in the achievement level of students on the Algebra I SOL test when the level of degree earned by the teacher is considered. Table 4 indicated that the three categories had higher numbers of teachers with bachelor's degrees than with master's degrees. Category 2 had the highest number of teachers with a bachelor's degree and category 3 schools had the highest number of teachers with a master's degree. Category 1 had the lowest number of certified teachers with bachelor's degrees. Thirty-seven (69.81%) of the study sample had bachelor's degrees and 16 (30.18%) had a master's degree. There were no teachers in the study with an Education Specialist degree, Certificate of Advanced Graduate Studies, or a doctoral degree. This finding is not consistent with previous research by Chaney (1995) and Goldhaber and Brewer (1996), which found that teachers with

advanced degrees such as a master's degree had an effect on student math test scores. Other studies by Hill, Rowan, and Ball (2005), and Goldhaber and Brewer (2000) had also shown an association between student achievement and teacher knowledge in their subject area**.**

Table 5 provides results of the Chi-Square analysis with a significant value of (p=.142). There was also no significant relationship between the teachers' degree and student achievement on the SOL test in Algebra I. The data shows that even with the variance in these areas, there was no statistically significant difference in the effect of these factors on the level of student achievement.

There is no statistically significant difference in the effect a degree in mathematics had on the level of student achievement. Table 6 provided the descriptive analysis of the SOL category and specification of degree. Numerically, category 1 schools had the fewest number of teachers with a degree in math and category 2 had the highest number of teachers with math degrees. Statistically, the category 1 schools had the lowest number of math degreed teachers and the highest number of teachers without math degrees. As described in Table 7, the Chi Square results, (p=.219), indicated no statistically significant difference in the effect these factors had on the level of student achievement. This finding did not support previous research by Goldhaber and Brewer (1996; 1999) which suggested that students taught by teachers with a bachelor's or master's degree in mathematics achieved higher scores than students taught by teachers without a degree in mathematics. In the Goldhaber and Brewer research (1996), teachers with certification/licensure in math had a significant positive impact on student test scores.

The data show that there was no statistically significant difference in the effect the attribute of teachers years of experience had on the level of student achievement. Table 8 provided the descriptive analysis of years of experience and the SOL categories. Schools in category 1 had the highest number of teachers with the least experience, and no teachers with a high number of career years. Categories 2 and 3 schools had the same number of teachers with the least amount of experience, with category 3 leading with the highest number of teachers with the most teaching experience.

Table 9 provided the Chi Square result (p=.587) for teacher experience. Even with the variance of these areas, the data show that there was no statistically significant difference in the effect these factors had on the level of student achievement. This finding was not consistent with previous research (Hill, Goldhaber & Anthony, 2003b; Monk, 1994; Rowan & Ball, 2005; Tucker & Stronge, 2005) which suggested that teachers with many years of classroom experience produced students with higher achievement than teachers with three or less years of experience, and that number of years of classroom experience was another predictor of student success (Goldhaber & Anthony, 2003a).

Student SES

This research question assessed the relationship between poverty (as measured by percentages of students who receive free and reduced lunch lunches) and student achievement. Table 10 provided a descriptive analysis of the cross tabulation of the SOL category and SES factor. Category 3 schools had the lowest socioeconomic status and Category 2 had the highest. The overall mean was 29.47 percent.

Table 11 data revealed a significant relationship between the Algebra I achievement levels of schools and the SES of the student population, as reflected by the percentage of students who received reduced or free lunch. This finding is consistent with findings from the Coleman Report (1966)*, A Nation at Risk* (1983), and later research by Dossett and Munoz (2000) and Fetler (2001), which found that students from low-income environments did not achieve as well academically as their peers from higher income environments.

Teacher Domains

The fifth research question, What is the relationship between the six teacher characteristics identified by Stronge (2002) and student achievement in Algebra I?, was addressed by the one-way ANOVA that was used to analyze the 18 questions related to the six teacher domains identified by Stronge (2002). Two domains were found to be significantly related to student achievement, while four were not.

The teachers in all three-school categories valued the profession of teaching, and held the students and the practice of pedagogy in high regard. The first domain,

Teacher as a Person (TAAP), had a mean score of 3.3716, and a significant positive correlation of p=.021. The TAAP indicated that the teachers in all three-school categories valued the profession of teaching, and held the students and the practice of pedagogy in high regard. This finding agreed with research by the Gallup Organization (2005) which found that great teachers were not afraid to show their pride in and care for their students by using words or actions.

Student achievement on the SOL Algebra I test was significantly related to the teachers' feedback and communication to students and parents about student progress. Monitoring Student Progress and Potential *(*MSPP) had a mean score of 3.102, which was statistically significant (p=.004). This finding concurs with the 2005 Gallup study, which found that great teachers were able to set the right goals for students and were flexible in making changes as needed to help students learn. This finding also agrees with a recent work by Arnove (2009) which suggested that great teachers were skilled at diagnosing student progress and identifying the tasks or stimuli that could help students move up to the next level of performance.

There was no statistical significance between student achievement on the SOL Algebra I test and the classroom approaches used by teachers to arrange student seating, or to use rules and student expectations to maximize student learning. Classroom Management and Organization (CMO) had a mean score of 2.9452, which was not statistically significant (p=.481). This finding may also be related to research that identified flexibility as a characteristic of great teachers (Gallup, 2005).

There was no significant relationship between student achievement on the SOL Algebra I test and approaches used by teachers to write daily lesson plans, differentiate instruction, or organize instruction. Organizing and Orienting for Daily Instruction (OODI) had a mean score of 2.9192, which was not statistically significant. Teachers who did not value these practices may not address the unique needs of student or use of manipulatives during instruction. Recent research on great teachers (Arnove, 2009) has shown that great teachers personalize instruction for their students, and work to develop new and improved ways of teaching.

There was no statistical significance relationship between the student achievement on the SOL Algebra I test and teacher pre-assessments, planned student-

centered activities, and class routine. Implementing Instruction *(*IIMP) had a mean score of 2.542, which was not statistically significant. This finding indicated that there was no significant relationship between student achievement on the SOL Algebra I test and the teachers' attempt to remain informed of current research in their content area, the teachers' collaboration with colleagues, or their participation in professional meetings. Teacher Professionalism (TP), with a mean score of 2.8167, was also not statistically significant. This is not consistent with findings from Gallup (2005) that suggested that the majority of mediocre teachers have stopped learning after five years on the job, and that it was great teachers who continue to learn and develop in the teaching profession.

Limitations

There are several limitations of this study, which may influence the generalizability of the results:

1. The participants in this study were teachers from the Commonwealth of Virginia. Findings may not be generalizable to teachers from other states where there may be local or regional differences in teaching philosophy or pedagogy.
2. Participants in this study were self-selected. This process of self-selection may have introduced a bias in the findings because teachers who did not respond to the study questionnaire may possess different perspectives on teaching.
3. The sample size of the study was small (N=53), and may not be a representative sample of teachers in the Commonwealth of Virginia.
4. The SES high school percentages may not be an accurate representation to the true percentage of high school students living in poverty in Virginia.

Implications for Practitioners

These implications can be drawn from the study results: The first finding of the study indicated no significance between teacher certification and student achievement on the Algebra 1 SOL test. With respect to a school division's human resources, teaching candidates with strong math backgrounds and experience should be

considered viable for teaching Algebra I even if they do not have certification in mathematics.

The second finding, no significant relationship between the teachers' degree and student achievement, indicated that candidates do not necessarily require advanced degrees to teach Algebra. Teachers and teacher candidates with strong math reasoning may be the better or at least equally as good as the teacher who has earned advanced degrees in mathematics.

The third finding indicated no significant relationship between a teacher's degree in the area of math and student achievement in Algebra. The implication of this finding is that human resources representatives may seek candidates with certification in other academic areas without having a negative impact on student pass rates on the SOLs. Thus, education leaders in the Commonwealth of Virginia school divisions may learn that candidates do not necessarily have to fit every level of 'preferred qualifications.'

The fourth finding showed no significant relationship between the number of years a teacher has taught and student achievement in Algebra I. Although many school divisions are struggling to avoid RIF, it might be economically beneficial if candidates with fewer years of teaching experience, strong mathematical talents and math interests, were considered as viable additions to a school's teaching staff.

The fifth finding showed significance between poverty and student achievement. It would be feasible for school divisions to invest in additional human resources, staff development, and materials that promote successful teaching and learning opportunities in multicultural schools with high poverty levels.

The sixth and seventh findings did show significance between two of Stronge's (2002) teacher attributes and student achievement. The first was TAAP. As school divisions interview potential applicants, the interview process should include questions of humanistic origin inquiring about the applicant's viewpoint of teaching as a long-term profession and their compassion for children.

The seventh finding, the second of Stronge's teacher attributes that showed significance was MSPP. As part of professional development, school divisions should include workshops and trainings for novices and veteran teachers the importance of

how communicating student progress and expectations to students and parents improves student achievement.

The eighth finding was that two of the hallmark attributes, certification and degree earned, were not found significant. These attributes are common in the educational realm to determine teacher compensation and pay. As part of reviewing the process of teacher compensation, school divisions might consider looking into alternative attributes to determine how a teacher might receive appropriate compensation for job assignment and job performance.

Finally, Arnove (2009), Gallup (2005), Gates (2009), and other educational reformers have dared to suggest that education and experience are not necessarily associated with good teaching. In a recently published study of great teachers, Arnove (2009) found that the best teachers were able to personalize instruction for their students. These teachers had a keen sense of where their students were in their learning plan, knew what tasks to assign, and engaged the students in constructive problem solving. The teachers encouraged and stimulated the students to learn, and provided the resources the students needed to investigate problems or practice. Other research on great teachers conducted by Gallup (2005) has suggested that being a great teacher requires innate talent. According to Gallup, great teachers know how to set the right expectations for students, remain flexible with learning, and are not afraid of showing that they care about their student's success.

Recommendations for Further Study

Based on the findings from this study this listing suggests several areas for further study:

1. *More research on great math teachers*. As cited in this chapter, current research on great teachers has provided valuable insights into the art of good teaching. However, these studies have included master teachers from a variety of disciplines. Studies that focus on the teaching of subjects such as Algebra could help to identify the characteristics of great math teachers and the unique, math-specific strategies these teachers use to help students learn math.

2. *More qualitative research on great teacher effectiveness.* Since research on great teachers has identified some classroom approaches used by great teachers, new research that utilizes qualitative research methods has the potential to identify additional strategies and approaches used by great teachers.
3. *More research on effective teachers in high poverty school settings*. The extensive, ongoing evaluation of educational programs such as KIPP will provide important insights for the education community. These would include the effects of strong principal leadership, parental involvement, and organizational culture on student achievement in impoverished communities.

Conclusion

In 2009, NCLB requires that all schools find, hire, and retain highly qualified teachers for core subject areas. The findings from this study of selected attributes of Algebra I teachers, student SES, and student achievement on the Algebra I SOL Test suggest that 1) traditional attributes of teachers such as teacher certification and specialization may not be accurate proxies for teacher effectiveness, and that 2) in selected Virginia schools, low SES continues to be an impediment to student achievement in math. Recent research on great teachers and their success positively impacting students in impoverished communities offer great hope and promise for the education community. The research reaffirms that effective teaching is an art and that educational environments which encourage and support teacher development, classroom management skills, evaluation of student progress/potential, rewards for higher education, and strong school leadership can help *all* students succeed in school. In this era of educational reform, the questions for education may be: What would happen in the US if all our schools were filled with great teachers? How can we make that a reality?

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APPENDIX A –
A DESCRIPTION OF VIRGINIA'S SOL TESTS

This appendix contains three parts: an overview of Virginia's criterion referenced tests, the validity of the tests and reliability of the tests.

Overview of Virginia's Criterion-Referenced Tests

The Standards of Learning (SOL) test is a criterion-referenced test given to all students in grades 3, 5, 8 and 11 attending public schools in the Commonwealth of Virginia. The test assesses the mastery of content and understanding of the academic domains in English, mathematics, science and social studies. However, for the focus of this study, only the Algebra I test scores given at the high school level were examined.

The purpose of a criterion-referenced test is to determine what skills or proficiencies a student has mastered. This test simply determines what a student knows or does not know (Gellman, 1995; McLean & Lockwood, 1996). The intent of these tests does not compare students with others, but compares them to their mastery of knowledge and skill (Gellman, 1995).

The validity of a criterion-referenced test has to do with the correspondence of the test items to the knowledge and skills that are directly being assessed (Gellman, 1995). In relation to the Virginia SOL, validity applies to the grade level mastery of competencies that is a blueprint for school divisions to develop and design their curriculum and instruction.

The disadvantage of criterion-reference tests is that the reliability factor cannot be measured because the scores are not widespread as on other types of tests (Gellman, 1995). Therefore, in relation to this study, the SOL test validity and reliability factor is understood and accepted by state standards. It will be the determining factor of whether the attributes of effective teachers made an impact on their achievement of these tests (Commonwealth of Virginia, 2005c).

Validity of the SOL Algebra I Test

The validity and reliability of the Commonwealth of Virginia's Standards of Learning assessments have been reviewed by S. E. Phillips from Michigan State University and James McMillan from Virginia Commonwealth University

(Commonwealth of Virginia, 1999). In regards to the validity, as stated in the SOL Test Validity and Reliability Information:

> The item and test development procedures follow best measurement practice for establishing content validity. Evidence for validity based on the content of the tests has been carefully gathered and clearly supports the inference that the test scores indicate student knowledge and skill as defined by the SOL (p.7).

The Standards of Learning tests are correlated to that of the Stanford 9 and the Literacy Passport Test. Results showed that the SOL test appeared to "rank order schools most similarly to the Stanford 9 in grade 8 and least similarly at the high school level" (Commonwealth of Virginia, 1999, p. 9). In addition, the SOL mathematics tests appeared to "rank order schools more similarly to Stanford 9 mathematics problem solving than mathematics procedures" (p. 9).

Reliability of the Algebra I End-Of-Course SOL Test

The reliability of the Commonwealth of Virginia's Standards of Learning Algebra I End-Of-Course test is designed to measure individual student's attainment of the commonwealth's standards. The test is developed using extensive input from Virginia educators to select items that match the related SOL and that meet the Kuder-Richardson Formula 20 (KR-20) internal consistency reliability estimate for the Standards of Learning Algebra I End-Of-Course test of .91 (Commonwealth of Virginia, 2005d). The Kuder-Richardson Formula is a reliable statistical instrument that looks at the degree to which questions measure content knowledge and skills (Commonwealth of Virginia, 2005d). The decision accuracy and consistency index that measures the accuracy of the decisions made between passing and failing for the Spring 2004 Algebra l assessment was .92 (Commonwealth of Virginia, 2005d, p. 73).

APPENDIX B –

ALGEBRA I TRIAL TEACHER QUESTIONNAIRE

Please check the appropriate box to the following questions. If you answer NO to the first question, please do not continue with this survey. Return the completed questionnaire in the self-addressed stamped envelope. Thank you for your participation.

Trial Algebra I Teacher Questionnaire

1. **I taught Algebra I at this high school level during the 2004-2005 school year.**

   ☐ 1. No
   ☐ 2. Yes

2. **I was certified to teach secondary math in 2004-2005.**

   ☐ 1. No
   ☐ 2. Yes
   ☐ If not, what was your certification status? _____.

3. **Check all the degrees earned in 2004-2005 or prior to 2004-2005.**

   ☐ 1. Bachelor
   ☐ 2. Masters
   ☐ 3. EdS or Certificate of Advanced Graduate Studies
   ☐ 4. Doctorate
   ☐ 5. Other: _____.

4. **I have taught Algebra I for _____ years, including 2004-2005.**

   ☐ 1. 0-3
   ☐ 2. 4-7
   ☐ 3. 8-11
   ☐ 4. 12-16
   ☐ 5. 17 plus

5. **My highest earned degree in mathematics in 2004-2005 was**

   ☐ 1. Bachelors in Mathematics.
   ☐ 2. Masters in Mathematics
   ☐ 3. EdS or Certificate of Advanced General Studies
   ☐ 4. Doctorate
   ☐ 5. None of the above

The following questions ask your feeling of how your teaching behaviors influence students' academic success. Please mark the response on the degree of agreement of each statement. 1 = Do not agree; 2 = Somewhat agree; 3 = Agree; and 4 = Very much agree.

6. **As an Algebra I teacher during the 04-05 school year, I believe my approach to teaching was structured, yet flexible.**

   - ☐ 1 = Do not agree
   - ☐ 2 = Somewhat agree
   - ☐ 3 = Agree
   - ☐ 4 = Very much agree

7. **As an Algebra I teacher during the 04-05 school year, I enjoyed teaching my subject.**

   - ☐ 1 = Do not agree
   - ☐ 2 = Somewhat agree
   - ☐ 3 = Agree
   - ☐ 4 = Very much agree

8. **As an Algebra I teacher during the 04-05 school year, I treated my students with respect.**

   - ☐ 1 = Do not agree
   - ☐ 2 = Somewhat agree
   - ☐ 3 = Agree
   - ☐ 4 = Very much agree

9. **As an Algebra I teacher during the 04-05 school year, I organized the student desks so that it would encourage group interaction among students.**

   - ☐ 1 = Do not agree
   - ☐ 2 = Somewhat agree
   - ☐ 3 = Agree
   - ☐ 4 = Very much agree

10. **As an Algebra I teacher during the 04-05 school year, maintained a personal work area.**

    - ☐ 1 = Do not agree
    - ☐ 2 = Somewhat agree
    - ☐ 3 = Agree
    - ☐ 4 = Very much agree

11. As an Algebra I teacher during the 04-05 school year, I posted classroom rules and student behavior expectations.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

12. As an Algebra I teacher during the 04-05 school year, I wrote daily lesson plans.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

13. As an Algebra I teacher during the 04-05 school year, I developed lesson plans that included activities that addressed the different levels of student abilities in my class.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

14. As an Algebra I teacher during the 04-05 school year, I developed instruction that allowed for the use of math manipulatives and supplemental materials.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

15. As an Algebra I teacher during the 04-05 school year, I used pre-assessments to guide my instruction.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

16. As an Algebra I teacher during the 04-05 school year, I planned student-centered activities rather than teacher led activities.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

17. As an Algebra I teacher during the 04-05 school year, I established a routine that students became accustomed to.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

18. As an Algebra I teacher during the 04-05 school year, I used more than the report card as a means of communicating with the parents of the students I taught.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

19. As an Algebra I teacher during the 04-05 school year, I used a variety of assessments to monitor student progress in my class.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

20. As an Algebra I teacher during the 04-05 school year, I provided written and verbal feedback to all students.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

21. As an Algebra I teacher during the 04-05 school year, I kept up with researched based literature in my field.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

22. As an Algebra I teacher during the 04-05 school year, I collaborated with my colleagues.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

23. As an Algebra I teacher during the 04-05 school year, I attend grade level meetings and other meetings pertaining to the needs of students.

- ☐ 1 = Do not agree
- ☐ 2 = Somewhat agree
- ☐ 3 = Agree
- ☐ 4 = Very much agree

Please complete the following items to provide feedback on this questionnaire.

1. The directions are clear.

☐ 1. No
☐ 2. Yes

2. Did you have any difficulty answering items 1 through 23?

☐ 1. No
☐ 2. Yes
If yes, please identify the item and explain. _____

_____.

Thank you for completing this survey.

APPENDIX C –

TEACHER QUESTIONNAIRE

Please check the appropriate box to the following questions. If you answer NO to the first question, please do not continue with this survey. Return the completed questionnaire in the self-addressed stamped envelope. Thank you for your participation.

Algebra I Teacher Questionnaire

1. **I taught Algebra I at this high school level during the 2004-2005 school year.**

   ☐ 1. No
   ☐ 2. Yes

2. **I was certified to teach secondary math in 2004-2005.**

   ☐ 1. No
   ☐ 2. Yes
   ☐ If not, what was your certification status? _____.

3. **Check all the degrees earned in 2004-2005 or prior to 2004-2005.**

   ☐ 1. Bachelor
   ☐ 2. Masters
   ☐ 3. EdS or Certificate of Advanced Graduate Studies
   ☐ 4. Doctorate
   ☐ 5. Other: _____.

4. **I have taught Algebra I for _____ years, including 2004-2005.**

   ☐ 1. 0-3
   ☐ 2. 4-7
   ☐ 3. 8-11
   ☐ 4. 12-16
   ☐ 5. 17 plus

5. **My highest earned degree in mathematics in 2004-2005 was**

   ☐ 1. Bachelors in Mathematics.
   ☐ 2. Masters in Mathematics
   ☐ 3. EdS or Certificate of Advanced General Studies
   ☐ 4. Doctorate
   ☐ 5. None of the above

The following questions ask your feeling of how your teaching behaviors influence students' academic success. Please mark the response on the degree of agreement of each statement. 1 = Do not agree; 2 = Somewhat agree; 3 = Agree; and 4 = Very much agree.

6. **As an Algebra I teacher during the 04-05 school year, I believe my approach to teaching was structured, yet flexible.**

   a. 1 = Do not agree
   b. 2 = Somewhat agree
   c. 3 = Agree
   d. 4 = Very much agree

7. **As an Algebra I teacher during the 04-05 school year, I enjoyed teaching my subject.**

   a. 1 = Do not agree
   b. 2 = Somewhat agree
   c. 3 = Agree
   d. 4 = Very much agree

8. **As an Algebra I teacher during the 04-05 school year, I treated my students with respect.**

   a. 1 = Do not agree
   b. 2 = Somewhat agree
   c. 3 = Agree
   d. 4 = Very much agree

9. **As an Algebra I teacher during the 04-05 school year, I organized the student desks so that it would encourage group interaction among students.**

   a. 1 = Do not agree
   b. 2 = Somewhat agree
   c. 3 = Agree
   d. 4 = Very much agree

10. **As an Algebra I teacher during the 04-05 school year, I maintained a personal work area.**

    a. 1 = Do not agree
    b. 2 = Somewhat agree
    c. 3 = Agree
    d. 4 = Very much agree

11. As an Algebra I teacher during the 04-05 school year, I posted classroom rules and student behavior expectations.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

12. As an Algebra I teacher during the 04-05 school year, I wrote daily lesson plans.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

13. As an Algebra I teacher during the 04-05 school year, I developed lesson plans that included activities that addressed the different levels of student abilities in my class.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

14. As an Algebra I teacher during the 04-05 school year, I developed instruction that allowed for the use of math manipulatives and supplemental materials.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

15. As an Algebra I teacher during the 04-05 school year, I used pre-assessments to guide my instruction.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

16. As an Algebra I teacher during the 04-05 school year, I planned student-centered activities rather than teacher led activities.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

17. As an Algebra I teacher during the 04-05 school year, I established a routine that students became accustomed to.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

18. As an Algebra I teacher during the 04-05 school year, I used more than the report card as a means of communicating with the parents of the students I taught.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

19. As an Algebra I teacher during the 04-05 school year, I used a variety of assessments to monitor student progress in my class.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

20. As an Algebra I teacher during the 04-05 school year, I provided written and verbal feedback to all students.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

21. As an Algebra I teacher during the 04-05 school year, I kept up with researched based literature in my field.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

22. As an Algebra I teacher during the 04-05 school year, I collaborated with my colleagues.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

23. As an Algebra I teacher during the 04-05 school year, I attend grade level meetings and other meetings pertaining to the needs of students.

a. 1 = Do not agree
b. 2 = Somewhat agree
c. 3 = Agree
d. 4 = Very much agree

APPENDIX D –
E-MAIL LETTER TO SUPERINTENDENTS REGARDING THE STUDY OF ALGEBRA I PERFORMANCE

[Return Address}
[date]
[Address]
[City] [State] [Zip code]

Dear [name]:

I am a Virginia Polytechnic Institute and State University doctoral candidate studying under the guidance of my advisor and chairperson, Dr. Travis Twiford. I am conducting a study of the relationships between the attributes of school Algebra I teachers and student performance on the Algebra I SOL test.

I am asking for your permission to field test my questionnaire with the Algebra I teachers currently assigned to Chancellor, Courtland, Massaponax, Riverbend, and Spotsylvania High Schools. The questionnaire has five short items regarding common teacher attributes found in research literature: teacher certification, number of years teaching, specialization in math, and the highest degree earned, and 18 Likert Scale items pertaining to teacher behaviors that promote successful student achievement. The responses will be confidential. A copy of the questionnaire is enclosed for your perusal. The questionnaire should take less than ten minutes to complete.

The questionnaire will have an identification code. This will be used only to monitor responses. Participation is voluntary. Teachers may refuse to answer any question. Responses are confidential and will not be identified in the final report. Teachers may withdraw at any time, and by completing and returning the questionnaire, the teachers are giving consent to use the data in this study.

Please contact me at home, [(540) 898-7924], call my office at [(540) 834-2500 extension 1115], or e-mail me at algquestionnaire@aol.com if I can address any questions or concerns. I sincerely appreciate your time. Thank you for your consideration of my request.

With regards,

Bernardine Goode

APPENDIX E –
INTRODUCTION LETTER TO BUILDING PRINCIPAL

[Return Address]
[date]
[Name]
[Address]
[City] [State] [Zip code]

[Current date]

Dear [name]:

I am a Virginia Polytechnic Institute and State University doctoral candidate studying under the guidance of my advisor and chairperson, Dr. Travis Twiford. I am conducting a study of the relationships between the attributes of school Algebra I teachers and student performance on the Algebra I SOL test.

Approval has been received from your school superintendent to conduct the study. I am asking that you distribute the questionnaires and letters to the Algebra I teachers in your school. If you receive this packet of information after the end of the current school year, please address the self-stamped envelope to the home address of the Algebra I teacher(s) at your school. The teachers will return only the survey and second pre-addressed stamped envelope to me.

The questionnaire will have an identification code. This will be used only to monitor responses. Participation is voluntary. Teachers may refuse to answer any question. Responses are confidential and will not be identified in the final report. Teachers may withdraw at any time, and by completing and returning the questionnaire, the teachers are giving consent to use the data in this study.

Please call me at [(540) 898-7924] or e-mail me at algquestionnaire@aol.com if I can address any questions or concerns. I sincerely appreciate your time. Thank you for your consideration of my request.

With regards,

Bernardine Goode

APPENDIX F –
INTRODUCTION LETTER TO TEACHERS

[Return Address]
[date]
[Name]
[Address]
[City] [State] [Zip code]

[Current date]

Dear [name]:

I am a Virginia Polytechnic Institute and State University doctoral candidate studying in the Department of Educational Leadership and Policy Studies at Virginia Tech under the guidance of my advisor and Chairperson Dr. Travis Twiford. I am conducting a study of attributes of high school Algebra I teachers.

The enclosed questionnaire has an identification code. This will be used only to monitor responses. You may refuse to answer any question. Responses are confidential and will not be identified in the final report. You may withdraw at any time, and by completing and returning the questionnaire, the teachers are giving consent to use the data in this study.

The questionnaire has five short items regarding common attributes found in research literature: certification, number of years teaching, content specialization, and the highest degree earned and 18 Likert Scale items pertaining to teacher behaviors that promote successful student achievement. I would appreciate your taking a few moments of your time to complete and return the enclosed questionnaire. A stamped, addressed envelope is enclosed for your convenience. The questionnaire will take less than ten minutes to complete.

Please call me at [(540) 898-7924] or e-mail me at algquestionnaire@aol.com if I can address any questions or concerns. I sincerely appreciate your time. Thank you for your consideration of my request.

With regards,

Bernardine Goode

APPENDIX G –

CORRELATION OF QUESTIONNAIRE QUESTIONS TO THE SIX TEACHER DOMAINS

Teacher Domain	Correlation to Questions
1. The Teacher as a Person	6. **As an Algebra I teacher during the 04-05 school year, I believe my approach to teaching was structured, yet flexible**
	7. **As an Algebra I teacher during the 04-05 school year, I enjoyed teaching my subject.**
	8. **As an Algebra I teacher during the 04-05 school year I treated my students with respect .**
2. Classroom Management and Organization	9. **As an Algebra I teacher during the 04-05 school year, I organized the student desks so that it would encourage group interaction among students**
	10**. As an Algebra I teacher during the 04-05 school year I maintained a personal work area.**
	11. **As an Algebra I teacher during the 04-05 school year, I posted classroom rules and student behavior expectations.**
3. Organizing and Orienting for Instruction	12. **As an Algebra I teacher during the 04-05, I wrote daily lesson plans.**
	13. **As an Algebra I teacher during the 04-05 school year, I developed lesson plans that included activities that addressed the different levels of student abilities in my class.**
	14. **As an Algebra I teacher during the 04-05 school year, I developed instruction that allowed for the use of math manipulatives and supplemental materials**.
4. Implementing Instruction	15. **As an Algebra I teacher during the 04-05 school year, I used pre-assessments to guide my instruction.**
	16. **As an Algebra I teacher during the 04-05 school year, I planned student-centered activities rather than teacher led activities.**
	17. **As an Algebra I teacher during the 04-05 school year, I established a routine that**

	students became accustomed to.
5. Monitoring Student Progress and Potential	18. **As an Algebra I teacher during the 04-05 school year, I used more than the report card as a means of communicating with the parents of the students I taught.** 19. **As an Algebra I teacher during the 04-05 school year, I used a variety of assessments to monitor student progress in my class.**
	20. **As an Algebra I teacher during the 04-05 school year, I provided written and verbal feedback to all students.**
6. Professionalism	21. **As an Algebra I teacher during the 04-05 school year, I kept up with researched based literature in my field.**
	22. **As an Algebra I teacher during the 04-05 school year, I collaborated with my colleagues.**
	23. **As an Algebra I teacher during the 04-05 school year, I attend grade level meetings and other meetings pertaining to the needs of students.**

APPENDIX H –

VIRGINIA DEPARTMENT OF EDUCATION LISTING OF HIGH SCHOOLS

2005 ALGEBRA I SOL TEST SCORES

Division Name	School Name	Algebra 1 Pass 2005
Accomack County Public Schools	DIVISION SUMMARY	83.22
Accomack County Public Schools	NANDUA HIGH	79.61
Accomack County Public Schools	ARCADIA HIGH	74.03
Accomack County Public Schools	CHINCOTEAGUE HIGH	89.19
Albemarle County Public Schools	DIVISION SUMMARY	87.31
Albemarle County Public Schools	WESTERN ALBEMARLE HIGH	83.85
Albemarle County Public Schools	ALBEMARLE HIGH	82.88
Albemarle County Public Schools	MURRAY HIGH	100
Albemarle County Public Schools	MONTICELLO HIGH	74
Alleghany County Public Schools	DIVISION SUMMARY	78.53
Alleghany County Public Schools	ALLEGHANY HIGH	75
Amelia County Public Schools	DIVISION SUMMARY	94.57
Amelia County Public Schools	AMELIA COUNTY HIGH	92.78
Amherst County Public Schools	DIVISION SUMMARY	81.28
Amherst County Public Schools	AMHERST COUNTY HIGH	75.16
Appomattox County Public Schools	DIVISION SUMMARY	85.14
Appomattox County Public Schools	APPOMATTOX COUNTY HIGH	77.55
Arlington County Public Schools	DIVISION SUMMARY	87.42
Arlington County Public Schools	WASHINGTON LEE HIGH	79.25
Arlington County Public Schools	YORKTOWN HIGH	85.57
Arlington County Public Schools	WAKEFIELD HIGH	69.94
Augusta County Public Schools	DIVISION SUMMARY	90.22
Augusta County Public Schools	BUFFALO GAP HIGH	88.78
Augusta County Public Schools	FT. DEFIANCE HIGH	80.7
Augusta County Public Schools	RIVERHEADS HIGH	100
Augusta County Public Schools	WILSON MEMORIAL HIGH	93.88
Augusta County Public Schools	STUARTS DRAFT HIGH	71.76
Bath County Public Schools	DIVISION SUMMARY	87.01
Bath County Public Schools	BATH COUNTY HIGH	87.01
Bedford County Public Schools	DIVISION SUMMARY	82.47

Bedford County Public Schools	LIBERTY HIGH	82.64
Bedford County Public Schools	STAUNTON RIVER HIGH	73.08
Bedford County Public Schools	JEFFERSON FOREST HIGH	75.55
Bland County Public Schools	DIVISION SUMMARY	65.79
Bland County Public Schools	ROCKY GAP HIGH	84.62
Bland County Public Schools	BLAND HIGH	56
Botetourt County Public Schools	DIVISION SUMMARY	74.43
Botetourt County Public Schools	JAMES RIVER HIGH	58.62
Botetourt County Public Schools	LORD BOTETOURT HIGH	71.54
Brunswick County Public Schools	DIVISION SUMMARY	88.1
Brunswick County Public Schools	BRUNSWICK SR. HIGH	50
Brunswick County Public Schools	JAMES S. RUSSELL JR. HIGH	95.28
Buchanan County Public Schools	DIVISION SUMMARY	83.7
Buchanan County Public Schools	GRUNDY HIGH	83.85
Buchanan County Public Schools	COUNCIL HIGH	90.91
Buchanan County Public Schools	HURLEY HIGH	82.5
Buchanan County Public Schools	TWIN VALLEY HIGH	80.6
Buckingham County Public Schools	DIVISION SUMMARY	70.7
Buckingham County Public Schools	BUCKINGHAM COUNTY HIGH	62.3
Campbell County Public Schools	DIVISION SUMMARY	89.12
Campbell County Public Schools	ALTAVISTA HIGH	92.11
Campbell County Public Schools	RUSTBURG HIGH	80.98
Campbell County Public Schools	WILLIAM CAMPBELL HIGH	86.52
Campbell County Public Schools	BROOKVILLE HIGH	89.06
Caroline County Public Schools	DIVISION SUMMARY	66.67
Caroline County Public Schools	CAROLINE HIGH	54.73
Carroll County Public Schools	DIVISION SUMMARY	71.67
Carroll County Public Schools	CARROLL COUNTY HIGH	55.56
Charles City County Public Schools	DIVISION SUMMARY	85.48
Charles City County Public Schools	CHARLES CITY CO. HIGH	86.05
Charlotte County Public Schools	DIVISION SUMMARY	87.04
Charlotte County Public Schools	RANDOLPH HENRY SR. HIGH	82.35
Chesterfield County Public Schools	DIVISION SUMMARY	85.47
Chesterfield County Public Schools	LLOYD C. BIRD HIGH	84.64
Chesterfield County Public Schools	CHESTERFIELD COMMUNITY HIGH	54.05
Chesterfield County Public Schools	MONACAN HIGH	87.23

Chesterfield County Public Schools	MIDLOTHIAN HIGH	79.91
Chesterfield County Public Schools	MATOACA HIGH	64.5
Chesterfield County Public Schools	MEADOWBROOK HIGH	73.03
Chesterfield County Public Schools	THOMAS DALE HIGH	85.6
Chesterfield County Public Schools	MANCHESTER HIGH	77.74
Chesterfield County Public Schools	CLOVER HILL HIGH	78.8
Chesterfield County Public Schools	JAMES RIVER HIGH	80.63
Clarke County Public Schools	DIVISION SUMMARY	77.16
Clarke County Public Schools	CLARKE COUNTY HIGH	46.99
Craig County Public Schools	DIVISION SUMMARY	79.49
Craig County Public Schools	CRAIG COUNTY HIGH	79.49
Culpeper County Public Schools	DIVISION SUMMARY	90.91
Culpeper County Public Schools	CULPEPER COUNTY HIGH	86.47
Cumberland County Public Schools	DIVISION SUMMARY	73.83
Cumberland County Public Schools	CUMBERLAND HIGH	66.27
Dickenson County Public Schools	DIVISION SUMMARY	78.22
Dickenson County Public Schools	HAYSI HIGH	78.75
Dickenson County Public Schools	CLINTWOOD HIGH	75.26
Dickenson County Public Schools	ERVINTON HIGH	88
Dinwiddie County Public Schools	DIVISION SUMMARY	80.08
Dinwiddie County Public Schools	DINWIDDIE COUNTY HIGH	78.51
Essex County Public Schools	DIVISION SUMMARY	73.48
Essex County Public Schools	ESSEX HIGH	60.67
Fairfax County Public Schools	DIVISION SUMMARY	89.31
Fairfax County Public Schools	FAIRFAX HIGH	84.8
Fairfax County Public Schools	HERNDON HIGH	86.65
Fairfax County Public Schools	LAKE BRADDOCK SECONDARY	92.95
Fairfax County Public Schools	CHANTILLY HIGH	88.27
Fairfax County Public Schools	WOODSON ADULT HIGH SCHOOL	50
Fairfax County Public Schools	CENTREVILLE HIGH	87.7
Fairfax County Public Schools	MOUNT VERNON HIGH	70.22
Fairfax County Public Schools	ANNANDALE HIGH	73.9
Fairfax County Public Schools	MCLEAN HIGH	84.91

Fairfax County Public Schools	WEST POTOMAC HIGH	78.57
Fairfax County Public Schools	LEE HIGH	86.36
Fairfax County Public Schools	MADISON HIGH	92.65
Fairfax County Public Schools	STUART HIGH	94.04
Fairfax County Public Schools	FALLS CHURCH HIGH	74.77
Fairfax County Public Schools	WOODSON HIGH	89.64
Fairfax County Public Schools	EDISON HIGH	72.5
Fairfax County Public Schools	MARSHALL HIGH	90.75
Fairfax County Public Schools	THOMAS JEFFERSON HIGH SCHOOL	100
Fairfax County Public Schools	LANGLEY HIGH	92.81
Fairfax County Public Schools	WEST SPRINGFIELD HIGH	82.89
Fairfax County Public Schools	OAKTON HIGH	90.43
Fairfax County Public Schools	HAYFIELD SECONDARY	82.75
Fairfax County Public Schools	ROBINSON SECONDARY	92.66
Fairfax County Public Schools	SOUTH LAKES HIGH	69.38
Fairfax County Public Schools	BRYANT ALTERNATIVE HIGH	100
Fairfax County Public Schools	PIMMIT HILLS ALTERNATIVE HIGH	76.92
Fairfax County Public Schools	WESTFIELD HIGH	88.65
Fauquier County Public Schools	DIVISION SUMMARY	84.62
Fauquier County Public Schools	FAUQUIER HIGH	60.47
Fauquier County Public Schools	LIBERTY HIGH	89.09
Floyd County Public Schools	DIVISION SUMMARY	82.08
Floyd County Public Schools	FLOYD COUNTY HIGH	82.08
Fluvanna County Public Schools	DIVISION SUMMARY	70.27
Fluvanna County Public Schools	FLUVANNA COUNTY HIGH	53.57
Franklin County Public Schools	DIVISION SUMMARY	90.68
Franklin County Public Schools	FRANKLIN COUNTY HIGH	86.9
Frederick County Public Schools	DIVISION SUMMARY	86.77
Frederick County Public Schools	JAMES WOOD HIGH	83.78
Frederick County Public Schools	SHERANDO HIGH	77.78
Frederick County Public Schools	MILLBROOK HIGH	81.61
Giles County Public Schools	DIVISION SUMMARY	72.44
Giles County Public Schools	GILES HIGH	68.27
Giles County Public Schools	NARROWS HIGH	77.27
Gloucester County Public Schools	DIVISION SUMMARY	83.99
Gloucester County Public Schools	GLOUCESTER HIGH	75.38
Goochland County Public Schools	DIVISION SUMMARY	84.85
Goochland County Public Schools	GOOCHLAND HIGH	84.85
Grayson County Public Schools	DIVISION SUMMARY	65.73

Grayson County Public Schools	GRAYSON COUNTY HIGH	55.24
Greene County Public Schools	DIVISION SUMMARY	80.73
Greene County Public Schools	WILLIAM MONROE HIGH	72.59
Greensville County Public Schools	DIVISION SUMMARY	93.9
Greensville County Public Schools	GREENSVILLE COUNTY HIGH	91.15
Halifax County Public Schools	DIVISION SUMMARY	93.18
Halifax County Public Schools	HALIFAX COUNTY HIGH	91.78
Hanover County Public Schools	DIVISION SUMMARY	88.32
Hanover County Public Schools	ATLEE HIGH	86.03
Hanover County Public Schools	LEE DAVIS HIGH	79.1
Hanover County Public Schools	PATRICK HENRY HIGH	74.14
Hanover County Public Schools	HANOVER HIGH	86.67
Henrico County Public Schools	DIVISION SUMMARY	90.18
Henrico County Public Schools	VA. RANDOLPH COMM. HIGH	60.71
Henrico County Public Schools	GODWIN HIGH	97.67
Henrico County Public Schools	HIGHLAND SPRINGS HIGH	87.06
Henrico County Public Schools	FREEMAN HIGH	85.24
Henrico County Public Schools	VARINA HIGH	82.57
Henrico County Public Schools	TUCKER HIGH	80
Henrico County Public Schools	HENRICO HIGH	80.33
Henrico County Public Schools	HERMITAGE HIGH	92.06
Henry County Public Schools	DIVISION SUMMARY	84.36
Henry County Public Schools	BASSETT HIGH	75.5
Henry County Public Schools	MAGNA VISTA HIGH	80.58
Henry County Public Schools	FIELDALE COLLINSVILLE HI	.
Henry County Public Schools	LAUREL PARK HIGH	.
Highland County Public Schools	DIVISION SUMMARY	100
Highland County Public Schools	HIGHLAND HIGH	100
Isle Of Wight County Public Schools	DIVISION SUMMARY	94.12
Isle Of Wight County Public Schools	SMITHFIELD HIGH	94.27
Isle Of Wight County Public Schools	WINDSOR HIGH	83.56
King George County Public Schools	DIVISION SUMMARY	85.31
King George County Public Schools	KING GEORGE HIGH	79.19
King And Queen County Public Schools	DIVISION SUMMARY	68.12
King And Queen County Public Schools	KING & QUEEN ELEM.	100
King And Queen County Public Schools	CENTRAL HIGH	66.67

King William County Public Schools	DIVISION SUMMARY	86.99
King William County Public Schools	KING WILLIAM HIGH	83.04
Lancaster County Public Schools	DIVISION SUMMARY	76.1
Lancaster County Public Schools	LANCASTER HIGH	69.67
Lee County Public Schools	DIVISION SUMMARY	94.94
Lee County Public Schools	LEE HIGH	87.14
Lee County Public Schools	THOMAS WALKER HIGH	100
Loudoun County Public Schools	DIVISION SUMMARY	88.77
Loudoun County Public Schools	DOMINION HIGH	67.23
Loudoun County Public Schools	PARK VIEW HIGH	75.54
Loudoun County Public Schools	POTOMAC FALLS HIGH	78.01
Loudoun County Public Schools	LOUDOUN COUNTY HIGH	71.02
Loudoun County Public Schools	LOUDOUN VALLEY HIGH	73.25
Loudoun County Public Schools	BROAD RUN HIGH	90.24
Loudoun County Public Schools	STONE BRIDGE HIGH	92.95
Loudoun County Public Schools	HERITAGE HIGH	70.27
Louisa County Public Schools	DIVISION SUMMARY	92.25
Louisa County Public Schools	LOUISA COUNTY HIGH	87.58
Lunenburg County Public Schools	DIVISION SUMMARY	83.05
Lunenburg County Public Schools	CENTRAL HIGH	75
Madison County Public Schools	DIVISION SUMMARY	91.41
Madison County Public Schools	MADISON COUNTY HIGH	88.52
Mathews County Public Schools	DIVISION SUMMARY	79.31
Mathews County Public Schools	MATHEWS HIGH	73.63
Mecklenburg County Public Schools	DIVISION SUMMARY	90.95
Mecklenburg County Public Schools	BLUESTONE HIGH	82.29
Mecklenburg County Public Schools	PARK VIEW HIGH	94.25
Middlesex County Public Schools	DIVISION SUMMARY	62.07
Middlesex County Public Schools	MIDDLESEX HIGH	52.17
Montgomery County Public Schools	DIVISION SUMMARY	78.45
Montgomery County Public Schools	AUBURN HIGH	55.93
Montgomery County Public Schools	BLACKSBURG HIGH	73.33
Montgomery County Public Schools	CHRISTIANSBURG HIGH	63.09
Montgomery County Public Schools	EASTERN MONTGOMERY HIGH	95.24
Nelson County Public Schools	DIVISION SUMMARY	74.07
Nelson County Public Schools	NELSON COUNTY HIGH	65.93
New Kent County Public Schools	DIVISION SUMMARY	87.31

New Kent County Public Schools	NEW KENT COUNTY HIGH	83.66
Northampton County Public Schools	DIVISION SUMMARY	95.7
Northampton County Public Schools	NORTHAMPTON HIGH	94.67
Northumberland County Public Schools	DIVISION SUMMARY	94.21
Northumberland County Public Schools	NORTHUMBERLAND HIGH	93.18
Nottoway County Public Schools	DIVISION SUMMARY	85.23
Nottoway County Public Schools	NOTTOWAY HIGH	78
Orange County Public Schools	DIVISION SUMMARY	74.92
Orange County Public Schools	ORANGE CO. HIGH	56
Page County Public Schools	DIVISION SUMMARY	85.38
Page County Public Schools	LURAY HIGH	85.95
Page County Public Schools	PAGE COUNTY HIGH	84.85
Patrick County Public Schools	DIVISION SUMMARY	74.85
Patrick County Public Schools	PATRICK COUNTY HIGH	74.85
Pittsylvania County Public Schools	DIVISION SUMMARY	78.39
Pittsylvania County Public Schools	DAN RIVER SR. HIGH	74.31
Pittsylvania County Public Schools	GRETNA SR. HIGH	62.75
Pittsylvania County Public Schools	CHATHAM HIGH	83.67
Pittsylvania County Public Schools	TUNSTALL SR. HIGH	71.53
Powhatan County Public Schools	DIVISION SUMMARY	92.47
Powhatan County Public Schools	POWHATAN HIGH	89.9
Prince Edward County Public Schools	DIVISION SUMMARY	78.53
Prince Edward County Public Schools	PRINCE EDWARD COUNTY HIGH	72.3
Prince George County Public Schools	DIVISION SUMMARY	93.2
Prince George County Public Schools	PRINCE GEORGE HIGH	87.96
Prince George County Public Schools	N. B. CLEMENTS JUNIOR HIGH SCHOOL	96.98
Prince William County Public Schools	DIVISION SUMMARY	81.1
Prince William County Public Schools	WOODBRIDGE HIGH	78.81
Prince William County Public Schools	OSBOURN PARK HIGH	83.79
Prince William County Public Schools	POTOMAC HIGH	80.83
Prince William County Public Schools	BATTLEFIELD HIGH	88.6
Prince William County Public Schools	FREEDOM HIGH	52.38
Prince William County Public Schools	BRENTSVILLE DISTRICT HIGH	96.55
Prince William County Public Schools	STONEWALL JACKSON HIGH	68.16
Prince William County Public Schools	GAR-FIELD HIGH	77.52
Prince William County Public Schools	C. D. HYLTON HIGH	70.92
Prince William County Public Schools	FOREST PARK HIGH	80.14
Pulaski County Public Schools	DIVISION SUMMARY	89.11

Pulaski County Public Schools	PULASKI COUNTY SR. HIGH	86
Rappahannock County Public Schools	DIVISION SUMMARY	80.26
Rappahannock County Public Schools	RAPPAHANNOCK CO. HIGH	74.14
Richmond County Public Schools	DIVISION SUMMARY	87.67
Richmond County Public Schools	RAPPAHANNOCK HIGH	85.48
Roanoke County Public Schools	DIVISION SUMMARY	90.29
Roanoke County Public Schools	CAVE SPRING HIGH	88
Roanoke County Public Schools	NORTHSIDE HIGH	85.35
Roanoke County Public Schools	GLENVAR HIGH	87.3
Roanoke County Public Schools	WILLIAM BYRD HIGH	85.63
Roanoke County Public Schools	HIDDEN VALLEY HIGH	91.37
Rockbridge County Public Schools	DIVISION SUMMARY	75.44
Rockbridge County Public Schools	ROCKBRIDGE COUNTY HIGH	78.72
Rockingham County Public Schools	DIVISION SUMMARY	93.62
Rockingham County Public Schools	SPOTSWOOD HIGH	89.64
Rockingham County Public Schools	TURNER ASHBY HIGH	94.81
Rockingham County Public Schools	BROADWAY HIGH	92.99
Russell County Public Schools	DIVISION SUMMARY	81.32
Russell County Public Schools	LEBANON HIGH	90.2
Russell County Public Schools	HONAKER HIGH	76.58
Russell County Public Schools	CASTLEWOOD HIGH	72.46
Scott County Public Schools	DIVISION SUMMARY	85.42
Scott County Public Schools	RYE COVE HIGH	100
Scott County Public Schools	GATE CITY HIGH	60
Scott County Public Schools	TWIN SPRINGS HIGH	100
Shenandoah County Public Schools	DIVISION SUMMARY	88.44
Shenandoah County Public Schools	STRASBURG HIGH	87.41
Shenandoah County Public Schools	CENTRAL HIGH	86.36
Shenandoah County Public Schools	STONEWALL JACKSON HIGH	80.21
Smyth County Public Schools	DIVISION SUMMARY	89.43
Smyth County Public Schools	NORTHWOOD HIGH	78.79
Smyth County Public Schools	CHILHOWIE HIGH	93.06
Smyth County Public Schools	MARION SENIOR HIGH	87.23

Southampton County Public Schools	DIVISION SUMMARY	89.08
Southampton County Public Schools	SOUTHAMPTON HIGH	92.31
Spotsylvania County Public Schools	DIVISION SUMMARY	76.28
Spotsylvania County Public Schools	COURTLAND HIGH	71.56
Spotsylvania County Public Schools	SPOTSYLVANIA HIGH	59.92
Spotsylvania County Public Schools	CHANCELLOR HIGH	79.7
Spotsylvania County Public Schools	MASSAPONAX HIGH	56.53
Spotsylvania County Public Schools	RIVERBEND HIGH	65.79
Stafford County Public Schools	DIVISION SUMMARY	84.26
Stafford County Public Schools	STAFFORD SR. HIGH	76.66
Stafford County Public Schools	NORTH STAFFORD HIGH	73.95
Stafford County Public Schools	BROOKE POINT HIGH	77.45
Stafford County Public Schools	COLONIAL FORGE HIGH	86.83
Surry County Public Schools	DIVISION SUMMARY	92.5
Surry County Public Schools	SURRY COUNTY HIGH	91.18
Sussex County Public Schools	DIVISION SUMMARY	83.04
Sussex County Public Schools	SUSSEX CENTRAL HIGH	82.08
Tazewell County Public Schools	DIVISION SUMMARY	81.98
Tazewell County Public Schools	RICHLANDS HIGH	79.01
Tazewell County Public Schools	TAZEWELL HIGH	79.05
Tazewell County Public Schools	POCAHONTAS HIGH	75
Tazewell County Public Schools	GRAHAM HIGH	79.13
Warren County Public Schools	DIVISION SUMMARY	85.86
Warren County Public Schools	WARREN COUNTY HIGH	69.7
Warren County Public Schools	WARREN CO. JR. HIGH	91.38
Washington County Public Schools	DIVISION SUMMARY	74.92
Washington County Public Schools	ABINGDON HIGH	56.41
Washington County Public Schools	JOHN S. BATTLE HIGH	84
Washington County Public Schools	PATRICK HENRY HIGH	56.19
Washington County Public Schools	HOLSTON HIGH	75.86
Westmoreland County Public Schools	DIVISION SUMMARY	73.53

Westmoreland County Public Schools	WASHINGTON AND LEE HIGH	67.07
Wise County Public Schools	DIVISION SUMMARY	90.54
Wise County Public Schools	POUND HIGH	80
Wise County Public Schools	COEBURN HIGH	86.96
Wise County Public Schools	APPALACHIA HIGH	100
Wise County Public Schools	ST. PAUL HIGH	94.59
Wise County Public Schools	J. J. KELLY HIGH	95.05
Wise County Public Schools	POWELL VALLEY HIGH	74.65
Wythe County Public Schools	DIVISION SUMMARY	82.65
Wythe County Public Schools	RURAL RETREAT HIGH	78.46
Wythe County Public Schools	GEORGE WYTHE HIGH	85.51
Wythe County Public Schools	FORT CHISWELL HIGH	73.04
York County Public Schools	DIVISION SUMMARY	88.45
York County Public Schools	BRUTON HIGH	69.81
York County Public Schools	YORK HIGH	78.4
York County Public Schools	TABB HIGH	80.73
York County Public Schools	GRAFTON HIGH	89.41
Alexandria City Public Schools	DIVISION SUMMARY	74.7
Alexandria City Public Schools	T. C. WILLIAMS HIGH	69.3
Bristol City Public Schools	DIVISION SUMMARY	86.67
Bristol City Public Schools	VIRGINIA HIGH	84.85
Buena Vista City Public Schools	DIVISION SUMMARY	84.85
Buena Vista City Public Schools	PARRY MCCLUER HIGH	91.43
Charlottesville City Public Schools	DIVISION SUMMARY	52.68
Charlottesville City Public Schools	CHARLOTTESVILLE HIGH	42.66
Colonial Heights City Public Schools	DIVISION SUMMARY	88.31
Colonial Heights City Public Schools	COLONIAL HEIGHTS HIGH	83.1
Covington City Public Schools	DIVISION SUMMARY	78.33
Covington City Public Schools	COVINGTON HIGH	78.33
Danville City Public Schools	DIVISION SUMMARY	90.09
Danville City Public Schools	GEORGE WASHINGTON HIGH	88.17
Danville City Public Schools	GALILEO MAGNET HIGH	97.56
Danville City Public Schools	FRESH START ACADEMY	77.78
Falls Church City Public Schools	DIVISION SUMMARY	98.82
Falls Church City Public Schools	GEORGE MASON HIGH	97.7
Fredericksburg City Public Schools	DIVISION SUMMARY	76.1
Fredericksburg City Public Schools	JAMES MONROE HIGH	72.78

Galax City Public Schools	DIVISION SUMMARY	77.27
Galax City Public Schools	GALAX HIGH	77.27
Hampton City Public Schools	DIVISION SUMMARY	85.04
Hampton City Public Schools	PHOEBUS HIGH	70.59
Hampton City Public Schools	HAMPTON HIGH	72.68
Hampton City Public Schools	KECOUGHTAN HIGH	82.49
Hampton City Public Schools	BETHEL HIGH	88.15
Harrisonburg City Public Schools	DIVISION SUMMARY	82.81
Harrisonburg City Public Schools	HARRISONBURG HIGH	77.66
Hopewell City Public Schools	DIVISION SUMMARY	80.69
Hopewell City Public Schools	HOPEWELL HIGH	76.64
Lynchburg City Public Schools	DIVISION SUMMARY	73.03
Lynchburg City Public Schools	HERITAGE HIGH	66.81
Lynchburg City Public Schools	E. C. GLASS HIGH	54.67
Martinsville City Public Schools	DIVISION SUMMARY	87.3
Martinsville City Public Schools	MARTINSVILLE HIGH	81.25
Newport News City Public Schools	DIVISION SUMMARY	81.26
Newport News City Public Schools	DENBIGH HIGH	70.03
Newport News City Public Schools	WARWICK HIGH	70.22
Newport News City Public Schools	MENCHVILLE HIGH	79.48
Newport News City Public Schools	HERITAGE HIGH	62.32
Newport News City Public Schools	WOODSIDE HIGH	84.69
Norfolk City Public Schools	DIVISION SUMMARY	80.36
Norfolk City Public Schools	GRANBY HIGH	74.55
Norfolk City Public Schools	NORVIEW HIGH	95.11
Norfolk City Public Schools	LAKE TAYLOR HIGH	70.86
Norfolk City Public Schools	B. T. WASHINGTON HIGH	58.51
Norton City Public Schools	DIVISION SUMMARY	84.44
Norton City Public Schools	J. I. BURTON HIGH	84.44
Petersburg City Public Schools	DIVISION SUMMARY	50.53
Petersburg City Public Schools	PETERSBURG HIGH	47.8
Portsmouth City Public Schools	DIVISION SUMMARY	76.45
Portsmouth City Public Schools	I. C. NORCOM HIGH	72.26
Portsmouth City Public Schools	CHURCHLAND HIGH	74.22
Portsmouth City Public Schools	WOODROW WILSON HIGH	60
Radford City Public Schools	DIVISION SUMMARY	74.47
Radford City Public Schools	RADFORD HIGH	74.47

Richmond City Public Schools	DIVISION SUMMARY	80.45
Richmond City Public Schools	THOMAS JEFFERSON HIGH	69.44
Richmond City Public Schools	OPEN HIGH	96.88
Richmond City Public Schools	JOHN MARSHALL HIGH	68.85
Richmond City Public Schools	GEORGE WYTHE HIGH	87.9
Richmond City Public Schools	ARMSTRONG HIGH SCHOOL	62.86
Richmond City Public Schools	HUGUENOT HIGH	95.65
Roanoke City Public Schools	DIVISION SUMMARY	56.72
Roanoke City Public Schools	PATRICK HENRY HIGH	29.82
Roanoke City Public Schools	WILLIAM FLEMING HIGH	51.99
Roanoke City Public Schools	NOEL C. TAYLOR LRNG. ACADEMY	32
Roanoke City Public Schools	BLUE RIDGE TECHNICAL ACADEMY	34.29
Staunton City Public Schools	DIVISION SUMMARY	78.81
Staunton City Public Schools	ROBERT E. LEE HIGH	70.93
Suffolk City Public Schools	DIVISION SUMMARY	70.24
Suffolk City Public Schools	NANSEMOND RIVER HIGH	65.64
Suffolk City Public Schools	LAKELAND HIGH	70.88
Suffolk City Public Schools	KING`S FORK HIGH	55.18
Virginia Beach City Public Schools	DIVISION SUMMARY	91.09
Virginia Beach City Public Schools	GREEN RUN HIGH	71.78
Virginia Beach City Public Schools	FRANK W. COX HIGH	94.23
Virginia Beach City Public Schools	PRINCESS ANNE HIGH	91.88
Virginia Beach City Public Schools	FLOYD KELLAM HIGH	82.72
Virginia Beach City Public Schools	BAYSIDE HIGH	91.29
Virginia Beach City Public Schools	FIRST COLONIAL HIGH	90.58
Virginia Beach City Public Schools	KEMPSVILLE HIGH	82.06
Virginia Beach City Public Schools	SALEM HIGH	88.24
Virginia Beach City Public Schools	TALLWOOD HIGH	83.51
Virginia Beach City Public Schools	OCEAN LAKES HIGH	85.38
Virginia Beach City Public Schools	LANDSTOWN HIGH	89.27

Waynesboro City Public Schools	DIVISION SUMMARY	77.11
Waynesboro City Public Schools	WAYNESBORO HIGH	66.07
Williamsburg-James City County Public Schools	DIVISION SUMMARY	92.26
Williamsburg-James City County Public Schools	LAFAYETTE HIGH	87.67
Williamsburg-James City County Public Schools	JAMESTOWN HIGH	88.84
Winchester City Public Schools	DIVISION SUMMARY	85.23
Winchester City Public Schools	JOHN HANDLEY HIGH	77.13
Franklin City Public Schools	DIVISION SUMMARY	64.89
Franklin City Public Schools	FRANKLIN HIGH	58.18
Chesapeake City Public Schools	DIVISION SUMMARY	90.36
Chesapeake City Public Schools	OSCAR F. SMITH HIGH	82.08
Chesapeake City Public Schools	DEEP CREEK HIGH	95.09
Chesapeake City Public Schools	GREAT BRIDGE HIGH	88.27
Chesapeake City Public Schools	INDIAN RIVER HIGH	81.52
Chesapeake City Public Schools	WESTERN BRANCH HIGH	89.43
Chesapeake City Public Schools	HICKORY HIGH	83.53
Salem City Public Schools	DIVISION SUMMARY	91.09
Salem City Public Schools	SALEM HIGH	83.85
Poquoson City Public Schools	DIVISION SUMMARY	98.59
Poquoson City Public Schools	POQUOSON HIGH	97.41
Manassas City Public Schools	DIVISION SUMMARY	84.78
Manassas City Public Schools	OSBOURN HIGH	81.94
Manassas Park City Public Schools	DIVISION SUMMARY	95.51
Manassas Park City Public Schools	MANASSAS PARK HIGH	93.58
Colonial Beach Public Schools	DIVISION SUMMARY	84.75
Colonial Beach Public Schools	COLONIAL BEACH HIGH	84.75
West Point Public Schools	DIVISION SUMMARY	94.05
West Point Public Schools	WEST POINT HIGH	90

SNP UNITS NOTES:

1. SCHOOL DOES NOT PARTICIPATE in the National School Lunch Program (NSLP). Free / Reduced Price eligibility data is not available.
2. ANNEX School Free / Reduced Price eligibility data is combined with PARENT school data.

APPENDIX I –

VALIDATION RESULTS FROM THE TRIAL ADMINISTRATION OF THE QUESTIONNAIRE

High School	Number of Questionnaires distributed to High Schools	Number of results returned	Percentage of Returns
1	8	4	50
2	8	3	38
3	8	3	38
4	8	1	12
5	8	2	25
TOTAL	40	13	32.5

APPENDIX J –

PERCENTAGES OF ACTUAL RETURNS

(A) Category of High School	(B) School Code	(C) Number of Questionnaires Sent	(D) Number Returned	(E) Number of Yes Responses	(F) Number of No Reponses	(G) Percentage of returns based on column D/C	(H) Percentage of SES Factor
1	A1	10	2	2	0	20	35.62
	A2	10	5	4	1	50	26.79
	A3	6	3	2	1	50	31.38
	A4	3	3	3	0	100	40.19
	A5	3	3	1	2	100	28.29
	A6	3	3	1	2	100	34.42
	A7	2	2	0	2	100	45.54
	A8	2	2	0	2	100	32.21
	A9	Did not participate					37.10
	A10	Did not participate					5.68
	Totals	**39**	**23**	**13**	**10**	**59**	
2	B1	10	1	1	0	10	5.52
	B2	4	3	2	1	75	53.63
	B3	8	6	4	2	75	43.28
	B4	4	2	2	0	50	48.66
	B5	3	1	0	1	34	27.12
	B6	2	2	2	0	100	48.66
	B7	3	3	1	2	100	27.12
	B8	2	1	1	0	50	48.18
	B9	6	4	4	0	67	36.35
	B10	6	3	3	0	50	45.12
	Totals	**48**	**26**	**20**	**6**	**54**	
3	C1	4	2	2	0	50	26.76
	C2	8	6	3	3	75	13.71
	C3	8	5	3	2	62	27.81
	C4	2	1	0	1	50	44.48
	C5	12	2	1	1	8	5.1
	C6	6	4	3	1	67	33.1
	C7	3	2	2	0	67	31.84
	C8	2	2	1	1	100	34.22
	C9	4	2	2	0	50	27.80
	C10	4	4	3	1	100	21.5
	Totals	**53**	**30**	**20**	**10**	**57**	
	G T	**140**	**79**	**53**	**26**	**56**	

APPENDIX K –

SES SCHOOL PERCENTAGES OF FREE/REDUCED LUNCHES FROM THE 53 TEACHER RESPONSES

Number of Teacher Survey Returns	Category 1 SES percentages	Category 2 SES percentages	Category 3 SES percentages
1	32.31	45.12	27.8
2	5.68	53.63	21.5
3	37.1	43.28	21.5
4	5.68	45.12	27.8
5	34.32	32.98	26.07
6	31.38	5.52	21.33
7	40.19	32.98	5.1
8	31.38	32.98	21.33
9	28.29	31.82	21.33
10	28.29	36.74	31.84
11	45.54	36.74	33.10
12	45.54	36.35	21.33
13	5.68	48.66	33.1
14		48.18	26.76
15		48.18	44.48
16		27.12	13.71
17		27.12	13.71
18		27.12	13.71
19		45.12	13.71
20		21.33	31.84
Total	371.38	726.09	471.05
SES Average	28.56	36.30	23.55

APPENDIX L –

IRB EXEMPT APPROVAL

VirginiaTech

Office of Research Compliance
Institutional Review Board
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24061
540/231-4991 Fax 540/231-0959
e-mail moored@vt.edu
www.irb.vt.edu
FWA00000572(expires 1/20/2010)
IRB # is IRB00000667

DATE: June 7, 2007

MEMORANDUM

TO: Travis W. Twiford
Bernardine Goode

FROM: David M. Moore

SUBJECT: **IRB Exempt Approval:** "The Relationships Between Selected Attributes of Algebra I Teachers and Student Achievement on the Algebra I SOL Test In Grades 9-12 (Testing of the Questionnaire)", IRB # 07-306

I have reviewed your request to the IRB for exemption for the above referenced project. I concur that the research falls within the exempt status. Approval is granted effective as of June 7, 2007.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must not be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.

2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

cc: File